JOSÉ LUIS LEZAMA AND JOSÉ B. MORELOS
coordinators

Population, City and Environment in Contemporary Mexico

EL COLEGIO DE MÉXICO

POPULATION, CITY AND ENVIRONMENT
IN CONTEMPORARY MEXICO

POPULATION, CITY AND ENVIRONMENT IN CONTEMPORARY MEXICO

José Luis Lezama
José B. Morelos
(coordinators)

EL COLEGIO DE MÉXICO

Translation: Suzanne D. Stephens

Cover illustration: Juan O'Gorman, *Mexico City* (1949). Tempera
on masonite, 66 x 122 cms. Museo de Arte Moderno. Photograph from
the archives of the Instituto de Investigaciones Estéticas, UNAM.

First edition, 2006

Printed in Mexico

CONTENTS

SECOND PART

FOREWORD

The coordinators of the book-homage to Gustavo Cabrera would
like to thank the Center for Demographic, Urban and Environ-
mental Studies (CEDUA) faculty for their enthusiast response to the
invitation to participate in the work, through which the Center
honors Gustavo Cabrera, a key architect of the quantitative and
qualitative changes to Mexican demography.

Gustavo Cabrera studied demography at Celade (Latin Ameri-
can Center for Demography) and worked as a professor and re-
searcher at the Center for Economic and Demographic Studies
(CEED), subsequently renamed the Center for Demographic and
Urban Development Studies at El Colegio de México.

In his capacity as General Secretary of the National Popula-
tion Council (Conapo) from 1976 to 1982, he was the first to de-
fine the demographic goals for this period until the year 2000 of
Mexico's Population Policy, known as the Regional Demographic
Policy of Mexico, whose strategy was defined by the three Rs, re-
tention, relocation and reorientation. He also established the bases
for the incorporation of the population factor into the Mexican
government's sectoral policies: Health, Labor, Urban Develop-
ment, Agriculture and Water Resources.

All this, which was groundbreaking work in the 1970s, estab-
lished the guidelines for enabling the population to become the
agent of change in cultural, political and socio-economic spheres,
as well as the beneficiary of present and future development.

In addition to the introduction, this book includes 17 articles,
9 from the area of demography and the remaining 8 from Urban
Development, in addition to two interviews, one with Víctor L.
Urquidi, former dean of El Colegio de México, and another with

Carmen Miró, former director of the Latin American Center of Demography (Celade).

These articles take stock of the developments of the past four decades and compare the concerns of the period that marked the beginning of reflection, analysis and policy proposals with those of today. They show how the researchers of then and now reflected and continue to reflect on a reality that can be regarded as both similar and changing. They also demonstrate the theoretical and methodological advances that have taken place in the fields of population and urban development studies.

The coordinators are grateful to Ma. Estela Esquivel, who was responsible for the secretarial work. They would also like to thank the Publications Department at El Colegio de México for its careful editing.

INTRODUCTION

In his contribution to this work, "Four Scenarios for the Population for Mexico for the Late 21st Century Constructed Through an (Exponential) Function," Manuel Ordorica designed a mathematical model to establish the long term as the time horizon for demographic perspectives and to gauge the influence of demographic inertia on Mexico's future growth. To this end, he constructed four scenarios that enable one to measure the effect of four stable growth rates on the amounts and rates of five-yearly growth of the Mexican population for the period from 1977 to 2100.

Beatriz Figueroa Campos' article, "Estimates of Births that Occurred During the 1990s in Mexico," used various sources to provide estimates for the births that occurred during the 1990s. One of the purposes of this exercise was to provide elements to explain the degree of under-estimation of fertility during the last decade of the 20th century.

In their essay, "A Decade in the Evolution of the Principal Causes of Death among Senior Citizens in Mexico and the Federal District, 1985-1995," José B. Morelos and Gabriela Mejía Paillés use a Box-Jenkins Univariate Model (ARIMA) to describe the evolution of the ten main causes of death among the elderly in Mexico and Mexico City. Since the data used are based on monthly estimates, the study used 132 observations spanning the period from January 1985 to December 1995. One of the advantages of using time series is that it permits the identification of the types of models describing the original data.

The article by Alejandro Mina Valdés, "Causes of Death in Mexico and Its Increase in Life Expectancy," focuses on the deaths due to a variety of causes during the second half of the 20th century and on the application of a method to measure the impact on

17

life expectancy of the elimination of each of the following three causes: heart disease, malignant tumors and diabetes mellitus, taken separately and together, compared with other causes of death.

Julieta Quilodrán's article, "Is the Nature of Consensual Union in Latin America Changing? The Examples of Brazil, Mexico and the Dominican Republic," describes the socio-demographic characteristics of co-habiting couples in the traditional model, including the changes experienced by couples living together and the features that the current model, dating from the second half of the 1990s, shares with the modern co-habitation model of developed countries and the traces, which can still be observed, of the traditional model. In addition to Mexico, the author analyzes the cases of Brazil and the Dominican Republic.

In their article, "A Reflection on Contraceptive Use in Mexico in Light of Reproductive Rights," Juan Guillermo Figueroa Perea and Blanca Margarita Aguilar Ganado review some of the changes that have occurred since 1994 in institutional standards. The most important of these include: a) the use of concepts and categories such as health and reproductive rights and b) the incorporation of informed consent into the official discourse of certain institutions such as SSA, Conapo and IMSS as a means of ensuring respect for the population's reproductive rights and providing a more integral contribution to health in the reproductive sphere.

In "Participation in the Labor Force, Women's Social Position and Reproductive Behavior: An Analysis of the Progress Achieved to Date," Brígida García and Orlandina de Oliveira describe the most recent advances in the explanation of the links between women's extradomestic work and their demographic behavior in relation to fertility and child survival. They begin with a summary of the earliest, mechanical approaches that explained these links and chart their evolution towards more subtle analytical approaches, highlighting efforts in new research areas to link women's demographic behavior with their extradomestic work and empowerment and/or autonomy.

In "School Dropout Rates, Adolescent Labor and Family Structures in Mexico," Silvia E. Giorguli Saucedo explores the existing links between teenagers' activities and their family environment.

She places particular attention on the implications for this group of the absence of one of the parents, the mother's employment status and the importance of these characteristics, in addition to gender, on teenagers' transition from school to the labor market.

In his article, "Change and Continuity in Government Responses to Mexican Migration," Francisco Alba describes the evolution of Mexican government responses and positions vis-à-vis US migratory policies and measures, which in turn have left their mark on the flow of Mexicans to their neighboring country. It also explains how, since the events of September 11 2001, Mexico has faced several dilemmas regarding migratory policy, and been forced to make difficult decisions because of the overlapping of security and border control issues with that of Mexican emigration.

The works included in the second half of the book explore various facets of the relationship between city and environment. In the case of the city, the authors research specific aspects of everyday life and its link with space, as well as its appropriation by specific social groups, and undertake model-based analyses of urbanization in Mexico.

The most crucial issues for understanding the urban dynamic in Mexico today are present in the works included in this book. These comprise the analysis of the *service revolution* and its main features in Mexico City. Also discussed is the problem of population distribution, poverty, the environment and sustainable development. Taken as a whole, the articles reflect the status of contemporary Mexico City. However, they also deal with specific issues and problems through which the city emerges as a sphere of coexistence that has been transformed into a modern space and one of contrasts. This is the case, from one of the approaches adopted in the book, of the modernity expressed in industrial development and the expansion of the service sector. From another point of view, the city and the countryside appear to be synonymous with poverty and pollution, as well as non-sustainable urban and regional development.

Gustavo Garza's article, "The Service Revolution," places the start of Mexico City's increased dependence on the service sector in the second half of the 20th century. This process can be explained by the acceleration of the manufacture of industrial goods and

the rise in the consumption of services, resulting from factors such as the increase in citizens' income, demographic changes, elasticity of demand, etc. The hegemony of the service sector in the more economically advanced countries constitutes a genuine service revolution, from which post-industrial society emerges. By way of a conclusion, Garza states that both neo-classical economic theory and political economy constitute conceptual and methodological patterns that can be used to understand the functioning of the production, distribution, circulation and consumption of goods and services. Analyzing the service sector in Mexico is crucial to understanding the macroeconomic evolution of recent decades and envisaging future perspectives for a possible service revolution in the early 21st century.

In his essay, "Competitiveness and Employment in the Largest Metropolitan Areas of Mexico," Jaime Sobrino maintains that the competitiveness of a city is determined by a series of factors known as competitive advantages. He also posits that its competitive performance tends to translate into changes in the levels of local productivity and transformations in the urban labor market. The author seeks to explore the impact of a city's competitive position on the dynamics of its labor market, for which he studies the ten main metropolitan areas in the country during the period from 1980 to 2000. The relationship between competitive performance and occupational dynamics is analyzed through the construction of a self-regressive statistical model. The results of the model allow the author to conclude that, in general terms, and according to the theory, the competitive position of the country's largest metropolitan areas during the period under study is positively linked to the increase in productivity and to the dynamics of its urban labor market.

In "Distribution of the Mexican Population During the 20th Century," Crescencio Ruiz Chiappetto studies the process of urbanization in Mexico, using Williams' population redistribution paradigm (1983) as a frame of reference. The article develops the formulation of three indices constructed by Williams (urbanization rate, rural and urban population growth rates and the urban-rural ratio).

The author points out that one of the main contributions of Williams' simple definition of the urbanization rate (differences

in the degree of urbanization per period) enable him to derive other indices from the latter (such as net urban growth, net rural growth and rate of change of the urban-rural ratio). This shows that a calculation regarded as over-simple until relatively recently constitutes the key to understanding the relationship between the indicators of population concentration.

One of the questions raised as possible themes for future research is the existence of a potential relationship between these urbanization indices and the bell shapes of other population concentration indicators, particularly those of the urban cycles proposed in more recent models such as those by Berry (1988), Geyer (1996) and Kontuly (1993).

Araceli Damián, the author of "The Evolution of Urban and Rural Poverty in Mexico", presents her version of the evolution of total, urban and rural poverty during the decade of the 1990s. She argues that the debt crisis and the subsequent stabilization and adjustment programs led to a considerable increase of poverty in the country. Among other aspects, the author highlights the fact that during the 1980s, the country lost everything it had gained during the import substitution period. Conversely, during the 1990s she finds that the poverty reduction was slower than the increase of poverty during periods of crisis, such as between 1994 and 1996. The period from 2000 to 2003 saw negative growth of per capita GDP which, together with the scant possibilities of a rapid recovery of the economy due to the recession in the United States and Europe, in addition to the negative effects of the economic policy implemented by federal government, comprising increased interest rates and reduced spending, will trigger further recession and therefore an increase in the number of people living in a state of poverty.

The author suggests that dealing with urban poverty more effectively requires not only reducing the rural bias of policies designed to combat poverty (for which federal government has decided to expand the Oportunidades program to urban areas) but also conducting an in-depth review of economic and social policies, including key issues such as the potential elimination of general subsidies.

Clara E. Salazar and Catherine Paquette, authors of the article "Senior Citizens in an Urban Space Undergoing a Process of Re-

generation. The Case of Mexico City's Historic Center," analyze the perception of this particular population group of the transformation of their urban space.

One of the most important contributions of this article to the study of spaces undergoing transformation is the exploration of everyday life as an aspect of urban studies, by linking it both to the impact of urban actions on specific dimensions (change of residence, new economic activities, etc.) and to the analysis of government policies and actions regarding urban transformation.

The authors argue that socio-demographic research on this subject ignores the everyday practices of this sector of the population in cities, which explains why there is widespread ignorance about the way senior citizens experience cities. The hypothesis guiding this research holds that Mexico City's Historic Center provides socio-spatial conditions that senior citizens can use as a resource for mitigating their precarious conditions, which may be altered by the process of regeneration currently underway.

The authors conclude that the impact of the transformations of senior citizens' living space is not always perceptible. However, they hold that a close link exists between senior citizens and the material and symbolic resources provided by the Historic Center.

In his article "Geography and Environment: From Natural Resources to Natural Capital," Boris Graizbord highlights the limitations of regional policy regarding the environment and sustainable development, from the perspective of regional and urban analysis. This argument is developed on the basis of the definition of the concept of *space* in regional economy, "regional" being defined as an intersection between the local and the regional, and notes the problem faced by regional analysis as a result of the introduction of the paradigm of sustainable development. Finally, the author highlights the conceptual and methodological difference in the use of the definitions of *natural resources* and *natural capital* as analytical categories. The main contribution of this work is its proposal of a methodology for evaluating urban-regional policy within the context of environmental transition.

José Luis Lezama's article, "Metropolitan Environmental Management: The Case of Air Pollution in the Valle de México," examines the problem faced by public administration in regulating

phenomena such as environmental problems, particularly those involving air pollution, due to their eco-systemic nature. The author explains that the main difficulty lies in the fact that issues such as air pollution are not restricted to politico-administrative limits, which is why they require governmental coordination, for which environmental management institutions in Mexico are not prepared. According to this article, the crux of the matter is the lack of a metropolitan authority with the constitutional authority to make decisions. The author therefore proposes adapting the Mexican legal and institutional framework to include a metropolitan authority that will be able to influence territorial spheres where various politico-administrative entities overlap.

In his contribution to this book, "Urban Transport and Air Pollution in the Mexico City Metropolitan Area," Valentín Ibarra Vargas analyzes one of the crucial aspects to understand the problem of air pollution in the Valle de México, namely its relationship with the transport sector. According to the author, the transport sector, which is responsible for the highest proportion of substances annually emitted into the atmosphere, has a structure that encourages or stimulates the production of pollutants. He therefore posits that in the search for solutions to both pollution and public transport service, it is essential to change the main direction, replace the public transport fleet with less polluting, more efficient vehicles from an energy point of view, rearrange routes to improve service and prevent the unnecessary overlapping of various modes of transport, establish stricter regulations for people and freight transport, and incorporate traffic administration measures.

In his article, Professor Ibarra discusses aspects that have not been analyzed in other contributions to the study of the relationship between transport and pollution, particularly as regards the urban dimension of transport and the elements that point to the planning of both transport and the factors affecting air quality in this metropolitan city.

<div style="text-align: right;">

José Luis Lezama
José B. Morelos
(coords.)
July 2004

</div>

FIRST PART

I. FOUR SCENARIOS FOR THE POPULATION OF MEXICO FOR THE LATE 21ST CENTURY CONSTRUCTED THROUGH AN EXPO (EXPONENTIAL) FUNCTION

Manuel Ordorica

What we do know, even in the 21st century, is that the world population is still experiencing its fastest period of demographic growth in history. Its increases in absolute numbers will remain at between 90 and 100 million inhabitants per year over the next 20 to 25 years. Tomorrow's world will be very different from today's, not only in terms of total numbers but also as regards its material conditions and quality of life. Even with alternatives of intermediate or low growth rates. The greatest challenge to be met is for population policies to be incorporated into sustainable development policies. The next 20 years will be crucial for the world to be able to achieve the stabilization of its population with approximately zero growth in the 21st century, in other words, in about 2090, on the threshold of the 22nd century, or 40 years earlier, in the mid-21st century.*

1. INTRODUCTION

In 1977, the National Population Council (Conapo) set a series of goals for demographic growth, of 2.5% for 1982 and of 1% for 2000, when the country had an annual population growth rate of 3.2%, meaning that the population doubled almost every two decades or, in other words, that every twenty years, a new Mexico would have to be constructed. One of the architects of this public policy was Gustavo Cabrera. He felt it was essential for long-term demographic goals to be set, since demographic processes do not experience brusque alterations in the short term. One should have an objective view of a demographic Mexico stretching over various decades; he had totally futuristic view.

As far as technical aspects were concerned, he pointed out, for example, that the indicator subjected to family planning policy should be the population's growth rate, since it was a global index that described the speed of the demographic increase of society as a whole, instead, for example, of the overall fertility rate which is applied to the individual, meaning that a goal concerning this indicator would go against the principle of people's freedom to decide on the number of children they wished to have. I remember that this aspect was widely discussed, and as a result, goals were presented in terms of the population growth rate. Another element that was present in demographic policy approaches in the late 1970s was the concept of *demographic inertia* or *population "momentum."* It was said that the population's growth rate resembled the movement of a boat weighing several tons. Even if brakes were applied, the boat's engines would continue advancing due to the law of inertia. The population has inertia because of the effect of the age structure on the other demographic components. In the year 2000, the *population momentum*[1] is 1.57, meaning that the population will still increase 57% in relation to that of the year 2000. It is impossible to slow down the demographic growth rate brusquely. I still remember the fact that the decision makers did not set a goal of zero demographic growth, because

[1] Momentum is calculated using the following expression developed by James Frauenthal. $M_k = (be^0_0)/R_0^{1/2}$ where b is the birth rate, e^0_0 is life expectancy at birth and R_0 is the net reproduction rate.

this would cause oscillations in the age structure of the population that would go against the dynamic of social structures. Gustavo Cabrera considered all these aspects in the design of demographic planning. He was a highly analytical person, who was both a deep thinker and extremely careful in the way he analyzed data and drew up a population policy.

In order to remember Licenciado Cabrera, as he was fondly known, I have developed a mathematical model that will permit the analysis of the population in the short, medium and long term. I will predict a series of scenarios for the total population for the late 21st century, when our great-grandchildren will be ruling the country and when many of us will form part of the statistics that enable analysts to calculate death rates and therefore life expectancy at birth. I am not trying to compete with the official demographic perspectives, which I use widely, but rather to draw attention to the fact that despite the sharp decline in fertility levels, we are still growing, meaning that we need a clear, objective image of the future demography of the country.

Human beings have always been interested in predicting the future and we construct mathematical and other types of instruments to be able to approach the future. We take the future as a reference point and organize our activities according to this vision of the world. Knowing the number of people there will be in the future is essential for economic and social planning. Projecting desirable scenarios will enable us to propose alternatives to the evolution of demographic phenomena that may produce negative effects on development. In the 17th century, the population forecasts carried out by Gregory King in England were based on the time it would take the number of inhabitants in the population to double. Malthus also undertook population forecasts, using duplication time and geometric function. In 1835, Quetelet was one of the first to apply mathematics to the issue of population, analyzing the fact that demographic evolution progresses rapidly and then more slowly. He said that "the sum of obstacles opposed to an unlimited population growth increases in proportion to the square of the speed with which the population tends to increase.[2]

[2] A. Quetelet (1835), *Sur l'homme et le développement de ses facultés*, Paris.

More complex mathematical functions were subsequently used to make population projections. The best known function is the logistics developed by Verhulst in 1838, examining the Quetelet principle. For a long time, the logistic curve was not used, since census data were unavailable. In 1920, Pearl and Reed rediscovered the logistic curve on their own. Logistics attracted a great deal of attention during the 1920s. It is based on the hypothesis that populations tend to reach a limit that they subsequently do not exceed. This function assumes that the population increase has limits: a lower and higher level, and is based on the assumption that population growth follows a linear path. It was criticized for its failure to take cultural changes into account, which enable a population to exploit its resources more effectively and modify its relations with other populations. The logistic function is now a museum piece. Other functions in which there are limits are Gompertz and Makeham's, which are commonly used in actuarial work. There are a number of groundbreaking theoretical studies of formal demography such as Euler's in the 18th century, which anticipated the concept of stability. It pointed out that a hypothetical population with a set of constant mortality rates by ages and an invariable growth rate would have a stable age structure, meaning that the other demographic components could be fully determined. In 1928, Delevsky pointed out that growth rates can sometimes increase and that the population could follow a wave curve.[3] In 1945, Leslie[4] introduced the use of matrix algebra into the method of components for making population projections. In 1960, Von Foerster used a hyperbole to adjust the population data. Another commonly used method is the exponential function, based on the assumption that the demographic growth rate remains constant. A linear differential equation of the first order is solved to obtain the exponential function. This hypothesis is then used to construct the *stable population* theory developed by Alften Lotka. The population is also assumed to be closed. Since these hypotheses are usually not fulfilled, it proved necessary to de-

[3] J. Delevsky (1928), *Une formulation mathématique de la loi de la population*, Metron (Italy), Vol. VII, pp. 75-96.

[4] P.H. Leslie (1945), "On the use of matrices in certain population mathematics," *Biometrika*, 33.

velop the theory of *quasi-stable populations* to approach reality, since they involve changes in the behavior of the components of the population's natural growth. Other types of mathematical functions have also been elaborated, such as the *expologistic*[5] and *expolinomial*,[6] which reproduce demographic reality more accurately. The problem with these last models is the difficulty of advancing in the theory of demography, since the formulation underlying this type of mathematical functions for incorporating age structure and other demographic indicators becomes more complex when we assume that the rate of population growth is not constant. How does one solve this mathematical difficulty? How can one propose a more realistic, less mathematically complex model that enables one to consider the population's composition by age?

The model I will develop describes the evolution of the demographic growth rate in Mexico from the moment it begins to decline until it becomes stable. It is not valid before this time. Statistics show that from the mid-1970s onwards the birth rate began to drop rapidly, as a result of which the demographic growth rate was reduced. This dynamic was the result of a series of actions derived from a population policy that defined a series of objectives and established goals for the population growth rate, mentioned at the beginning of this article. The rate of demographic increase declined rapidly during the early years, after the population policy mentioned earlier was defined in the 1970s, and more slowly in recent years. The mathematical function that could reproduce the evolution of this demographic growth rate from the mid-1970s onwards is known as the negative exponential function. While this function does not enable one to describe the dynamics of the intensity of population growth before 1975, it accurately projects

[5] M. Ordorica (1990), "Ajuste de una función expologística a la evolución de la población total de México, 1930-1985," *Estudios Demográficos y Urbanos*, 5 (3), Sept.-Dec., pp. 373-386, Centro de Estudios Demográficos y de Desarrollo Urbano, El Colegio de México.

[6] M. Ordorica (1994), "Conciliación de la población de los censos y las estadísticas de nacimientos, defunciones y migración a través de una función expolinomial," *Estudios Demográficos y Urbanos*, 9 (3), Sept.-Dec., pp. 509-519, Centro de Estudios Demográficos y de Desarrollo Urbano, El Colegio de México.

what will happen in the future in the 21st century. What population function is generated? The aim of this article is to answer this question, in other words, to develop a mathematical function that will enable one to analyze the future development of the population on the basis of the negative exponential and establish scenarios of what could happen in the short, medium and long term. The panorama forecasts according to the various alternatives of demographic growth could be useful for reformulating the 20th century's population policy, particularly as regards actions concerning the birth rate. The mathematics for developing an exponential function are not that complex and would allow one to advance in theoretical results linking the other components of population growth and age structure.

2. METHODOLOGY

Let

$$\frac{1}{P(t)}\frac{dP(t)}{dt} = r(t) \tag{1}$$

be the population growth rate, where $r(t)$ is the time function.

Let us assume that $r(t)$ experiences an exponential decline as follows:

$$r(t) = \rho + \alpha' e^{\beta t} \tag{2}$$

Where α' and β are parameters, and the latter has a negative value. When t tends to infinite, $r(t)$ tends to ρ. This means that ρ is the demographic growth rate to which the population tends when t tends to infinite. Expressing the previous equation in a linear fashion we have:

$$r(t) - \rho = \alpha' e^{\beta t} \tag{3}$$

Using logarithms we have:

$$\ln\left[r(t) - \rho\right] = \ln \alpha' + \beta t \tag{4}$$

or

$$\ln[r(t)-\rho] = \alpha + \beta t \qquad (5)$$

where $\alpha = \ln \alpha'$

On the basis of equation (5) it is possible to estimate the parameters of the model through a simple linear regression model. Using the values of the demographic growth rate for several years, we obtain α and β through minimum squares.

To obtain the function of the population, we find $r(t)$:

$$r(t)-\rho = e^{\alpha+\beta t} \qquad (6)$$

In other words:

$$r(t) = \rho + e^{\alpha+\beta t} \qquad (7)$$

substituting equation (7) for (1) we have:

$$\frac{1}{p(t)}\frac{dP(t)}{dt} = \rho + e^{\alpha+\beta t} \qquad (8)$$

which is equal to:

$$\frac{d\ln P(t)}{dt} = \rho + e^{\alpha+\beta t} \qquad (9)$$

incorporating both sides of equation (9) we have:

$$\ln P(t) = \rho t + \frac{e^{\alpha}}{\beta}e^{\beta t} + c \qquad (10)$$

when $t = 0$ the initial conditions are:

$$\ln P(0) = \frac{e^{\alpha}}{\beta} + c \qquad (11)$$

meaning that

$$c = \ln P(0) - \frac{e^{\alpha}}{\beta} \qquad (12)$$

Substituting (12) for (10) we have:

$$\ln P(t) = \rho t + \frac{e^{\alpha}}{\beta} e^{\beta t} + \ln P[0] - \frac{e^{\alpha}}{\beta} \qquad (13)$$

By grouping terms together we have:

$$\ln P(t) = \rho t + \ln P(0) + \frac{e^{\alpha}}{\beta}\left(e^{\beta t} - 1\right) \qquad (14)$$

Finding P (t) we have the final formula:

$$P(t) = P(0)e^{\rho t}e^{\frac{e^{\alpha}}{\beta}\left(e^{\beta t}-1\right)} \qquad (15)$$

The document *World Population Prospects. The 2000 Revision. Comprehensive Tables. Volume I,* published by United Nations, was used to obtain the demographic growth rates for Mexico of 0.0268 for 1977.5, 0.0221 for 1982.5, 0.0196 for 1987.5, 0.0182 for 1992.5 and 0.0163 for 1997.5, which represent the average figures for each of the five-year periods from 1975-1980 to 1995-2000. It is important to note that the total demographic growth rate estimated by United Nations for the middle of the period from 1977-1980 is greater than that estimated by Conapo for that period, due to the fact that Conapo thought that Mexico's population was closed to migration. These data were used to calculate the values of α and β using a classic linear regression model, with different ρ values of –0.5, 0, 0.5 and 1%.

3. VALUES OF PARAMETERS
AND THE DETERMINATION COEFFICIENT

1) If $\rho = -0.5\% \Rightarrow \alpha = -3.483$ and $\beta = -0.01914$, and the determination coefficient is 0.965.

2) If $\rho = 0\% \Rightarrow \alpha = -3.660$ and $\beta = -0.02377$, and the determination coefficient is 0.970.

3) If $\rho = 0.5\% \Rightarrow \alpha = -3.872$ and $\beta = -0.03146$, and the determination coefficien is 0.977.

4) If $\rho = 1\% \Rightarrow \alpha = -4.133$ and $\beta = -0.04701$, and the determination coefficient is 0.987.

In every case, the determination coefficient is extremely high, above 0.965, showing a good fit for the data, the best fit being the one for $\rho = 1\%$.

4. SCENARIOS

Let us assume four scenarios in the stable demographic growth rate:

$$\rho = 1\%; \ \rho = 0.5\%; \ \rho = 0\% \text{ and } \rho = -0.5\%.$$

As we saw earlier, each scenario has different values for α and β.

When $\rho = 1\%$, the function of $P(t)$ is:

$$P(t) = P(0)e^{0.01t}e^{\frac{e^{-4.133}}{-0.0470}\left(e^{-0.0470t}-1\right)}$$

When $\rho = 0.5\%$, the function of $P(t)$ is:

$$P(t) = P(0)e^{0.005t}e^{\frac{e^{-3.872}}{-0.03146}\left(e^{-0.03146t}-1\right)}$$

When $\rho = 0\%$, the function of $P(t)$ is:

$$P(t) = P(0)e^{\frac{e^{-3.660}}{-0.02377}\left(e^{-0.02377t} - 1\right)}$$

When $\rho = -0.5\%$, the function of $P(t)$ is:

$$P(t) = P(0)e^{-0.005t}e^{\frac{e^{-3.483}}{-0.01914}\left(e^{-0.01914t} - 1\right)}$$

5. RESULTS

Below are the results of the different scenarios from 1977 to 2100.

Table 1
Mexico: Total Population, 1977-2100 with $\rho = 1\%$

Year	t	$P(t)$
1977.5	0	63,322,000
1982.5	5	71,498,897
1987.5	10	79,532,749
1992.5	15	87,428,770
1997.5	20	95,214,189
2000	22.5	99,077,527
2010	32.5	114,472,942
2020	42.5	130,074,786
2030	52.5	146,271,794
2040	62.5	163,418,758
2050	72.5	181,834,315
2060	82.5	201,811,457
2070	92.5	223,627,722
2080	102.5	247,556,093
2090	112.5	273,875,312
2100	122.5	302,874,508
$\rho = 1\%$	$\alpha = -4.133$	$\beta = -0.04700$

Table 2
Mexico: Total Population, 1977-2100 with ρ = 0.5%

Year	t	P(t)
1977.5	0	63,322,000
1982.5	5	71,488,955
1987.5	10	79,585,939
1992.5	15	87,544,945
1997.5	20	95,319,493
2000	22.5	99,127,931
2010	32.5	113,796,156
2020	42.5	127,568,754
2030	52.5	140,549,638
2040	62.5	152,903,190
2050	72.5	164,812,222
2060	82.5	176,453,782
2070	92.5	187,989,214
2080	102.5	199,559,790
2090	112.5	211,287,087
2100	122.5	223,274,702
ρ = 0.5%	α = −3.872	β = −0.03146

Table 3
Mexico: Total Population, 1977-2100 with ρ = 0%

Year	t	P(t)
1977.5	0	63,322,000
1982.5	5	71,489,145
1987.5	10	79,619,943
1992.5	15	87,611,623
1997.5	20	95,377,496
2000	22.5	99,153,450
2010	32.5	113,389,629
2020	42.5	126,040,921
2030	52.5	137,003,416
2040	62.5	146,314,853
2050	72.5	154,100,483
2060	82.5	160,530,008
2070	92.5	165,787,824
2080	102.5	170,054,460
2090	112.5	173,495,695
2100	122.5	176,257,990
ρ = 0%	α = −3.660	β = −0.02377

Table 4
Mexico: Total Population, 1977-2100 with $\rho = -0.5\%$

Year	t	P(t)
1977.5	0	63,322,000
1982.5	5	71,499,340
1987.5	10	79,660,786
1992.5	15	87,682,227
1997.5	20	95,452,216
2000	22.5	99,211,960
2010	32.5	113,180,730
2020	42.5	125,092,991
2030	52.5	134,691,403
2040	62.5	141,929,171
2050	72.5	146,913,309
2060	82.5	149,849,677
2070	92.5	150,998,085
2080	102.5	150,635,249
2090	112.5	149,032,633
2100	122.5	146,440,800

$\rho = -0.5\%$ $\alpha = -3.483$ $\beta = -0.01914$

Table 5
Mexico: Average Annual Population Growth Rate
According to ρ, α and β Values
(as a percentage)

Year	1	0.5	0	−0.5
1977.5				
	2.459	2.456	2.456	2.459
1982.5				
	2.153	2.169	2.178	2.185
1987.5				
	1.911	1.925	1.931	1.937
1992.5				
	1.721	1.716	1.713	1.713
1997.5				
	1.604	1.579	1.565	1.557
2000				
	1.455	1.390	1.351	1.326
2010				
	1.286	1.149	1.063	1.006
2020				
	1.180	0.974	0.837	0.742
2030				
	1.115	0.846	0.660	0.525
2040				
	1.074	0.753	0.520	0.346
2050				
	1.048	0.685	0.410	0.198
2060				
	1.032	0.635	0.323	0.076
2070				
	1.022	0.599	0.254	−0.024
2080				
	1.015	0.573	0.201	−0.107
2090				
	1.012	0.553	0.158	−0.176
2100				
$\alpha =$	−4.133	−3.872	−3.660	−3.483
$\beta =$	−0.04700	−0.03146	−0.02377	−0.01914

Graph 1
Mexico: Total Population, 2000-2100
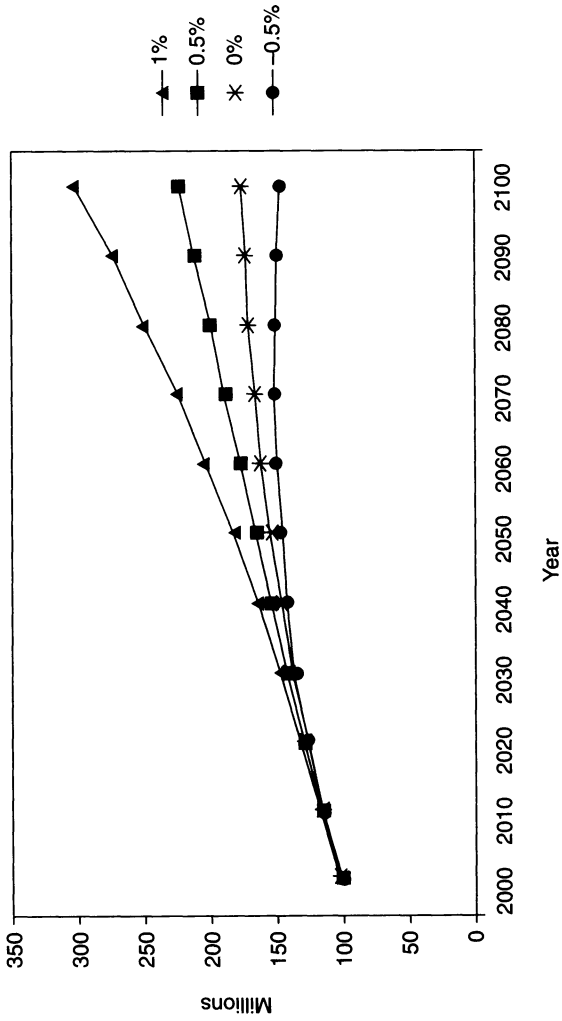
Graph 2
Mexico: Average Annual Population Growth Rate, 2000–2100
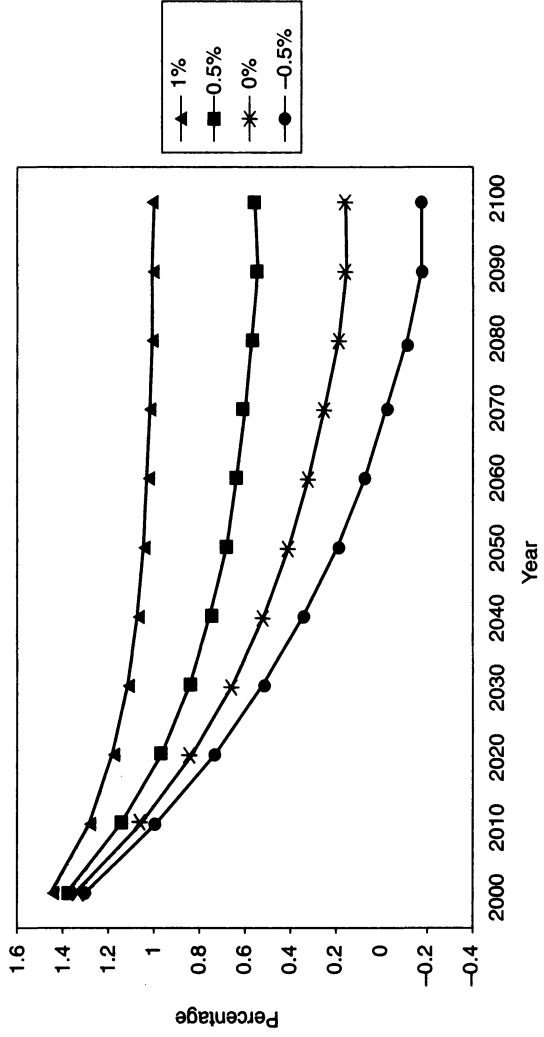
6. ANALYSIS OF RESULTS

According to official data from the National Population Council, Mexico had 104 million inhabitants in 2000, and an annual demographic growth rate of just over 1%. This means that Mexico would double its population over periods of approximately 70 years, if this demographic growth rate continued. Its life expectancy at birth is 75 years and its overall fertility rate approaches replacement levels. At present, Mexico also expels nearly 400,000 people. With all these demographic characteristics, the issue of fertility would appear to have receded into the background, while issues such as international migration, the aging of the population and the rapid increase of the population at active ages have become crucial issues in the sphere of the country's social planning.

On the basis of the results obtained in this paper, I attempt to show that family planning and the issue of reproductive health in general will have to remain on the population policy agenda, since the number of inhabitants will continue growing during the rest of the century. Tables 1 to 5 and Graphs 1 and 2 derived from the model that has been constructed enable us to point out the following: assuming that Mexico's population will stabilize at an annual rate of demographic growth of 1%, by 2100, the country's population would reach 302.9 million inhabitants, nearly three times the current population. If, on the other hand, it stabilized at 0.5%, the population for the end of the century would be 223.3 million and if it stabilized at zero growth, the population would rise to 176.3 million. In the event that Mexico experienced a negative demographic growth rate of –0.5%, by 2100, the population would total a mere 146.4 million, 40% more than the current population.

In an extreme case of negative demographic growth, the population would become extinct. At the other end of the spectrum, it would continue to grow rapidly. What sort of country do we want? What sort of demographic image would we like for the end of the century?   •

7. References

Bourgeois-Pichat, Jean (2001), *The Concept of a Stable Population. Applica-tion to the study of Populations of Countries with Incomplete Demographic Statistics*, ST/SOA/SERIE A/39, U. N.

Foerster, H. V., P. M. Mora and L. W. Amiot (1960), "Doomsday: Friday, 13 November, A.D. 2026," *Science* 132, pp. 1291-1295.

Keyfitz, Nathan (1968), *Introduction to the Mathematics of Population: With Revisions*, 2nd ed., 1977, Reading, Mass., Addison-Wesley.

——— (1977), *Applied Mathematical Demography*, New York, J. Wiley.

——— and John A. Beekman (1984), *Demography Through Problems*, New York, Sringer.

Lotka, Alfred J. (1934-1939), *Théorie Analitique des Associations Biologiques*, Deuxième partie, Paris, Hermann, pp. 11-24 and 64-71.

Ordorica, Manuel (1990), "Ajuste de una función expologística a la evolución de la población total de México, 1930-1985," *Estudios Demográficos y Urbanos*, Vol. 5 (3), pp. 373-386.

——— (1993), "Desarrollo y aplicación de una función expologística para el análisis de congruencia de las fuentes demográficas entre 1940 y 1990: el caso de México," *Revista Mexicana de Sociología*, Year IV (1), pp. 3-16.

——— (1994), "Conciliación de la población de los censos y las estadísticas de nacimientos, defunciones y migración a través de una función expolinomial," *Estudios Demográficos y Urbanos*, 9 (3), pp. 509-519.

United Nations (1978), "Factores determinantes y consecuencias de las tendencias demográficas," *Estudios sobre Población*, 1 (50), New York, Department of Economic and Social Affairs.

II. ESTIMATES OF BIRTHS THAT OCCURRED DURING THE 1990s IN MEXICO

Beatriz Figueroa Campos

1. INTRODUCTION

The main purpose of this paper is to present various estimates of the number of births that occurred for the country as a whole and to contrast the estimates and see whether the levels and trends match or differ. The sources used are: vital statistics from 1990 to 2001; 1990 and 2000 General Population and Housing Censuses, the 1995 Population and Housing Survey and the 1992 and 1997 National Surveys on Demographic Dynamics (ENADID). The aim is to observe the changes that have occurred in this demographic phenomenon and to contribute to the task of reviewing the various information sources rather than to evaluate the information itself. Comparing these estimates will also provide a different perspective on what happened in the area of fertility during the last decade of the 20th century in Mexico. Most of the studies comparing fertility levels are based on the comparison between Overall Fertility Rates or Specific Fertility Rates for five-year groups of the mothers' age, from which the pattern by age is derived. If the estimated rates are drawn from a survey, the information for calculating these rates is drawn from the same source, and when these rates are obtained from census information they are taken from several techniques that have been developed for this purpose. Conversely, when vital statistics are used to estimate these rates, two different information sources are involved: population cen-

45

suses or surveys and vital statistics, meaning that it is more diffi-
cult to identify the information source responsible for the varia-
tions in the estimates of fertility levels. In order to avoid this prob-
lem in this article, instead of comparing fertility rates, we will
compare the total number of births estimated according to differ-
ent information sources during the 1990s.

2. BIRTH ESTIMATES BASED ON 1990 AND 2000 CENSUSES.
THE 1995 POPULATION COUNT AND THE '92 AND '97 ENADID SURVEYS

a) Estimation Methodology

In order to estimate the births that have occurred in a given year
$z(O^z)$ we have women of (Pf) reproductive age by five-year age
groups from the 1990 and 2000 censuses, the 1995 population count
and those of the '92 and '97 ENADID surveys (see Table 1). We also have
the Specific Rates for five-year age groups $(n f^z(x, x + 4))$ that
have been obtained and published in various documents by INEGI,
on the basis of these same sources, with the exception of the 1995
Population Count in which no information was obtained on fer-
tility (see Table 2). The estimated number of births that have taken
place in a given year (O^z) is expressed in symbols as follows:

$$O^z = \sum_{x=15}^{44} O^z_{(x, x+4)} \tag{1}$$

where $O^z_{(x,x+4)}$ are the estimates of births that have taken place in
the year z to women between the ages of x and $x + 4$, which are
obtained as follows:

$$O^z_{(x, x+4)} = \sum_{x=5}^{44} \left(\left(n f^z_{(x, x+4)} \right) \bullet \left(P^{1-VII-z}_{f(x, x+4)} \right) \right) \tag{2}$$

Replacing (1) by (2), we find that:

$$O^z = \sum_{x=15}^{44} \left(nf^z_{(x,\,x+4)} \right) \bullet \left(P^{1-VII-z}_{f(x,x+4)} \right) \tag{3}$$

Consequently, the number of births that have occurred for a set year z (O^z) will be determined by: the total number of women of reproductive age $\sum_{x=15}^{44} P^{1-VII-z}_{f(x,x+4)}$, the age structure of the women in the ages considered (15-49) and specific fertility rates ($nf^z_{(x,\,x+4)}$).

3. Basic Information, Description and Analysis

The first point to note regarding information on the population is the differences in the number of women classified in the unspecified age cohort. This section may affect the estimates of births provided in this paper, depending on its size. The problem of the women for whom no age has been assigned varies according to the source (see Table 1). In the ENADID surveys, the problem is minimal, just 15,839 in 1992 and 8,527 in 1997 (totalling 0.035% and 0.017% respectively) and somewhat greater in the 1995 population count, i.e. 111,643 (0.24%). The problem is most acute in the censuses, since in the 1990 census figures are almost double, equivalent to 252,207 of an unspecified age, accounting for just over half a percentage point. Nevertheless, the 2000 census undoubtedly has the most problems in this respect, since 1,020,126 (2.04%) of the women were not classified by age. Given the importance of the number of women of an unspecified age in 2000, we decided to follow the traditional procedure, meaning that women of an unspecified age were proportionally distributed. Thus two columns with the population figures for each year were drawn up: the former containing the raw data and the latter containing what one might call the adjusted population (see Table 1). Failure to include these women in the calculations produces an under-estimate in the number of births that have occurred. Nevertheless, in order to determine the effect of this problem, estimates have been made of the number of births that have taken place among the adjusted and non-adjusted population.

Table 1

Mexico: Female Population by Five-Year Age Groups, 1990-2000, Various Sources

Age groups	1990	Adjusted	1992	Adjusted	1995	Adjusted	1997	Adjusted	2000	Adjusted
0-4	5,035,176	5,066,071	5,197,076	5,198,957	5,274,744	5,287,505	5,268,568	5,269,503	5,233,851	5,343,102
5-9	5,223,949	5,256,003	5,412,744	5,414,703	5,351,919	5,364,867	5,506,274	5,507,252	5,537,612	5,653,203
10-14	5,158,434	5,190,086	5,355,427	5,357,365	5,265,787	5,278,527	5,374,249	5,375,203	5,300,756	5,411,403
15-19	4,904,511	4,934,605	5,053,997	5,055,826	5,119,828	5,132,215	5,067,327	5,068,227	5,082,487	5,188,578
20-24	4,091,035	4,116,137	4,141,663	4,143,162	4,858,738	4,870,493	4,784,169	4,785,018	4,767,534	4,867,051
25-29	3,353,917	3,374,496	3,463,474	3,464,728	3,960,095	3,969,676	4,094,930	4,095,657	4,296,261	4,385,940
30-34	2,808,883	2,826,118	3,046,829	3,047,932	3,412,143	3,420,398	3,527,631	3,528,257	3,753,167	3,831,510
35-39	2,368,551	2,383,084	2,679,487	2,680,457	3,015,882	3,023,178	3,140,781	3,141,339	3,329,210	3,398,703
40-44	1,792,757	1,803,757	2,006,782	2,007,508	2,261,276	2,266,747	2,517,816	2,518,263	2,700,062	2,756,423
45-49	1,519,287	1,528,609	1,726,359	1,726,984	1,848,947	1,853,420	2,048,721	2,049,085	2,114,914	2,159,060
50-54	1,231,916	1,239,475	1,379,534	1,380,033	1,477,541	1,481,116	1,602,584	1,602,869	1,733,920	1,770,114
55-59	975,620	981,606	1,259,239	1,259,695	1,148,604	1,151,383	1,400,036	1,400,285	1,325,159	1,352,820
60-64	841,400	846,563	1,051,969	1,052,350	1,012,303	1,014,752	1,221,724	1,221,941	1,152,742	1,176,804
65 and over	1,798,033	1,809,066	1,986,776	1,987,495	2,138,341	2,143,514	2,469,004	2,469,442	2,543,358	2,596,448
Population of unknown age	252,207		15,839		111,643		8,527		1,020,126	
Total	41,355,676	41,355,676	43,777,195	43,777,195	46,257,791	46,257,791	48,032,341	48,032,341	49,891,159	49,891,159
% Population of unknown age	0.6098		0.0362		0.2413		0.0178		2.0447	
Pop. 15-49		41,355,676		43,777,195		46,257,791		48,032,341		49,891,159
Proportion of population ages 15-49 of total		50.7		50.54		53.04		52.44		55.13

Sources: 1990: INEGI, *Estados Unidos Mexicanos, Resumen general, XI Censo de Población y Vivienda, 1990*, p. 265; 1992: INEGI, ENADID 92, *Encuesta Nacional de la Dinámica Demográfica, 1992, Metodología y tabulados*, p. 37; 1995: INEGI, *Estados Unidos Mexicanos, Conteo de Población y Vivienda 1995. Resultados definitivos, tabulados complementarios*, p. 207; 1997: INEGI, ENADID 97, *Encuesta Nacional de la Dinámica Demográfica, 1997, Metodología y tabulados*, p. 23; 2000: INEGI, *XII Censo General de Población y Vivienda*, Web site, October 18, Table 2.

Other factors to be taken into account include the proportion of women of reproductive age and the age structure or relative distribution within the 15-49 age group. The proportion of women of reproductive age has shown a spectacular increase (see Table1). In 1990, 50.70% of the total female population was within this age range, whereas by the year 2000 this proportion had risen to 55.13%, an increase of 5%. In absolute numbers, the total population of women aged 15-49 rose by 5,620,459. This increase should be reflected in the number of births that have occurred, despite the steady decline in fertility rates, as we shall see further on. This analysis of the number of births that have occurred will show whether the increase in the number of women of reproductive age is offset by the decline in fertility.

Table 3 shows the distribution by five-year age groups of women ages 15 to 49. If we compare the 1990 data with those for 2000, the first thing that strikes one is the fact that the groups whose percentage has declined most are the first two. The 15-19 year group has declined by four points, while the 20-24 group has decreased by just over one point (1.3). The 25-29 group has slightly increased its share (from 16.09 to 16.50%) while those with the greatest increase are the 35-39 and the 40-44 group, by 1.5 and 1.7 points respectively. The decline in the 15-19 group is fairly unimportant in the number of births that have occurred because of the low fertility levels for this age group. Nevertheless, the change that has occurred in the following group (20-24) may produce a small reduction in the number of estimated births. Increases among the 35-39 age group are unimportant for the purpose of estimating births, since this is the age group in which fertility has declined the most (see Tables 2 and 4). Another outstanding fact is the information from ENADID 92 in the 20-24 and 25-29 age groups, which are less important than in the 95 Population Count and in the 97 ENADID and even in the 2000 census. I believe that the 92 ENADID has underestimated the number of women in these age groups, which in turn will lead to an underestimation of the number of births calculated using this source, since fertility is higher among these age groups. Consequently, these age groups are responsible for just over 50% of the births that take place in a year (see Tables 2 and 4).

Table 2
Mexico: Specific Fertility Rates by Various Sources, 1990-2000

Age groups	ENADID 92[1]				ENADID 97[2]			Census[3]	Absolute differences
	1990	1991	1992	1993	1994	1995	1996	1999	1990-1999
15-19	0.0803	0.0821	0.0882	0.0871	0.0808	0.0775	0.0743	0.0642	0.0161
20-24	0.1780	0.1779	0.1696	0.1696	0.1699	0.1528	0.1479	0.1542	0.0238
25-29	0.1708	0.1667	0.1663	0.1697	0.1522	0.1433	0.1541	0.1514	0.0194
30-34	0.1207	0.1188	0.1140	0.1194	0.1098	0.1115	0.0975	0.1111	0.0096
35-39	0.0761	0.0738	0.0706	0.0691	0.0545	0.0613	0.0552	0.0617	0.0144
40-44	0.0175	0.0246	0.0234	0.0231	0.0205	0.0218	0.0180	0.0228	-0.0053
45-49	0.0061	0.0035	0.0052	0.0032	0.0049	0.0046	0.0029	0.0056	0.0005
TGF	3.25	3.24	3.1868	3.2056	2.9626	2.8638	2.7501	2.855	0.395

Sources: [1] INEGI, ENADID 92, *Encuesta Nacional de la Dinámica Demográfica, 1992, Metodología y tabulados*, p. 212. [2] INEGI, ENADID 97, *Encuesta Nacional de la Dinámica Demográfica, 1992, Metodología y tabulados*, p. 64. [3] INEGI, *XII Censo de Población y Vivienda 2000*, Web site, October 2003.

Table 3

Mexico: Percentage Distribution of Women of Reproductive Age by Five-Year Age Groups, 1990-2000, Various Sources

Age groups	Year					Absolute differences				
	1990	1992	1995	1997	2000	2000-1992	2000-1995	1997-1990	2000-1997	1990-2000
15-19	23.54	22.85	20.92	20.12	19.52	-3.33	-1.40	-3.41	-0.61	-4.02
20-24	19.63	18.72	19.85	19.00	18.31	-0.42	-1.54	-0.63	-0.69	-1.33
25-29	16.09	15.66	16.18	16.26	16.50	0.84	0.32	0.17	0.23	0.40
30-34	13.48	13.77	13.94	14.01	14.41	0.64	0.47	0.53	0.40	0.93
35-39	11.37	12.11	12.32	12.47	12.78	0.67	0.46	1.11	0.31	1.42
40-44	8.60	9.07	9.24	10.00	10.37	1.29	1.13	1.40	0.37	1.76
45-49	7.29	7.81	7.55	8.14	8.12	0.32	0.57	0.85	-0.02	0.83
Total	100.00	100.00	100.00	100.00	100.00					

Sources: 1990: INEGI, Estados Unidos Mexicanos. Resumen General, XI Censo de Población y Vivienda, 1990, pp. 2 and 265; 1992: INEGI, ENADID 92, Encuesta Nacional de la Dinámica Demográfica, 1992, Metodología y tabulados, p. 37; 1995: INEGI, Estados Unidos Mexicanos, Conteo de Población y Vivienda de 1995, Resultados definitivos, tabulados complementarios, p. 107; 1997: INEGI, ENADID 97, Encuesta Nacional de la Dinámica Demográfica, 1992, Metodología y tabulados, p. 23; 2000: INEGI, XII Censo General de Población y Vivienda, Web site, October 18, Table 2.

Table 4
Mexico: Relative Distribution of Specific Fertility Rates, 1990, Various Sources

Age groups	ENADID 92				ENADID 97		
	1990	1991	1992	1993	1994	1995	1996
15-19	12.36	12.68	13.84	13.58	13.63	13.53	13.51
20-24	27.41	27.48	26.61	26.45	28.67	26.68	26.90
25-29	26.30	25.75	26.09	26.47	25.68	25.02	28.02
20-29	53.70	53.23	52.71	52.92	54.35	51.69	54.92
30-34	18.58	18.35	17.89	18.62	18.53	19.47	17.73
35-39	11.72	11.40	11.08	10.78	9.20	10.70	10.04
40-44	2.69	3.80	3.67	3.60	3.46	3.81	3.27
45-49	0.94	0.54	0.82	0.50	0.83	0.80	0.53
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Table 2.

Age-specific fertility rates, another central component in the estimates of the number of births that have taken place we will undertake, are displayed in Table 2. This table shows that during this period, there has been a constant decline in fertility as measured by the Overall Fertility Rate. Women have an average of 0.4 children less, equivalent to a 12% decrease during the period considered (1990-1999). Not all the age groups have experienced the same reduction, and levels tend to oscillate. Thus the 15-19 age group increased slightly from 1990 to 1994 and fell from 1995 onwards, reaching an extremely low level in 1999. This fact, coupled with the changes in the age structure that have taken place, will have a minimal effect on our estimates of the total number of births. Conversely, the next two groups show the greatest decreases in specific fertility rates. It is worth noting that there are also small oscillations that may affect the estimates, such as the fact that rates for the 20-24 age group are higher in 1999 than they were in 1996, while for the 25-29 age group rates are higher than they were for 1995. Oscillations also occur among the 30-34 and 35-39 age group, although there is a general downward trend. Nevertheless, these rates are higher in 1999 than they were for 1996. Consequently, we assume that there will be an increase in the number of births estimated for the year 1999 since the proportion of women increased among these age groups. There are also oscillations among the last two age groups (40-44 and 45-49) and no clear downward trend. Moreover, in 1999, rates were higher than those estimated for 1990. However, given that their contribution to fertility is lower than that of the other groups, estimates of the number of births that have occurred will be less affected than they will be by the reduction of rates in the previous two groups. Nevertheless, the 1999 increase may mean that the number of births estimated for that year is higher than for 1996 and 1997. The oscillations that occur in the rates for each year (as in the last year, 1999) suggest that there will be similar oscillations in the estimates of the number of births that have occurred.

4. POPULATION ESTIMATES

UP TO JULY 1 OF EACH YEAR Z $\left(P_{f(x,x+4)}^{I-VII-z}\right)$

Estimating the number of births that have taken place in a set year z requires having estimates of the female population by five-year age groups, between the ages of 15 and 49 up to July 1 of each year. The fact that the dates when information is obtained for each of these sources is different and does not coincide with the dates required meant that it was necessary to obtain estimates of the population up to July 1 of each year. As mentioned earlier, information is available from two censuses, a population count and two surveys. Moreover, raw and adjusted population data are available for each of these sources. The range of possible combinations means that it is possible to obtain six different estimates for each year. However, population growth can be either linear or exponential; a total of 12 population estimates were carried out for each year between 1990 and 1997, and eight for the period from 1998 to 2000. The result of these interpolations is shown in Table 5. As one might expect, the population estimates (up to July 1) with the highest results are those corresponding to the linear interpolations, whose population base were the 1990 and 2000 censuses, using the 1995 count and the adjusted population as an intermediate point.[1] As anticipated, the lowest figures are those obtained from the interpolation between the two censuses (of 1990 and 2000) and raw data (excluding women of an unspecified age) and considering that the population has increased exponentially. Graph 1 gives the linear estimates of the adjusted population, considering the three main sources, showing that the highest estimate corresponds to the one mentioned earlier, the linear interpolation of the adjusted population, where the population count was taken as an intermediate point. The lowest estimates in this graph correspond to those made using data from the ENADID surveys and the 1990 census. Variations in the estimates between the highest and lowest for each year, in absolute numbers and percentages,

[1] This is why the estimates for 1995 are divided into two groups. Column A shows the estimates based on the 1990 census and 1995 population count, while Column B shows those corresponding to the 1995 and the 2000 census.

are shown in the two last lines of Table 5. The years with the great-
est differences are 1995, 1996 and 1997 (over 800,000 women) ac-
counting for just over 3%. How will this affect birth estimates?

The birth estimates for these populations are given below.
However, the estimate of births that have not occurred will not
only show the effect of population differences but also that of fer-
tility levels and the oscillations between specific rates by age.

5. ESTIMATES OF BIRTHS THAT HAVE OCCURRED (O), 1990-1996 AND 1999

Table 6 contains data on birth estimates (O^z). As one would ex-
pect, the highest estimates were obtained from the adjusted popu-
lation estimated up to June 1, based on information from the cen-
suses and population count, and linear population growth. The
lowest estimates (from 1990 to 1996) were obtained from the ENADID
data using data that had not been adjusted and exponential
growth. If one excludes the estimates based on data that have not
been adjusted, the highest figures continue to be those that have
already been mentioned. The lowest figures are still those obtained
from ENADID population data in which exponential population
growth is considered, except that this time they are based on ad-
justed data. This corroborates the importance in these estimates
of both the population and the age structure of the population of
reproductive age.

The difference between the highest and lowest estimates is
greatest when all the estimates are taken into account, since women
of an unspecified age play a key role, particularly for the years of
the census (1990 and 2000) and the 1995 population count. The
differences range from 23,554 (1.04%) in 1990 to 103,846 (4.7%) in
1995. If one only compares the adjusted data, differences are small,
especially for 1990 and 1999. In 1990, the difference declined to
nearly half (11,011) with a value of 0.48%. By the year 1999 (be-
cause of the effect of the number of women of an unspecified age
on the 2000 census) it fell to nearly a fifth, from 60,188 (2.53%) to
12,805 (0.53%). Generally speaking, the differences obtained by
comparing the birth estimates for each year are slightly greater

Table 5

Mexico: Estimate of Total Population of Women of Reproductive Age by Five-Year Age Groups up to July 1 of Each Year, 1990-2000 on the Basis of Information from the 1990 and 2000 Censuses, the 1995 Count and the ENADID 1992 and 1997 Surveys

Type of interpolation for the population in the middle of the year	Years					
	1990	1991	1992	1993	1994	1995A
Linear Censuses 90 and 2000	20,998,268	21,522,183	22,047,532	22,571,448	23,095,361	23,619,275
Linear Censuses 90 and 2000 adj. pop.	21,138,861	21,704,629	22,271,943	22,837,710	23,403,475	23,969,242
Exp. Censuses 90 and 2000	20,976,949	21,439,393	21,916,735	22,406,808	22,911,349	23,430,831
Exp. Censuses 90 and 2000 adj. pop.	21,115,058	21,612,161	22,125,803	22,653,684	23,197,718	23,758,444
Linear Censuses 90, 2000 and 95 Count	21,034,589	21,677,930	22,323,034	22,966,378	23,609,718	24,253,061
Linear Censuses 90, 2000 and 95 Count adj. pop.	21,158,762	21,789,965	22,422,895	23,054,100	23,685,301	24,316,503
Exp. Censuses 90, 2000 and 95 Count	21,017,576	21,617,917	22,240,377	22,882,290	23,546,096	24,232,579
Exp. Censuses 90, 2000 and 95 Count adj. pop.	21,142,330	21,732,009	22,343,084	22,972,924	23,623,890	24,296,740
Linear Census 90 and ENADID 92 and 97	20,986,384	21,480,120	21,975,204	22,553,017	23,165,238	23,777,460
Linear Census 90 and ENADID 92 and 97 adj. pop.	21,102,605	21,549,149	21,996,915	22,560,521	23,172,036	23,783,550
Exp. Census 90 and ENADID 92 and 97	20,980,509	21,465,506	21,969,307	22,522,432	23,108,064	23,713,629
Exp. Census 90 and ENADID 92 and 97 adj. pop.	21,097,340	21,536,246	21,991,719	22,529,995	23,114,972	23,719,845
Differences between highest and lowest	181,813	350,572	506,160	647,292	773,952	885,672
Percentage differences	0.87	1.64	2.31	2.89	3.38	3.78

Type of interpolation for the population in the middle of the year		Years				
	1995B	1996	1997	1998	1999	2000
Linear Censuses 90 and 2000		24,144,625	24,668,539	25,192,455	25,716,367	26,241,718
Linear Censuses 90 and 2000 adj. pop.		24,536,558	25,102,323	25,668,091	26,233,856	26,801,171
Exp. Censuses 90 and 2000		23,967,225	24,518,107	25,085,440	25,669,766	26,273,310
Exp. Censuses 90 and 2000 adj. pop.		24,338,038	24,933,914	25,548,239	26,181,641	26,836,582
Linear Censuses 90, 2000 and 95 Count	24,349,525	24,716,631	25,082,736	25,448,841	25,814,947	26,182,053
Lineal Censuses 90, 2000 and 95 Count adj. pop.	24,369,357	24,849,970	25,329,268	25,808,569	26,287,867	26,768,481
Exp. Censuses 90, 2000 and 95 Count	24,358,370	24,703,462	25,058,389	25,424,416	25,801,884	26,192,232
Exp. Censuses 90, 2000 and 95 Count adj. pop.	24,381,112	24,832,445	25,296,834	25,775,986	26,270,421	26,782,095
Linear Census 90 and ENADID 92 and 97		24,391,358	25,003,579			
Lineal Census 90 and ENADID 92 and 97 adj. pop.		24,396,741	25,008,255			
Exp. Census 90 and ENADID 92 and 97		24,341,572	24,989,190			
Exp. Census 90 and ENADID 92 and 97 adj. pop.		24,347,052	24,993,895			
Differences between highest and lowest	31,587	882,745	811,161	723,129	618,101	654,529
Percentage differences		3.68	3.31	2.88	2.41	2.50

Graph 1
Estimated Female Population Based on the 1990 and 2000 Censuses, the 1995 Population Count and the ENADID 1992 and 1997 Surveys
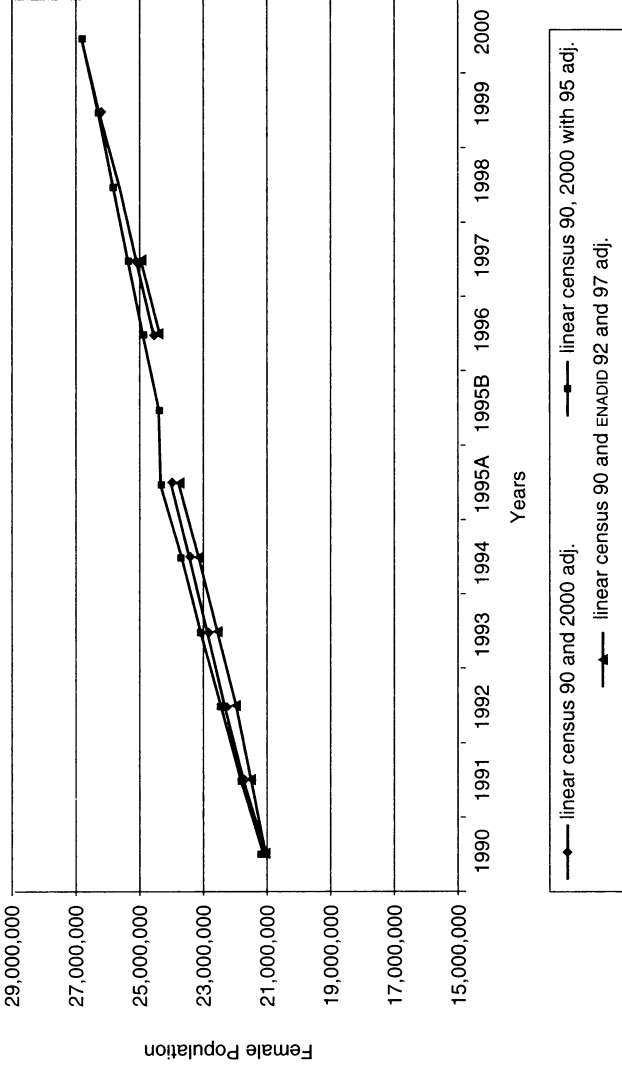
Source: Table 5.

than those for population estimates. The fact that there are differences of the order of 3 and 4% in the estimates is regarded as a factor of uncertainty, since this means that 75,000 to 90,000 more or fewer births occur each year.

In addition to the differences pointed out earlier concerning the influence of population estimates, there is another even more striking difference. There is no clear downward or upward trend in the number of births estimated. The lowest figure occurs in 1990 (2,289,202) after which it increases steadily until 1993. It subsequently declines in 1994, 1995 and 1996, rising again in 1999. This is due both to the influence of fertility rates (which, as we noted, oscillate) as well as the structure of the population of reproductive age which is changing, as noted in Section 2 (see Graph 2).

According to our estimates, the highest number of births took place in 1993 (2,477,390) due to high fertility levels, rather than to the population estimates (the fertility rates for that year were extremely high, see Table 2). The second highest value occurred in 1999 (2,436,189) as we expected. This result is largely due to the increase in the population of reproductive age but also to the fact that fertility rates for that year were higher among the most reproductive ages (20-29) than among those reported by ENADID for the period between 1994 and 1996. Finally, it is worth noting that for the period as a whole, estimates exceed 2,200,000 and that in 1993 and 1999 they are close to two and a half million (see Graph 3). All that remains now is to compare these figures with those obtained from the vital statistics given below.

6. Registered Births Drawn from Data Recorded by the Civil Registry 1990-2001

Table 7 presents the data on births recorded in the 1990s and the first two years of the 21st century, showing six different series. The first corresponds to the births that occurred and were registered in the same year: these figures can be regarded as the minimum level of births that have occurred in a set year z (O^z). The second column corresponds to the births registered in year z but refers to infants under the age of one. If the problem of late registration

Table 6

Mexico: Estimate of 1990-1999 Births on the Basis of the Population and Specific Fertility Rates Based on Information Drawn from the Censuses, 95 Population Count and ENADID 92 and 97 Surveys

Type of interpolation for the population in the middle of the year	ENADID 92		1992	1993	ENADID 97			1996	1999 Census
	1990	1991			1994	1995A	1995B		
Linear Censuses 90 and 2000	2,270,180	2,313,043	2,334,531	2,399,326	2,278,736	2,224,736		2,195,397	2,379,614
Linear Censuses 90 and 2000, adj. pop.	2,285,354	2,332,550	2,358,124	2,427,430	2,308,907	2,257,512		2,230,858	2,427,469
Exp. Censuses 90 and 2000	2,268,413	2,306,198	2,324,026	2,385,984	2,265,322	2,211,116		2,183,249	2,376,189
Exp. Censuses 90 and 2000 adj. pop.	2,283,348	2,324,782	2,346,195	2,412,273	2,293,636	2,242,032		2,217,028	2,423,572
Linear Censuses 90, 2000 and 95 Count	2,275,766	2,336,814	2,375,314	2,457,994	2,352,239	2,308,920	2,324,401	2,268,985	2,392,641
Linear Censuses 90, 2000 and 95 Count adj. pop.	2,289,202	2,348,895	2,385,949	2,467,390	2,359,775	2,314,961	2,323,705	2,281,108	2,436,377
Exp. Censuses 90, 2000 and 95 Count	2,274,040	2,330,762	2,367,244	2,449,721	2,346,480	2,307,121	2,322,233	2,268,288	2,391,889
Exp. Censuses 90, 2000 and 95 Count adj. pop.	2,287,538	2,343,063	2,378,176	2,459,424	2,354,232	2,313,229	2,321,733	2,280,132	2,435,323
Linear Censuses 90 and ENADID 92	2,265,995	2,295,943							
Linear Censuses 90 and ENADID 92 adj. pop.	2,278,492	2,303,337							
Exp. Censuses 90 and ENADID 92	2,265,648	2,295,083							

Exp. Censuses 90 and ENADID 92 adj. pop.	2,278,191	2,302,604					
Linear ENADID 92 and ENADID 97			2,305,948	2,376,511	2,270,611	2,230,442	2,212,547
Linear ENADID 92 and ENADID 97 adj. pop.			2,308,240	2,377,301	2,271,277	2,231,013	2,213,035
Exp. ENADID 92 and ENADID 97			2,305,611	2,373,526	2,265,458	2,224,915	2,208,365
Exp. ENADID 92 and ENADID 97 adj. pop.			2,307,953	2,374,323	2,266,136	2,225,499	2,208,862
Difference between highest and lowest estimate. Absolute figures	23,554	53,811	80,338	93,864	94,454	103,846	97,859
Difference between highest and lowest %	1.04	2.34	3.48	3.95	4.17	4.70	4.48
Difference between highest and lowest estimate, adj. pop.	11,011	46,290	77,996	93,067	93,640	89,463	72,246
Difference between highest and lowest estimate, adj. pop. %	0.48	2.01	3.38	3.92	4.13	4.02	3.27

Note: the "Difference" rows have an additional final-column value:
- Absolute figures: 60,188
- highest and lowest %: 2.53
- estimate, adj. pop.: 12,805
- estimate, adj. pop. %: 0.53

Graph 2
Estimated Births for 1990-1996 and 1999 According to Various Population Estimates and Specific Fertility Rates

Graph 3

Estimate of Births that Occurred Based on 1990 and 2000 Population Censuses, 1995 Population Count and 1992 and 1997 ENADID Surveys and Fertility Rates by Age from these Information Sources
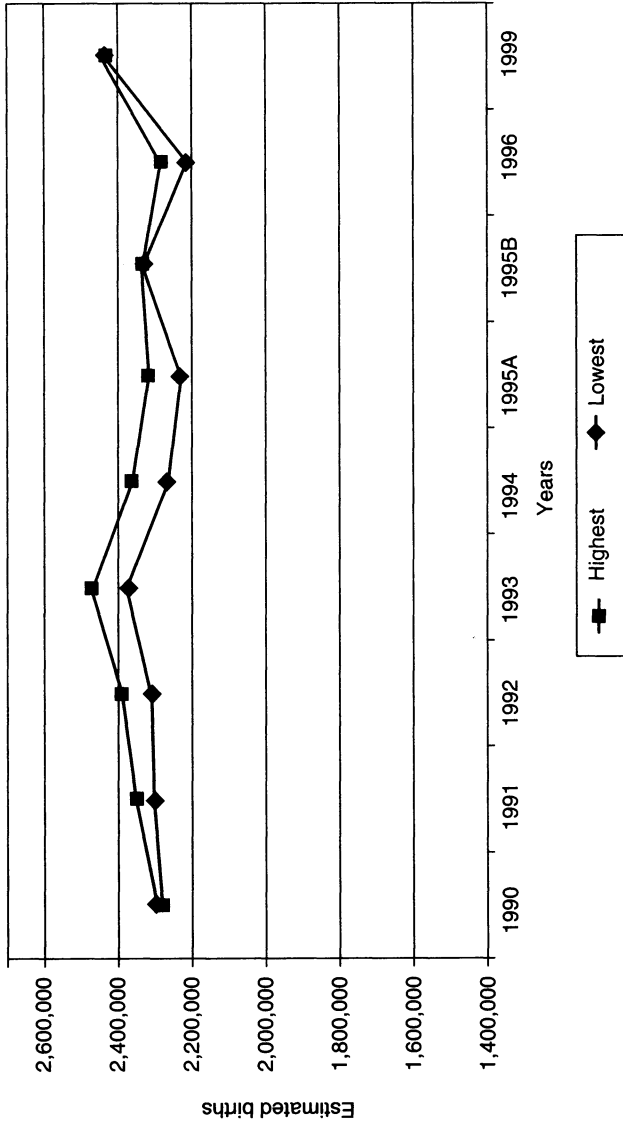
Source: Table 6.

Table 7

Mexico: Births Registered from 1990-2001. Born and Registered in the Same Year.
Registered under the Age of One and Reconstruction of Generations Registered after the Age of One

Year of birth	Births occurring and registered in year z	Births registered under the age of one	Reconstructed generations of births occurred in year z and registered that same year and later up to the age of seven	Estimated of reconstructed generations of births occurring in year z and registered that same year and up to the age of seven	Estimate of reconstructed generations of births occurring in year z and registered that same year and up to the age of eleven	Estimate of births based on information from census, 1995 count and ENADID surveys. Highest estimate, Table 6	Total births registered in year z	Absolute and percentage differences between estimates in columns 3 and 6	
	1	2	3	4	5	6	7		
1990	1,644,572	2,113,555	2,603,937	2,570,570	2,603,937	2,289,202	2,735,312	314,735	12.09
1991	1,619,228	2,097,158	2,598,982	2,573,586	2,603,926	2,348,895	2,756,447	250,087	9.62
1992	1,642,875	2,118,781	2,635,027	2,615,998	2,646,086	2,385,949	2,797,397	249,078	9.45
1993	1,628,491	2,098,692	2,602,303	2,591,499	2,621,246	2,467,390	2,839,686	134,913	5.18
1994	1,634,543	2,102,581	2,591,845	2,591,845	2,622,741	2,359,775	2,904,389	232,070	8.95
1995	1,581,236	2,047,889	2,535,541	2,556,457	2,586,345	2,324,401	2,750,444	211,140	8.33
1996	1,530,583	2,015,097	2,400,827	2,452,046	2,453,586	2,281,108	2,707,718	119,719	4.99
1997	1,521,816	1,990,010	2,326,466	2,443,002	2,471,767		2,698,425		

1998	1,552,141	2,016,688	2,309,195	2,486,359	2,515,697		2,668,428	
1999	1,566,352	2,038,787	2,245,467	2,496,912	2,526,519	2,436,377	2,769,089	−190,910
2000	1,595,089	2,070,554	2,189,690	2,558,670	2,588,820		2,798,339	
2001	1,531,420	2,021,581	1,531,420	2,443,901	2,472,847		2,767,610	−8.50

Sources: Three first columns: data obtained from special tabulations provided by INEGI. Columns 4 and 5, estimates by B. Figueroa in November 2003, on the basis of data provided by INEGI

Graph 4
Births Registered that Same Year, of Infants under the Age of One, Reconstructed Generations and Estimate Based on Census Data and other Sources
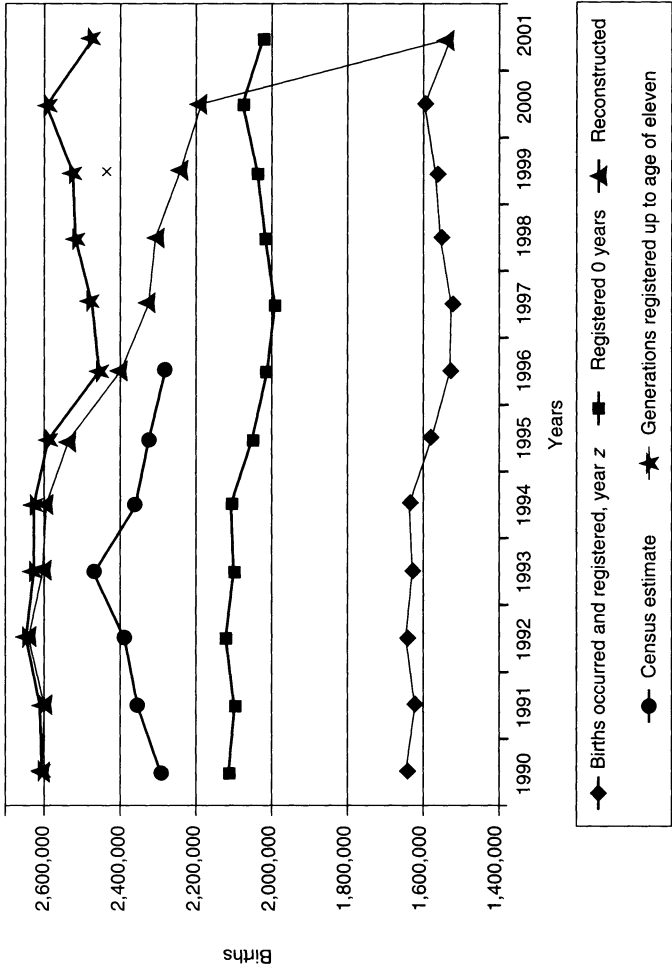
did not exist, these figures would be very close to that of the births that had taken place in a set year z. The third column shows the reconstructed cohorts of births that have taken place in a set year z, taking into account the records of these births that took place in subsequent years, $z + 1, z + 2 \ldots z + n$. Data from this series cannot be compared from one year to the next because the reconstruction of the generations does not cover the same period. For example, for 1990, the registers of births that have taken place during that year include all the late registrations carried out in subsequent years, year after year until 2001, in other words, during the next eleven years. For 1991, since data are only available until 2001, only the registers for ten years are included. In 1992, only nine years are considered and so on successively, so that as the decade advances, fewer years are considered in the reconstruction of generations until the minimum period in the year 2001. For that year, the only data available is that of the births that occurred and were registered that same year, a data that coincides with that of column 1. The data from these series are data that have not been corrected or else are the result of an estimate. They are data that have been published or provided by the INEGI.

Conversely, the data in columns 4 and 5 are the result of estimates based on data from the three previous series and are intended to solve the problem of truncating the generations. To this end, we used the extemporaneous registration record observed for the period from 1990-2000 and simulated the birth registration that would take place extemporaneously until the age of seven and eleven. The data from these last two series can be compared every year, but we know that the estimates are based on a powerful assumption: that extemporaneous registration during the first decade of the 21st century will be the same as for the 1990s. In order to facilitate comparisons between the estimates in the previous section and those of the civil registry, we placed the estimates with the highest values for the number of deaths that had taken place in the sixth column. Finally, in the sixth column and merely as a point of reference, we included the total number of births registered each year, even though we know that these last data are not a good reference for the number of births that have taken place in a given year, because at least 20% of the births in

these figures occurred in years prior to year z. According to what has been observed in recent years, an increasing proportion of this extemporaneous registrations corresponds to people who registered over the age of 50, in other words, they are births that occurred at least z-50 years ago.

For the period as a whole, the number of births registered in the same year in which they occurred exceeds one and a half million. The highest figure corresponds to the year 1990 with 1,644,572, and the lowest to the year 1997, with 1,521,816. There are no upward or downward trends, merely fluctuations or oscillations (see Graph 4). The same is true of registered births of infants under one year of age, except for the fact that the number of births registered is over two million except for 1997, when 1,990,010 were registered. The highest number of registrations in this category took place in the year 1992 (2,118,781) while the lowest number of births that took place and were registered in the same year corresponded to 1997.

Among the reconstructed generations, the highest number of births also corresponded to 1992 (2,635,027) while the second highest corresponded to the year 1990, with 2,603,937. Until the year 1995, figures generally exceed two and a half million. After that year, due to the truncation effect, there is a downward trend until the year 2001. As in the two previous categories, the first six years of the decade failed to see a clear upward or downward trend, instead of which there were merely fluctuations.

In the estimates in which the generations of children up to seven years of age were reconstructed, there are no clear trends either, although the highest and lowest estimates also occurred for 1992 and 1997 respectively. This is due to the methodology used in the estimate, since the basis of the calculation are the births that were registered in the same year of birth (data in the first column). In the reconstructions carried out up to the age of eleven, the highest estimate also corresponded to 1992, the next corresponded to 1994, the third to 1993, the fourth to 1990 and the fifth to 1991. The years for which the lowest number of births was estimated was 1996, the second lowest being 1997. There is no point in drawing attention to these figures because they are estimates based on an assumption that could give rise to a number of con-

troversies, although in each case the figures for the estimates are higher than 2,400,000 and in five of the twelve years considered (from 1990 to 1994) the figures are over 2,600,000.

Comparing the figures for generations reconstructed on the basis of the number of births that occurred (shown in column 3 of Table 7) with the estimates we obtained on the basis of the data from censuses, the population count and surveys (presented in a previous point in this document and included in column 6) we find that the latter are always lower, with the obvious exception of the year 1999, when the truncation effect was extremely strong. The differences are far from negligible, the highest corresponding to 1990 with 314,735 births (12.09%) and the lowest to 1996 with 119,719 (4.99%). For nearly all the years, the difference is higher than 200,000 births, or 8%, except in 1996 as mentioned earlier and in 1993 (134,913 or 5.18%) which was the year with the highest recorded estimates based on data from censuses and surveys. As one would expect, in the case of the estimates obtained by reconstructing age cohorts up to the age of eleven, the range of differences increases, since they account for approximately 10 percentage points, except when they totalled 5.9% in 1993.

In short, if we accept the data from vital statistics and use only published data as a reference, the number of deaths that had occurred in 1990 was at least 12% more than those estimated on the basis of other sources, since the comparison was made using the higher estimate. From 1991 to 1995, we would have between 8 and 9.5% more births except for 1993, in which there would only be 5.18% more.

The implications of these results for estimates of Mexico's fertility levels during the last decade of the century is that the latter has been underestimated by at least 8% during the first five years. In 1990, figures may have been underestimated by as much as 12%. For the second five-year period, if extemporaneous registration during the first decade of the 21st century followed the pattern of the 1990s, fertility levels would be underestimated by between 3 and 7%.

The comparison of the estimates carried out with the data from vital statistics shows that a great deal of work remains to be done in the comparison, confrontation and evaluation of information

from various sources of demographic information. These tasks should be undertaken as soon as possible in order to determine the country's true fertility levels, since the discrepancies found are by no means insignificant.

7. Conclusions

Throughout the 1990s, estimates of the number of births that have taken place, based on information from population censuses (1990, 2000), the 1995 population count and the 1992 and 1997 ENADID surveys, exceeded 2,200,000. In 1993 and 1999, these figures were even higher, approaching two and a half million. At the same time, depending on the population used as a basis — censuses, population count, surveys — different results are obtained for each year. Variations oscillate between 3 and 4%, which creates uncertainty in estimates of the number of births that have occurred, since between 77,000 and 90,000 more or fewer births may have occurred at a particular year z during the decade of the 1990s.

The number of births that occurred, which were obtained using information from vital statistics, is always higher than the figure estimated on the basis of other data sources, which we mentioned in the previous paragraph. Reconstructing the different generations using published data alone shows that, during the first five-year period, the figures for births that had taken place exceed two and a half million. For 1990, the number of births that had occurred was at least 12% higher than the number estimated using other sources, since the comparison was made using a higher estimate. From 1991 to 1995, between 8 and 9.5% more births would actually have occurred, except for 1993, when there would only have been 5.18% more. These results make one reflect on the need to continue working on this issue and to redouble our efforts in the comparison, confrontation and evaluation of information from the various sources of demographic information. It is essential to undertake these tasks since the differences discovered to date are certainly not insignificant.

8. References

Arrext, Carmen (1989), "La fecundidad en México," in Beatriz Figueroa (comp.), *La fecundidad en México: cambios y perspectivas*, Mexico, Centro de Estudios Demográficos y de Desarrollo Urbano, El Colegio de México, pp. 197-215.

Arriaga, Eduardo (2001), *Análisis de la población con microcomputadoras*, Córdoba, Argentina, doctorate in Demography/Facultad de Ciencias Económicas/Universidad de Córdoba,

Camisa, Zulma, C. (1970), *Las medidas tradicionales de la fecundidad*, San José, Costa Rica, Centro Latinoamericano de Demografía, Serie BS, No. 1, 32 pp.

Carleton, Robert O. (1972), *Aspectos metodológicos y sociológicos de la fecundidad humana*, Santiago de Chile, Centro Latinoamericano de Demografía, pp. 119-143.

Consejo Nacional de Población/Instituto Nacional de Estadística, Geografía e Informática (1992), "Análisis y estimación de la fecundidad en México, 1960-1990," Mexico (mimeo).

Figueroa, Beatriz (1992), "Los niveles de la fecundidad en el decenio 1980," *DEMOS. Carta Demográfica de México 1992*, Mexico, Demos, pp. 10-12.

———— (1998), "El registro extemporáneo de los nacimientos. Una fuente de información desatendida," *DEMOS. Carta Demográfica de México 1998*, Mexico, Demos, pp. 35-37.

———— and Virgilio Partida (1994), "Nuevas estimaciones de los nacimientos ocurridos para la República Mexicana, 1950-1980," in *Memorias de la IV Reunión Nacional sobre la Investigación Demográfica en México*, Mexico, Instituto Nacional de Estadística, Geografía e Informática/Sociedad Mexicana de Demografía, pp. 55-65.

Instituto Nacional de Estadística, Geografía e Informática (1992), *Estados Unidos Mexicanos, Resumen General de Población y Vivienda, 1990*, Mexico, INEGI.

———— (1994), *Encuesta Nacional de la Dinámica Demográfica 1992, Metodología y Tabulados*, Mexico, INEGI.

———— (1994), *Encuesta Nacional de la Dinámica Demográfica 1992, Análisis de resultados*, Mexico, INEGI.

———— (1997), *Estados Unidos Mexicanos, Conteo de Población y Vivienda 1995, Resultados Definitivos. Tabulados Complementarios*, Mexico, INEGI.

———— (1999), *Encuesta Nacional de la Dinámica Demográfica 1997, Metodología y Tabulados*, Mexico, INEGI.

———— (2000), *Encuesta Nacional de la Dinámica Demográfica. Panorama Sociodemográfico*, Mexico, INEGI.

Paz Gómez, Leonor, and Lourdes Camargo Valverde (1992), "Análisis de la fecundidad para el ejercicio de conciliación demográfica nacional 1960-1990," Mexico, Instituto Nacional de Estadística, Geografía e Informática/Consejo Nacional de Población (mimeo).

———— and Carlos Welti (2002), "La estimación de la fecundidad en el XII Censo de Población," Semana del INEGI en la Universidad Nacional Autónoma de México, una cátedra de información, Mexico, UNAM.

III. A DECADE IN THE EVOLUTION OF THE PRINCIPAL CAUSES OF DEATH AMONG SENIOR CITIZENS IN MEXICO AND THE FEDERAL DISTRICT, 1985-1995

*José B. Morelos**
*Gabriela Mejía Paillés***

1. INTRODUCTION

When the literature on demography mentions mathematical models for analyzing the behavior of mortality by age groups, the figures are often provided by Gompertz and Makehan, authors who constructed their respective laws on the basis of the function of survivors (lx) of the life table and the relations that occur between this function and the force of mortality (Ortega, 1987).

In the projections for this variable, the above mentioned laws are used together with a variety of methods. Some of these are based on the life table models designed by the United Nations, which "represent the average patterns of mortality rates by age of each level of mortality obtained empirically on the basis of reliable life tables" (Brass, 1974: 547) and the Coale and Demeny life table models, which are superior to the former since they provide four patterns of mortality for each level of the table *(ibidem).* In Brass' view (1974), a more reliable means of producing mortality projection is the logit ratio, since this not only eliminates the limitations derived from the use of life tables, but constitutes the most accurate description of the way life tables vary *(ibidem).*

* Professor-researcher at El Colegio de México.
** Ph.D. candidate at the London School of Economics and Political Science.

73

Through analysis by cohort and the use of cyclical procedures, Brass (1974) approached times series from a conceptual point of view. In principle, analysis by cohort, like time series, depends on past events, as we shall see further on. The defense of the use of analysis by cohort for the case of mortality is summarized by Brass (1974: 551) in the following phrase: "each generation is the bearer of its own mortality, which implies that those who enjoyed favorable health conditions at an early age will also enjoy them during adulthood," meaning that the past prefigures the present and determines the future, a concept underlying the time series models.

A recent application of time series models for predicting mortality was presented at the VII National Meeting of Demography by Odorica (2003), another antecedent being the work of Mejía Paillés (2001); both these authors used the time series to predict mortality.

Conversely, there are several examples of the successful application of time series in disciplines or areas such as economics, physical sciences, marketing and control processes (Charfield, 1992). As for the type of time series models, their application ranges from stationary and non-stationary models useful for studying changes in firms' inventories, the behavior over time of people's savings rates, coal production and the closest thing to population growth, which concerns the permits or licenses for building houses, to non-stationary and stationary models applied to a range of problems, some of which are also related to population. Examples of the latter include the number of armed robberies during the past month, monthly cigarette consumption and the behavior of the populations' six-monthly enrolment at the bachelor's and graduate degree level (Pankratz, 1983).

A couple of the examples cited above are either closely or indirectly related to the issue of morbimortality or more specifically to certain causes of death. This is the case of armed robbery, when the felony is accompanied by injuries or the death of the victim or the assailant, as well as cigarette use, which causes cancer in smokers themselves while also affecting passive smokers.

Despite these recently mentioned examples, which tangentially affect the object of this paper, it has been thought that one of the reasons accounting for the infrequent use of time series mod-

els lies in the limitations entailed by their use, for the case of mortality, since this variable is characterized by the unequal decline in the number of deaths among the various age groups in the population, changes in the profiles of the causes of death and the modification of the age structure of the population over time, factors that are associated with the demographic transition (Kirk, 1996) and the health transition (Frenk, 1993).

Despite this and considering *a)* the advantages of univariate time series models; *b)* the interest in using new, non-demographic models for the analysis of the issue dealt with in this paper, together with the aforementioned examples that are indirectly associated with the issue of morbi-mortality; and *c)* the fact that the decrease in the population ages 65 and over is due primarily to death there seem to be sufficient reasons to justify the application of the Univariate Box-Jenkins models (UBJ, ARIMA).[1]

2. OBJECTIVE

Although one of the most widespread applications of time series techniques is to predict future values, their main function is to achieve a description of time series, which is the aim of this study, in other words, the characterization of the evolution of the respective proportions of the ten main causes of death among senior citizens (ages 65 and over) during the period from January 1985 to December 1995 through the UBJ model (ARIMA).

a) Territorial Units of Analysis

The country as a whole and the Federal District were chosen as geographical spheres of study.

The choice of these two spatial units will enable similarities and differences to be established between national data and those on the Federal District for each of the ten causes of death se-

---

[1] The acronym ARIMA refers to the three filters used in the Box-Jenkins methodology: The self-regressing, the integration and the mobile averages on, Ordorica (2003).

lected[2] and also in the types of models that describe the data in question: stationary and non-seasonal models, non-stationary and non-seasonal and non-stationary and seasonal models.

b) Limitations

Due to the suggested length of this article, it will only include the results of parts of each of the ten causes. The appendix only includes the results at the national level of the application of the UBJ (SARIMA) models using absolute data on causes for deaths from myocardial infarction and diabetes mellitus.

c) Working Plan

The first part of the paper discusses certain conceptual aspects linked to aging. The second part presents data on selected causes of death and makes general observations on the profiles of the ten causes of death selected. The third contains a brief review of certain conceptual aspects of the UBJ (ARIMA) models while the fourth section contains the main results, obtained by using the proportions of the cause (i) in relation to the total number of deaths which will be analyzed in light of the types of models represented by the time series. The last section contains the main conclusions.

d) Some Conceptual Considerations

Some articles on the aging of the population discuss the issue of the age at which a person is considered to belong to the group of senior citizens. These articles choose the population ages 60 or over (Lozano and Frenk, 1999) or 65 and over (Ham Chande, 2003). In this paper, the second group has been chosen.

---

[2] A possible cause of the divergence between national and Federal District data is the quality of the information. It is worth noting that in 1985, the percentage of deaths with medical certificates was 99.6 whereas the national figure was 90.1.

However, the aging of the population is closely linked to the trajectory of demographic transition, but above all to the speed of changes in mortality, fertility and migration. In Mexico, the demographic transition was encouraged by the import substitution model and to a lesser extent, by the model of an open economy. Industrialization, urbanization, the expansion of sources of work, and the development of social security influenced the rapid decline in mortality and fertility (Morelos, 1999). In addition to the latter, there are other determinants of the decline in deaths known as exogenous factors. The main ones include the use of new drugs, the introduction of medical technology useful for the diagnosis, prevention and treatment of disease and measures for cleaning up the atmosphere through the use of new pesticides (Morelos, 1994).

At present, the country is characterized by the fact that its profile of causes of death has preserved the vestiges of a demographic regime in which the loss of human life took place at an early age, combined with features from the more developed countries, whose profile is dominated by degenerative diseases.

From a demographic point of view, the advances in both transitions (demographic and epidemiological) entail the aging of death rates. This is reflected in the high proportion of deaths among senior citizens. In terms of the survival curve, this means that a significant proportion (over 80%) of the population lives to the age of 60 or 65, which proves that the aging of mortality has occurred much more quickly than the aging of the population.

In 1960, the year when Mexico saw the beginning of a decline in the reduction of death rates, approximately 21% of the total number of deaths nationwide took place after the age of 60, with a similar proportion being observed in the Federal District. By 1985, these proportions had risen to 42 and 50% respectively.

Another way of appreciating the phenomenon of the aging of mortality involves comparing the mean ages of deaths. In 1960, this indicator was located above the age of 30 in both cases, whereas by 1985 figures had risen to 46 nationwide, and to 51.5 in the Federal District. In 1995, the respective values were 54 and 58.

As regards the age composition, in 1960, in both the Federal District and the country as a whole, over 44% of the population was between the ages of 0 and 14 whereas approximately 3% was

aged 65 or over. Since the Federal District was the territorial space which saw the beginning of the decrease in fertility, a variable that reflects the aging of the population because of the base of the pyramid, while showing the slower rate at which the age structure aged, in 1980 the proportion of the population under the age of 15 in the Federal District was 37%, while the population ages 65 and over accounted for 4%.

The gradual change in the population's age structure, the growing relative importance of deaths after the age of 60 and the increases in the mean ages of deaths are some of the factors associated with the predominance of degenerative, cardiac and cerebro-vascular diseases.

e) The Data

The selection criterion for the ten main causes of death[3] among the population ages 65 or over was the number of deaths that had occurred in the Federal District, a state that leads the process of demographic transition with a relatively older age structure than the rest of the states in the country and where the rate of aging of mortality rates is higher than that observed in the rest of the country. In addition to this criterion, the ten causes were compared with the data presented by Ham Chande (2003) at the national level for the period between 1970 and 2000. For the years 1990 and 2000, the data selected for this study are among those chosen by this author but what changes is the order in which some of these causes are given (see Ham Chande, 2003, Graphs 17 and 18). The causes selected were:

- Myocardial infarction
- Diabetes mellitus
- Pneumonia
- Ischemic heart diseases
- Diseases of the circulatory apparatus and other heart diseases
- Chronic pulmonary diseases

[3] Causes of death were classified using the 9th Revision of the WHO International Classification of Disease.

- Diseases of the digestive apparatus
- Cerebrovascular diseases
- Cirrhosis and other diseases of the liver
- Nephritis, nephrotic syndrome and nephrosis

The information used was the proportions of deaths for each of the selected causes in relation to the total number of deaths among the population ages 65 and over, percentages that are estimated on a monthly basis, providing a total of 132 observations covering the interval from January 1985 to December 1995. Graph I shows the evolution, by calendar year, of the proportions of mortality for each of the causes chosen for the country and the Federal District.

3. Box-Jenkins Methodology (arima)

The main features of this technique are:

- It works with stationary series. (A stationary series is characterized by having a constant mean, variance and self-correlation function, ACF, over time. In addition the act should tend towards zero.)[4]
- It converts non-stationary series through transformations and/or differences in stationary series.
- It applies self-regressing methods to the differences as well as mobile average methods to residues. Three types of parameters should be estimated: that of the order d of differences, p for self-regressing parameters Φ and q parameters for mobile averages. The models are said to be ARIMA type models (p,d,q). If they are seasonal models, they are called SARIMA (p,d,q) (P,D,Q)s.
- The method is applied in three stages. The first determines the appropriate model for the series; the second estimates the parameters and checks the fit of the model, and the third uses the model to adjust the data and make a forecast (González Videgaray, 1990).

---

[4] When the mean is non-stationary, the tendency towards 0 is extremely slow.

Graph 1

Proportion of Deaths for each of the Causes Chosen for the Country and the Federal District in Senior Citizens (Ages 65 and Over), 1985-1995

Nationwide

Federal District

| | Cause 1 | Cause 2 | Cause 3 | Cause 4 | Cause 5 | Cause 6 | Cause 7 | Cause 8 | Cause 9 | Cause 10 |
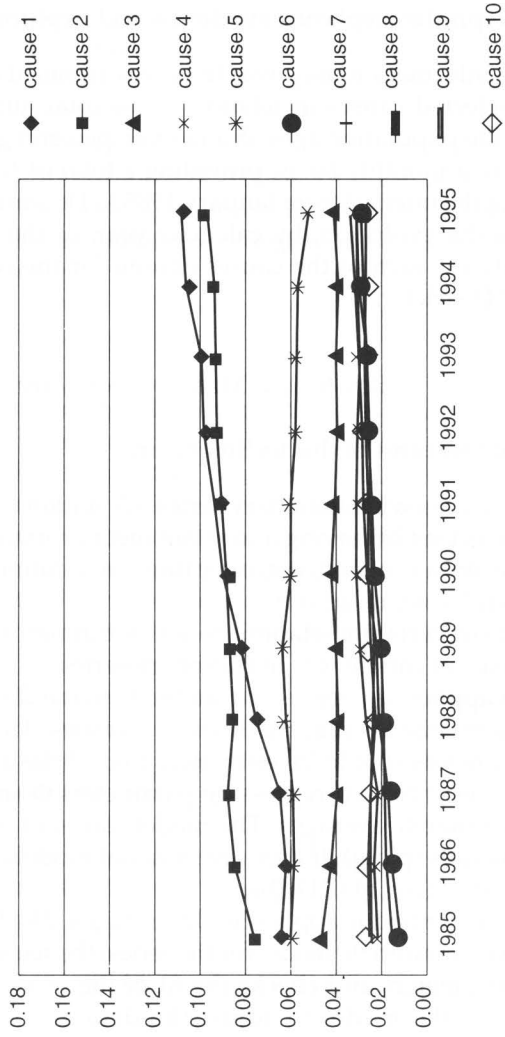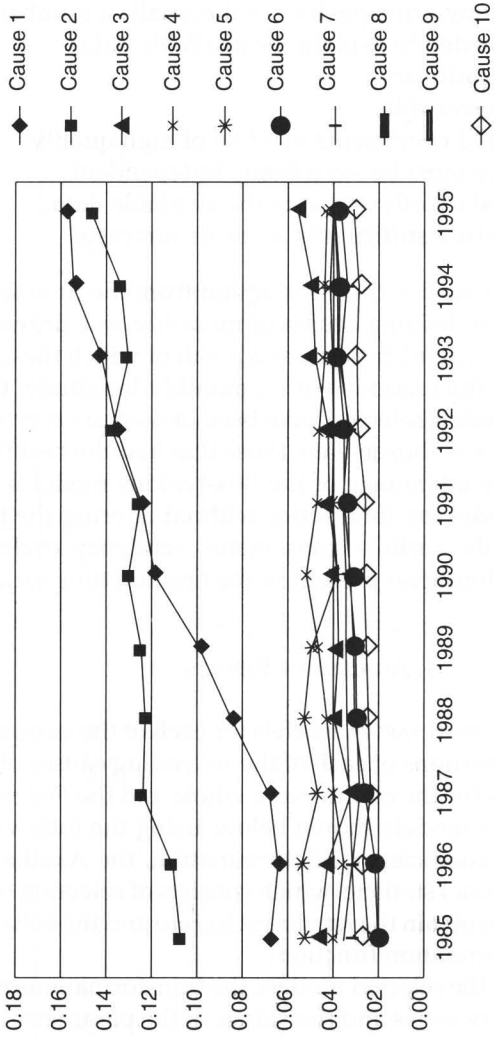
According to Pankratz (1983), the characteristics one should look for in choosing the best model are:

- The parsimony principle (use of the smallest number of coefficients needed to explain the available data).
- It must be stationary.
- It must be reversible.
- The estimated coefficients must be of high quality.
- The residues must be statistically independent.
- It must satisfactorily adjust to the available data.
- It must produce sufficiently accurate forecasts.

As mentioned earlier, the information from the time series of deaths from the ten leading causes of mortality was drawn from data obtained on a monthly basis, as a result of which these series showed seasonal fluctuations with a monthly longitude. Consequently, all the models selected have been of a SARIMA type (p,d,q) (P,D,Q)s. The models chosen were those that had the best fit with the data, since the advantage of the Box-Jenkins model is that it allows one to model the time series without altering the behavioral patterns of the various components (tendency, cycles, seasonality and randomness) present in the original time series.

4. ANALYSIS OF RESULTS

After testing a series of SARIMA models for each of the various time series on the proportions of each of the 10 leading causes of death for senior citizens for the country as a whole and the Federal District, we chose the models shown below, using the following selection criterion: coefficient of determination, the Akaike Information Criterion (AIC) statistic, which consists of selecting one out of a set of model to obtain the AIC closest to zero and the behavior of the pcf (partial correlation function).

Table I shows the selected models, the transformations needed to obtain stationary series and the values of the parameters corresponding to the various time series.

It is worth noting that the randomness of residual values was accepted with a reliability level of 95%.

Table 1

SARIMA Models Selected for Time Series of Deaths for the Main Causes of Death in Senior Citizens in Mexico and the Federal District, 1985-1995

Cause, 9th Review basic list	SARIMA Model (p,d,q) (P,D,Q)s	Transformation to establish series	Content	Self-regressing coefficients and mobile averages		A/C
			Country			
1. Myocardial infarctions	(0, 1, 1)(1, 1, 1)	1 difference 1 difference seasonal	0.0000091	MA1 SAR1 SMA1	0.67829898 0.14175278 1.0	-1,380.889
2. Diabetes Mellitus	(2, 1, 1)(0, 0, 0)	1 difference	-0.0000234	AR1 AR2 MA1	0.04836803 -0.0636545 0.6645973	1,385.511
3. Pneumonia	(2, 2, 2)(1, 1, 1)	2 differences 1 difference seasonal	-0.0000014	AR1 AR2 MA1 MA2 SAR1 SMA1	0.57887138 -0.2014507 1.9842708 -1.0 -0.2017209 0.99999934	-1,365.219
4. Ischemic diseases of the heart	(2, 1, 1)(1, 1, 1)	1 difference 1 difference seasonal	-0.00001115	AR1 AR2 MA1 SAR1 SMA1	0.07000505 0.03997563 0.8064982 -0.0111745 0.99999999	-1,488.912

Table 1
(continued)

Cause, 9th Review basic list	SARIMA Model (p,d,q) (P,D,Q)s	Transformation to establish series	Content	Self-regressing coefficients and mobile averages		A/C
5. Diseases of the circulatory apparatus and other heart diseases	(1, 1, 1)(2, 1, 2)	1 difference 1 difference seasonal	−0.0000372	AR1 MA1 SAR1 SAR2 SMA1 SMA2	−0.0682204 0.74471222 −0.2598986 −0.0063624 1.041898 −0.041898	−1,453.919
6. Chronic pulmonary diseases	(2, 1, 2)(1, 1, 1)	1 difference 1 difference seasonal	−0.000019	AR1 AR2 MA1 MA2 SAR1 SMA1	0.03914142 −0.0148321 0.59829738 0.40083724 0.04546988 0.99999999	−1,463.609
7. Diseases of the digestive apparatus	(1, 1, 1)(1, 1, 2)	1 difference 1 difference seasonal	0.00001216	AR1 MA1 SAR1 SMA1 SMA2	−0.0241813 0.75397985 −0.1329079 0. 9216704 0.07976453	−1,564.751
8. Cerebrovascular diseases	(4, 1, 1)(1, 0, 1)	1 difference	0.00022979	AR1 AR2 AR3 AR4	−0.1615075 −0.0222442 −0.0545757 0.03593509	−1,675.05

9. Cirrhosis and other liver diseases	(2, 1, 2)(2, 1, 2)	1 difference 1 difference seasonal	0.00002682	MA1 0.85922719 SAR1 −0.3339076 AR1 −0.73478 AR2 0.20303368 MA1 1.5172e−8 MA2 0.9999999 SAR1 −0.2598986 SAR2 −0.0063624 SMA1 0.30015096 SMA2 0.00500596	−1,465.247
10. Nephritis, nephrotic syndrome and nephrosis	(2, 1, 1)(0, 0, 0)	1 difference	0.00000263	AR1 0.04091632 AR2 0.02913804 MA1 0.84755416	−1,642.254

Federal District

11. Myocardial infarctions	(4, 1, 1)(0, 0, 0)	1 difference	0.00100829	AR1 −0.1673019 AR2 −0.2475866 AR3 −0.2591533 AR4 −0.1668604 MA1 0.53311006	−12,340.123
12. Diabetes mellitus	(2, 1, 2)(0, 0, 0)	1 difference	−0.0000696	AR1 −0.1710013 AR2 −0.1590438 SMA1 −0.480842 MA1 −0.47269645 MA2 0.09379079	1,094.812

Table 1
(end)

Cause, 9th Review basic list	SARIMA Model (p,d,q) (P,D,Q)s	Transformation to establish series	Content	Self-regressing coefficients and mobile averages		A/C
13. Pneumonia	(1, 1, 1)(2, 0, 1)	1 difference	-0.000009	AR1	0.31521799	-1,297.006
				MA1	0.89659784	
				SAR1	0.5648238	
				SAR2	4.333e-12	
				SMA1	0.26296199	
14. Ischemic heart diseases	(2, 1, 2)(0, 0, 0)	1 difference	-0.0000291	AR1	-0.4295305	-1,336.267
				AR2	-0.0673085	
				MA1	0.26809271	
				MA2	0.5055005	
15. Diseases of the circulatory apparatus and other heart diseases	(2, 1, 1)(0, 0, 0)	1 difference	-0.0000928	AR1	0.27137361	-1,323.027
				AR2	0.2280419	
				MA1	1.0	
16. Chronic pulmonary diseases	(2, 1, 2)(1, 1, 1)	1 difference 1 difference seasonal	-0.000035	AR1	-0.1710013	-1,218.793
				AR2	-0.1017785	
				MA1	0.84596593	
				MA2	0.73843987	
				SAR1	0.0654552	
				SMA1	0.90007217	

17. Diseases of the digestive apparatus	(2, 1, 1)(0, 0, 0)	1 difference	0.0000227	AR1	0.21209568	-1,413.493
				AR2	0.03843595	
				AR3	0.1339357	
				AR4	-0.0450874	
				MA1	0.99999946	
18. Cerebrovascular diseases	(4, 1, 1)(0, 0, 0)	1 difference	0.0000395	AR1	0.13387237	-1,422.604
				AR2	-0.1548085	
				AR3	-0.0746305	
				AR4	-0.0994826	
				MA1	0.91593903	
19. Cirrhosis and other liver diseases	(2, 1, 1)(0, 0, 0)	1 difference	-0.0000424	AR1	0.17546595	-1,406.151
				AR2	-0.0102607	
				AR3	-0.0401474	
				AR4	-0.0423117	
				MA1	0.99999904	
20. Nephritis, nephrotic syndrome and nephrosis	(4, 1, 1)(1, 0, 1)	1 difference	0.0000013	AR1	0.34778285	-1,383.277
				AR2	-0.0278799	
				AR3	-0.0170498	
				AR4	0.03123418	
				MA1	1.0	
				SAR1	0.5391127	
				SMA1	0.60165686	

One of the advantages of the Box-Jenkins model lies in the fact that it enables one to model time series without altering the patterns of behavior of the various components (tendency, cycles, seasonality and randomness) present in the original time series. Consequently, the adjusted time series for the proportions of deaths for the different causes of death selected maintain the tendency and the patterns of fluctuations present in the time series observed (see Graphs 2.1 to 2.10).

Nationwide, the time series of the real and adjusted proportions of deaths from myocardial infarctions (Graph 2.1) account for a smaller proportion of the deaths recorded in the Federal District. Nevertheless, both sets of time series show an upward trend, with the most pronounced slope appearing in the time series for the Federal District. As for the adjustments obtained for the time series corresponding to the Federal District and the country as a

Graph 2.1
Time Series Observed and Adjusted for Proportions of Deaths
from Myocardial Infarctions in the Federal District
and the Rest of the Country, 1985-1995

Sequence number
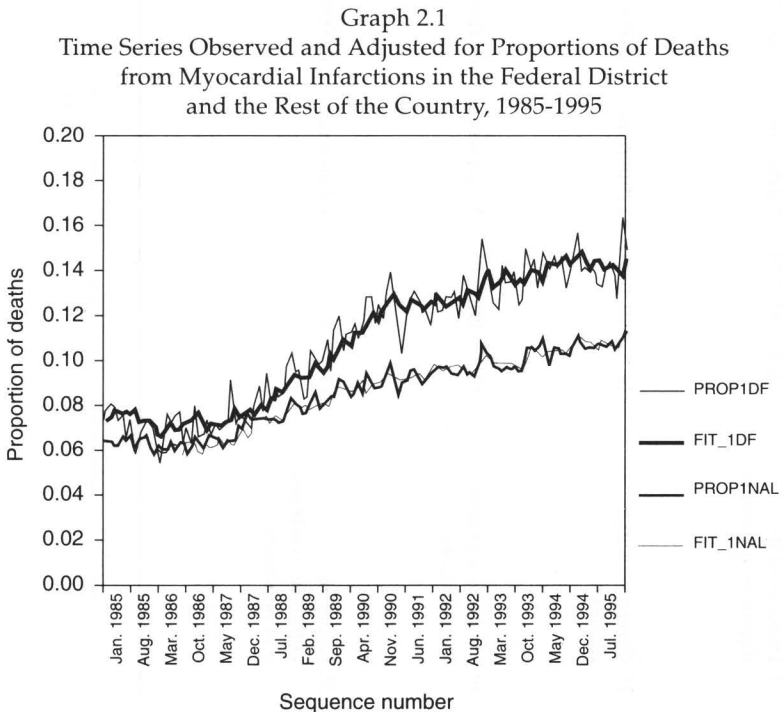
whole, the model corresponding to the time series for the deaths that had occurred in the country managed to record the cyclical, seasonal and random fluctuations corresponding to the original time series more accurately. This does not imply, however, that the adjustment obtained for the time series corresponding to deaths in the Federal District is less exact. The coefficients of determination are 0.96 nationwide and 0.92 for the Federal District. A detailed examination of Graph 2.1 shows how seasonal adjustments are maintained in this adjustment, except in a less pronounced fashion than in the original time series.

The set of time series for the proportion of deaths related to diabetes mellitus for the Federal District displays a series of cycles throughout the period of study. After maintaining a relatively stable pattern, the time series for this state apparently experiences a sudden upturn, which then stabilizes once more. After experiencing this cycle, the series tends to stabilize again. However, throughout the series, fluctuations can be observed due to the monthly seasonal factor of these series. As for the time series estimated for the Federal District, this estimate shows behavior of the original series as regards tendency, cycles and seasonality. However, this series achieves less drastic movements than the one observed. The coefficient of determination is –0.27.

Unlike the time series for the Federal District, national time series show less stationary behavior (see Graph 2.2). The levels of the time series for the country in the proportions of deaths from diabetes mellitus are below those for the Federal District. Nevertheless, the adjustment obtained nationwide continues the patterns followed by the time series. The coefficient of determination shows a much higher value (0.52) than the one obtained for the Federal District.

The levels and tendencies of the time series for the proportions of deaths from pneumonia are found within fairly similar parameters for the country as a whole and for the Federal District. Differences are found in the values of the coefficients of determination, totaling 0.29 for the Federal District as opposed to 0.71 nationwide.

National levels occasionally exceed those of the Federal District. The tendencies for both geographical contexts are fairly stable,

Graph 2.2
Time Series Observed and Adjusted for Proportions of Deaths
from Diabetes Mellitus in the Federal District and the Rest
of the Country, 1985-1995
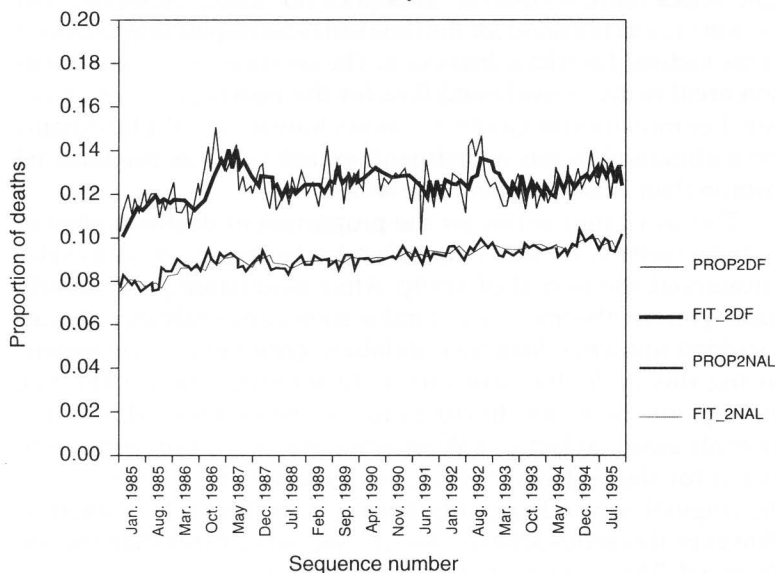
displaying virtually stationary time series throughout the period
of study. Cyclical fluctuations remain relatively constant, like sea-
sonal fluctuations, although the latter component shows more
pronounced peaks in the national time series (see Graph 2.3). At
the same time, the time series adjusted for both the Federal Dis-
trict and the rest of the country follow the behavior of the time
series observed as regards tendency, cycles, seasonality and
randomness.

In the Federal District, ischemic heart diseases at the begin-
ning of the period of analysis show an upward trend. Neverthe-
less, in the early 1990s this trend is reversed when it begins to
descend. The opposite happens in the national time series. The
series displays a gradual upward trend throughout the period of
study. As for seasonal fluctuations, the time series corresponding

Graph 2.3
Time Series Observed and Adjusted for the Proportions of Deaths
from Pneumonia in the Federal District and the Rest of the Country,
1985-1995
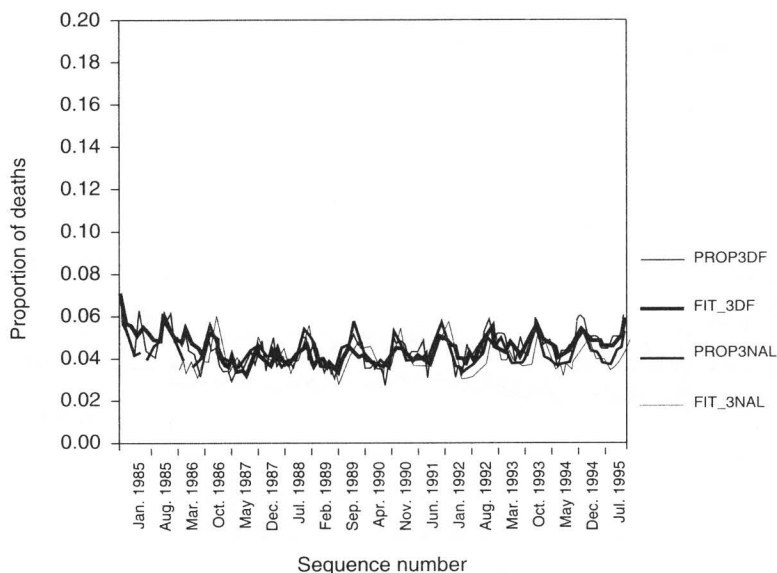
to the Federal District displays far more obvious monthly fluctua-
tions in the proportion of deaths from this cause than the time
series for the country as a whole.

The series adjusted for deaths that have occurred in the Fed-
eral District tends to reduce the cyclical, seasonal and random fluc-
tuations in the series observed, although it maintains these pat-
terns in the original series. At the same time, the series adjusted
for deaths at the national level blends almost perfectly with the
actual series. For this type of deaths, the coefficients of determi-
nation are 0.65 nationwide and 0.16 for the Federal District.

Of particular interest is the behavior of the set of time series
corresponding to *diseases of the circulatory apparatus and other heart
diseases.* Of all the time series on the proportions of the different

Graph 2.4
Time Series Observed and Adjusted for Proportions
of Deaths from Ischemic Diseases of the Heart in the Federal District
and the Rest of the Country, 1985-1995
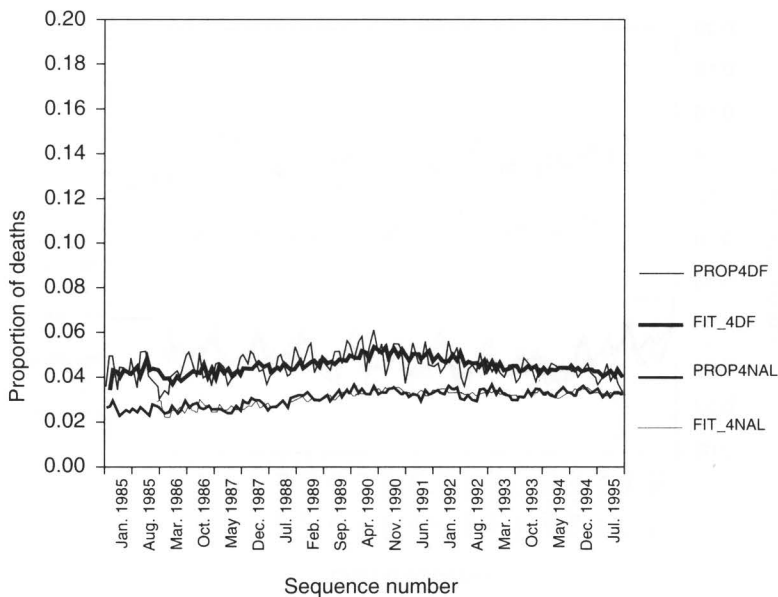
causes of mortality, those corresponding to the latter are the only
ones in which the set of time series observed and estimated in the
country maintains a higher proportion than the time series ob-
tained for the proportions of deaths in the Federal District. It is
worth noting that the trends in the series for the country and the
Federal District begin with relatively similar levels. By the end of
the 1980s, however, the time series for the Federal District begins
to show a downward trend, stabilizing in the early 1990s. At the
same time, the country's time series has shown a fairly stable trend,
with a slight downward trend throughout the period of study. Of
all the causes selected, diseases of the circulatory apparatus and
other heart diseases are the only ones displaying this pattern of
behavior as regards levels. As for the cyclical and seasonal fluc-
tuations, those presented in the Federal District time series show

Graph 2.5
Time Series Observed and Adjusted for Proportions
of Deaths from Diseases of the Circulatory Apparatus and Other Heart
Diseases in the Federal District and Rest of the Country, 1985-1995
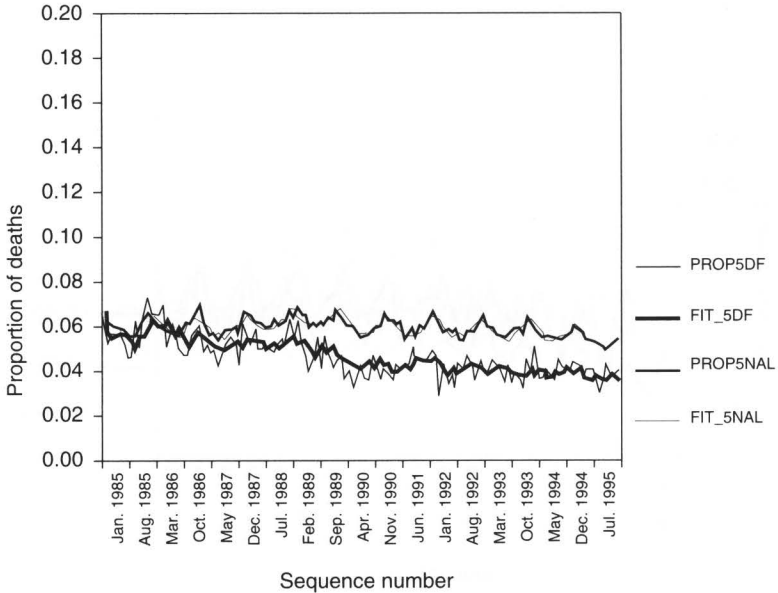
a more uneven pattern, in other words, a less monotonous one than that of the time series for the country as a whole, although in terms of its end coefficients its values are relatively close, 0.70 for the national level and 0.57 for the Federal District.

The estimate obtained for the time series observed for the country accurately reflects the patterns found in the original series, while the adjustment for the series corresponding to the time series for the Federal District tends to reduce the oscillatory movements of the original series.

The upward trends corresponding to the time series for the proportions of deaths from chronic pulmonary diseases for the Federal District as well as for the country run virtually parallel during the period between 1985 and 1995, with the time series for the Federal District showing the highest levels. Nevertheless, at the end

POPULATION, CITY AND ENVIRONMENT

Graph 2.6
Time Series Observed and Adjusted for Proportions of Deaths
from Chronic Pulmonary Diseases in the Federal District
and the Rest of the Country, 1985-1995
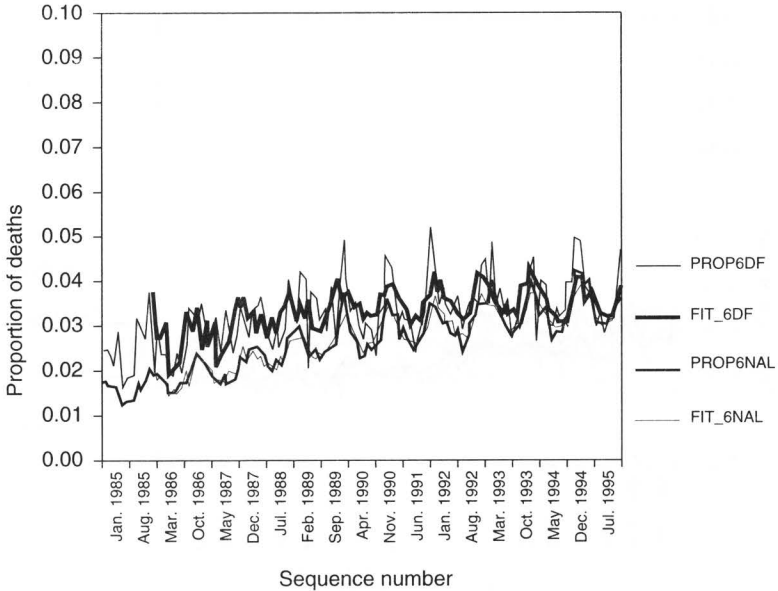
of the period, the two series begin to overlap, which suggests an increase in the following years in the time series corresponding to the country. Seasonal fluctuations are perceived in both the series observed and those adjusted for each of the geographical spheres analyzed throughout the period of study. Nevertheless, the pattern of time series at the national level shows a constant in the repetition of the oscillations, which does not merge until the second half of the time series in the Federal District. Once again, the coefficients of determination for the country far surpass those of the Federal District. The former has a value of 0.89 while the latter has a value of just 0.28.

As for the time series for the proportions of deaths from diseases of the digestive apparatus, levels in the Federal District are slightly higher than in the rest of the country. The tendencies for

Graph 2.7
Time Series Observed and Adjusted for Proportions of Deaths
from Diseases of the Digestive Apparatus in the Federal District
and the Rest of the Country, 1985-1995
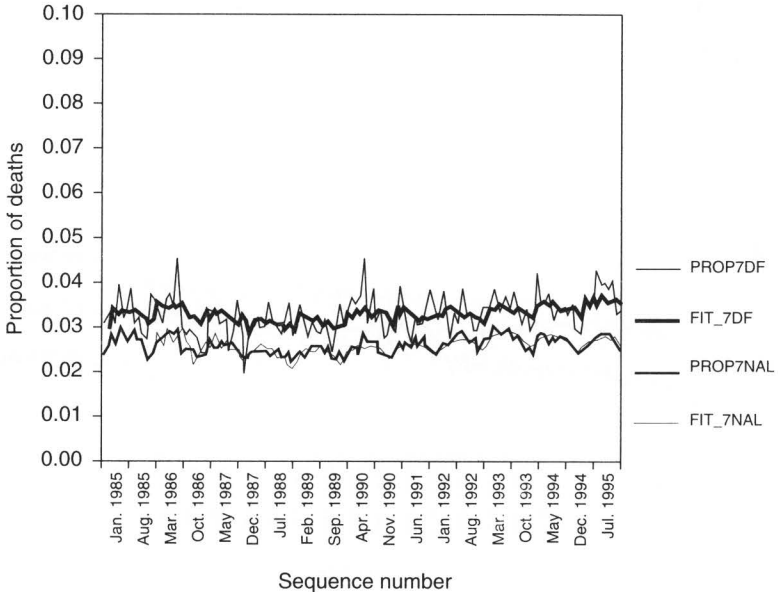
both series are relatively constant for the period of study, making
them virtually stationary time series. The time series for the Fed-
eral District, however, shows pronounced oscillations in its cycli-
cal and above all seasonal components. Nevertheless, the adjusted
model manages to capture the oscillation patterns present in
the original series in a less pronounced form. At the same time, the
time series for the country shows a more constant pattern in its
seasonal component as far as oscillatory behavior is concerned,
which is reflected in the corresponding estimated time series.

Nationwide, there is an upward trend in the time series corres-
ponding to the proportions of deaths from cerebrovascular dis-
eases. Conversely, the time series for the Federal District main-
tains a virtually unchanging trend throughout the period of
analysis. Nevertheless, precisely because of the patterns followed

Graph 2.8
Time Series Observed and Adjusted for Proportions of Deaths
from Cerebrovascular Diseases in the Federal District and the Rest
of the Country, 1985-1995
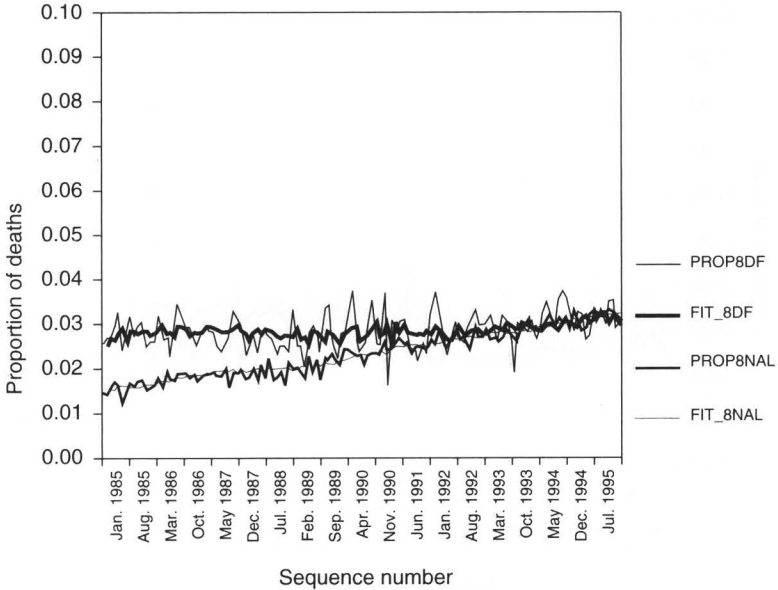
in the two time series observed for the Federal District and the country as a whole, the tendencies converge during the last periods. However, the pattern for the cyclical and seasonal fluctuations of the respective series is reversed. Whereas the time series for the country shows regular, constant oscillations throughout the series, the pattern of oscillation for the time series for the Federal District shows more drastic, pronounced changes in both its cyclical and seasonal component.

It is particularly interesting to note that the estimated time series (see Graph 2.8) show gentler patterns in both cases, which are distinguished from the other adjusted time series for the other causes of death due to this behavioral phenomenon. It should be noted that this does not reduce the cyclical and seasonal fluctuations and oscillations present in the original series.

Graph 2.9
Time Series Observed and Adjusted for the Proportions of Deaths
from Cirrhosis and Other Liver Diseases in the Federal District
and the Rest of the Country, 1985-1995
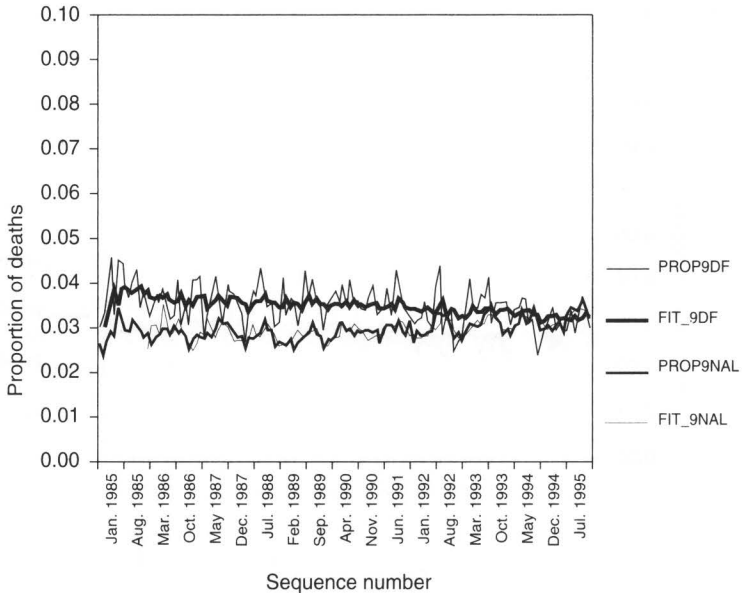
The levels of the real time series for the proportions of deaths from cirrhosis and other liver diseases in the Federal District are slightly higher than those for the time series observed for the rest of the country. Nevertheless, the two time series display different tendencies. Whereas the Federal District time series displays a slight downward trend, the time series for the country shows a slightly upward trend, the two of which eventually converge at the end of the period of study. The cyclical and seasonal variations are far more pronounced in the time series corresponding to the Federal District. The same is true of its repetition patterns, which are far more varied than those in the time series for the country. Nevertheless, the time series estimated for both geographical spheres managed to maintain the tendency of its corresponding original pair, and once again, cyclical and seasonal fluc-

Graph 2.10
Time Series Observed and Adjusted for the Proportions of Deaths
from Nephritis, Nephrotic Syndrome and Nephrosis in the
Federal District and the Rest of the Country, 1985-1995
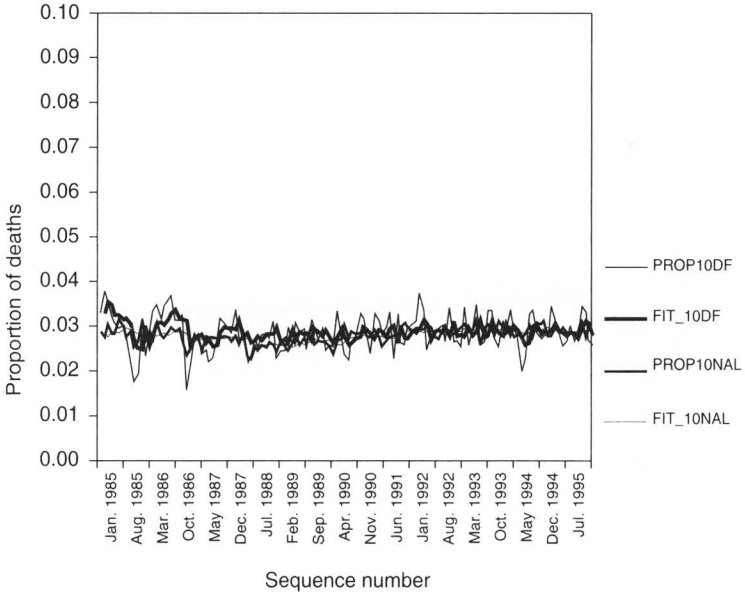
tuations tend to be more reduced in the time series adjusted for the Federal District and to remain exactly the same as the time series observed for the rest of the country.

It is interesting to contrast the behavior of the time series for the proportions of deaths from nephritis, nephrotic syndrome and nephrosis for the Federal District and the rest of the country, since, although both series have maintained the same constant tendency over time at fairly similar levels, the series for the Federal District shows sharp fluctuations resulting from seasonal fluctuations in the time series. The estimated time series fit the patterns and components of the original series almost exactly.

5. Principal Conclusions

In terms of the coefficient of determination, the values obtained nationwide exceed those of the Federal District. The same phenomenon (not included) is observed when the total number of deaths is used to model the time series. As one can see, the models chosen used the smallest number of coefficients to explain the available data (parsimony principle) while the models in the CF tended rapidly to zero, in addition to the AIC value. As a result, the authors of this paper feel that the best models were chosen to model each of the ten causes of mortality.

At the same time, the results of the time series estimated showed that, in general, the components of the original time series are preserved almost exactly. Nevertheless, this exactness is better preserved in the adjusted time series corresponding to the deaths from particular causes at the national level than in the time series estimated for the Federal District. This may explain the differences in the coefficients of determination, to which one should add that the proportions of deaths in the country tend to be lower than those in the Federal District while the adjustments are finer. Despite this, in both cases, the models were successfully adjusted in order to meet all the conditions of Box-Jenkins methodology.

The study undertaken showed that employing vital statistics to carry out analyses such as that of historical time series is extremely useful, because of the value of data at a set point in time.

It is worth noting that despite the fact that time series models in this study were only used to adjust historical series of data, they can also be utilized to forecast the behavior of time series on the proportions of deaths from particular causes.

Likewise, time series models are useful for studying information on the causes of deaths, and the Box-Jenkins methodology in particular manages to adapt the type of data one wishes to analyze, since the fact that they are based on stochastic models allows them to model not only the tendency but also the fluctuations characteristic of the time series on the proportions of deaths by types of cause.

Comparing the national sphere with the Federal District enabled us to contrast the behavior of mortality from particular

causes and at the same time to detect symmetries or asymmetries between national data and those of the Federal District. Since the Federal District is the territorial area that saw the beginning of the decline in fertility, a variable that reflects the aging of the population due to the base of the pyramid while reflecting the slower pace of the aging of age structures, in most cases the levels of the time series for the proportions of deaths in the Federal District due to selected causes are higher than those observed nationwide. Nevertheless, cyclical and seasonal fluctuations are more drastic and their repetitions less constant in the time series for the Federal District than in those for the rest of the country.

It is important to stress the quality of the information used for this analysis, since this may determine the presence or absence of the most notoriously erratic behavior of the data for the country as a whole as opposed to the Federal District data for the reasons explained at the beginning of this paper.

It is hoped that this paper will contribute to the literature on the issue that examines the behavior of the causes of death over time, and that progress will continue to be made in this area of research.

6. References

Brass, William (1974), "Perspective in Population Prediction: Illustrated by the Statistics of England and Wales," *Journal of the Royal Statistical Society*, 137, pp. 532-583.

Chatfield, C. (1992), *The Analysis of Time Series: An Introduction*, New York, Chapman & Hall.

Frenk, Julio (1993), *La salud de la población. Hacia una nueva salud pública*, Mexico, SEP/FCE.

González Videgaray, María del Carmen (1990), *Modelos de decisión con procesos estocásticos II (Metodología Box-Jenkins)*, Mexico, ENEP Acatlán, UNAM.

Ham Chande, Roberto (2003), *Envejecimiento en México: el siguiente reto de la transición demográfica*, Tijuana B.C., El Colegio de la Frontera Norte.

Kirk, Dudley (1996), "Demographic Transition Theory," *Population Studies*, Vol. 50, pp. 361-387.

Lozano, Rafael, and Julio Frenk (1999), "Aspectos sociomédicos del envejecimiento en México," in Hugo Aréchiga and Marcelino

Cereijido (coords.), *El envejecimiento: sus desafíos y esperanzas*, Mexico, Siglo XXI/CIICH-UNAM, pp. 90-111.

Mejía Paillés, Gabriela (2001), "Una década de evolución de las principales causas de mortalidad en adultos mayores," Mexico, El Colegio de México (mimeo).

Morelos, José B. (1994), "La mortalidad en México: hechos y consensos," in Francisco Alba and Gustavo Cabrera, *La población en el desarrollo contemporáneo de México*, Mexico, El Colegio de México, pp. 53-84.

———— (1999), "Apuntes sobre la demografía regional, 1950, 1970, 1990," *Estudios Sociológicos*, Vol. 17 (51), Sept.-Dec., pp. 683-702.

Pankratz, Alan (1983), *Forecasting with Univariate Box-Jenkins Models: Concepts and Cases*, New York, John Wiley & Son.

Ordorica, Manuel (2003), "Pronóstico de las defunciones a través de los modelos autorregresivos integrados de promedios móviles (ARIMA)," paper delivered at the 7th National Meeting of Demographic Research in Mexico, *La población ante los desafíos del cambio global*, Guadalajara, Jalisco, December 2-5. Organized by the Sociedad Mexicana de Demografía (SOMEDE).

Ortega, Antonio (1987), *Tablas de mortalidad*, San José C.R., Centro Latino Americano de Demografía.

SAS Institute (s.f.), JMP4, USA, Business Unit of SAS.

World Health Organization (2001), *Clasificación Internacional de Enfermedades: IX Revisión*, Springfield.

Graph 1

Deaths from Myocardial Infarctions by Month
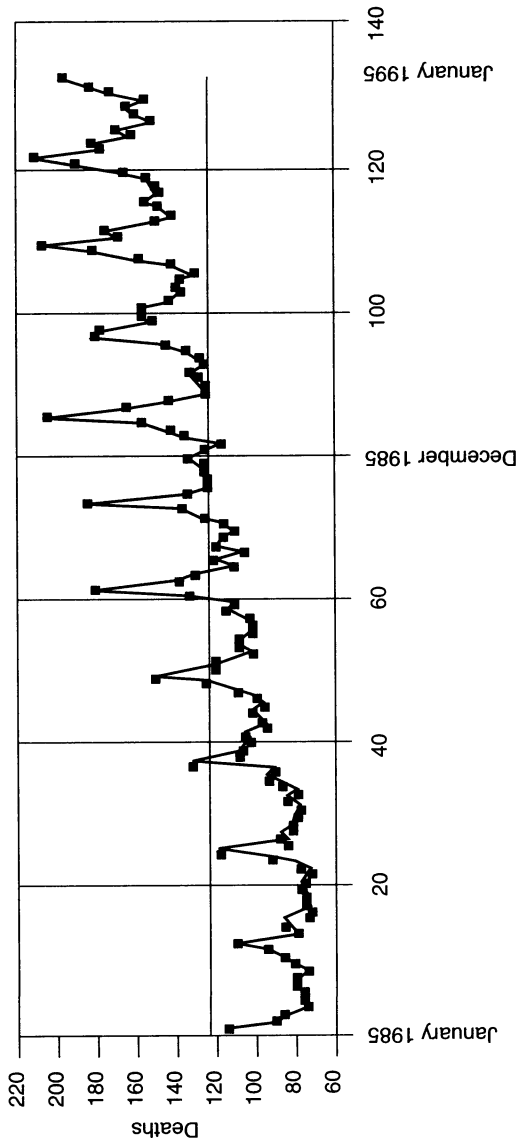
Months (January 1985 = 0; December 1995 = 132)

Table 1
Summary of Parameters of Model
Model: Seasonal ARIMA (0, 1, 1)(1, 1, 1)12
Summary of the Model

Federal District	115
Sum of errors squared	767738,831
Estimated variance	6675,98983
Standard deviation	81,7067307
Akaike criterion	1055,94646
Schwarz's Bayesian criterion	1067,06295
Determination coefficient	0,94385956
Adjusted determination coefficient	0,94239
–2 logarithm goodness of fit	1050,32889

Stable	Yes
Invertible	Yes

Table 2
Estimate of Parameters of Model UBJ (ARIMA)

Term	Factor	Lag	Estimate	Standard error	t statistic	Probability >	t	
AR2,12	2	12	-0.0818756	0.2253714	-0.36	0.7171
MA1,1	1	1	0.75391403	0.0755774	9.98	< 0.0001
MA2,12	2	12	0.55509845	0.2324480	2. 39	0.0186
Interception	1	0	0.66631983	0.9140987	0. 73	0.4675

Estimate of constant   0.72087514

Graph 2
Deaths from Myocardial Infarction. 1985-1996

Deaths

Months (January 1985 = 0; December 1995 = 132)

Figure 1

Lag	Self-corr.
0	1.0000
1	0.1453
2	−0.1349
3	−0.0159
4	−0.0444
5	−0.0869
6	0.0149
7	−0.0556
8	0.0100
9	0.0246
10	0.0573
11	0.0136
12	−0.0112
13	0.0547
14	0.0307

Figure 2

Lag	Partial
0	1.0000
1	0.1479
2	−0.1667
3	0.0336
4	−0.0738
5	−0.0734
6	0.0330
7	−0.0994
8	0.0450
9	−0.0081
10	0.0604
11	−0.0029
12	−0.0183
13	0.0902
14	−0.0054
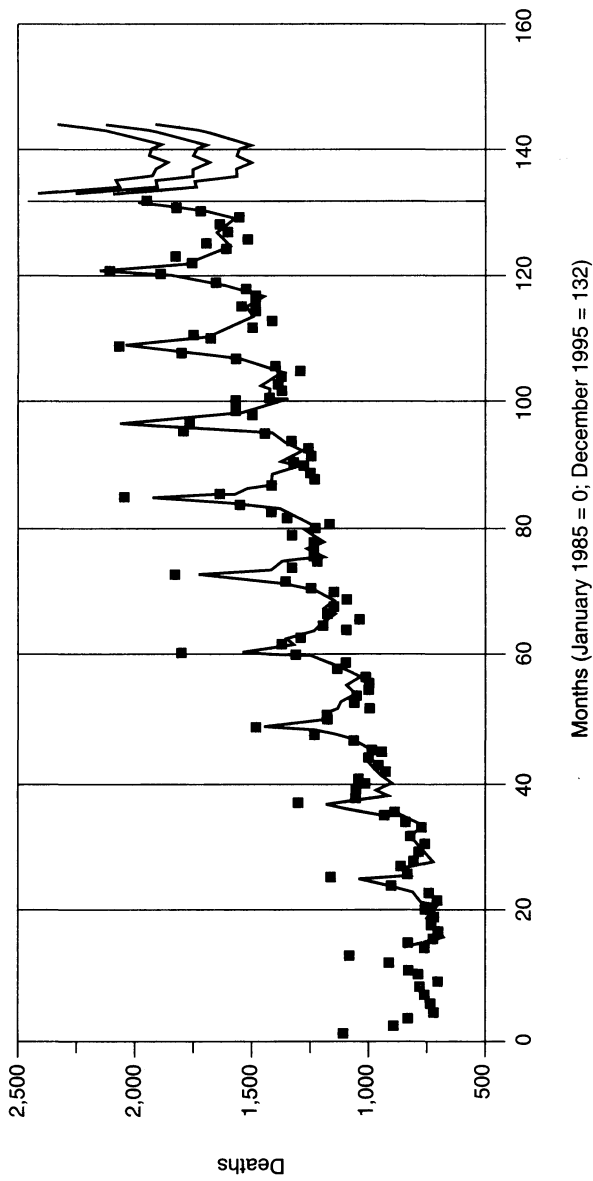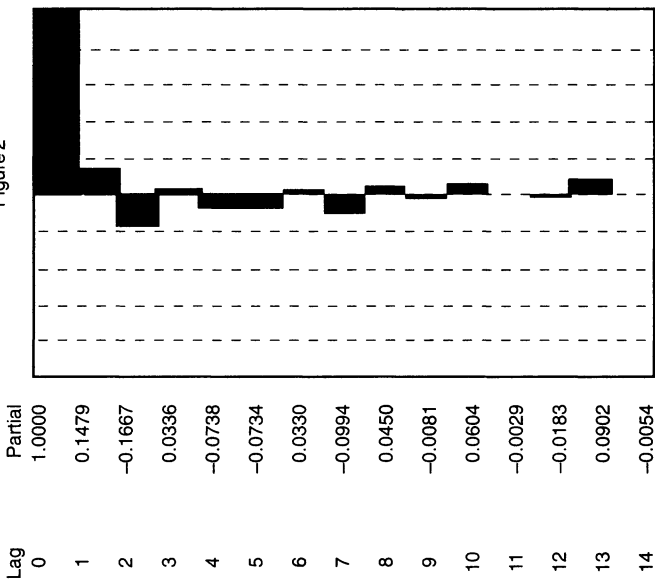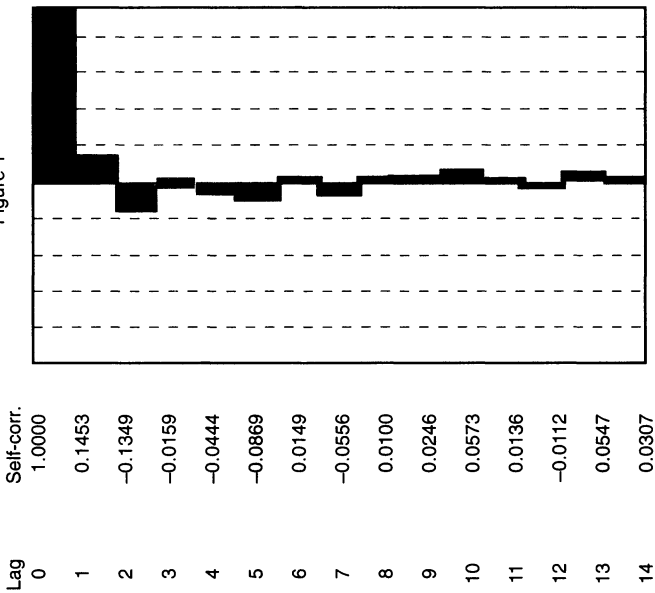
Graph 3
Deaths from Diabetes Mellitus Nationwide, 1985-1995
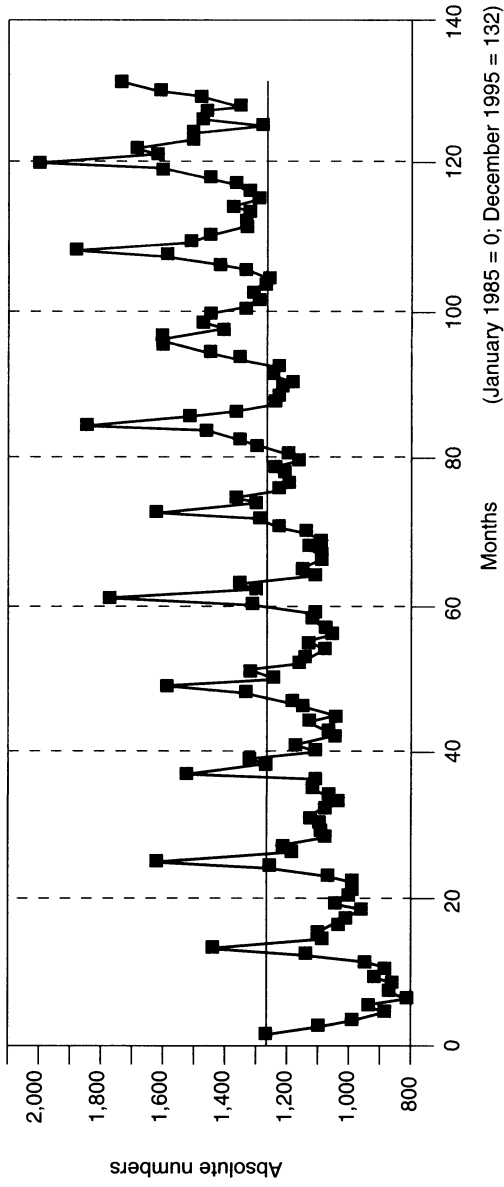
Table 3
Parameters of Model
Model: Seasonal ARIMA (2, 1, 2)(1, 1, 1)12
Summary of the Model

Federal District	112
Sum of errors squared	433550,089
Estimated variance	3870,98294
Standard deviation	62,2172238
Akaike criterion	997,090385
Schwarz's Bayesian criterion	1016,54425
Determination coefficient	0,90051793
Adjusted determination coefficient	0,89518853
–2 logarithm goodness of fit	1000,20004

Stable	Yes
Invertible	Yes

Table 4
Estimate of Parameters

Term	Factor	Lag	Estimate	Standard error	t statistic	Probability>|t|
AR1,1	1	1	-0.666989	0.0980863	-6.80	<0.0001
AR1,2	1	2	0.22401331	0.1109721	2.02	0.0459
AR2,12	2	12	-0.0917269	0.1341365	-0.68	0.4955
MA1,1	1	1	0.00187616	0.0253731	0.07	0.9412
MA1,2	1	2	0.73562097	0.0940894	7.82	<.0001
MA2,12	2	12	0.93158831	0.3522686	2.64	0.0094
Interception	1	0	-0.0326939	0.3433164	-0.10	0.9243

Estimate of constant   -0.0515038

Graph 4
Forecast of Deaths from Diabetes Mellitus

Figure 3

Lag	Self-correction
0	1.0000
1	−0.0085
2	−0.0499
3	−0.0278
4	−0.0305
5	−0.0462
6	−0.0622
7	0.1553
8	−0.0071
9	0.0266
10	0.1298
11	−0.1723
12	0.0107
13	0.0266
14	0.1859

Figure 4

Lag	Partial
0	1.0000
1	−0.0091
2	−0.0543
3	−0.0320
4	−0.0357
5	−0.0570
6	−0.0787
7	0.1853
8	−0.0238
9	0.0288
10	0.1791
11	−0.2292
12	0.0369
13	0.0861
14	−0.2061
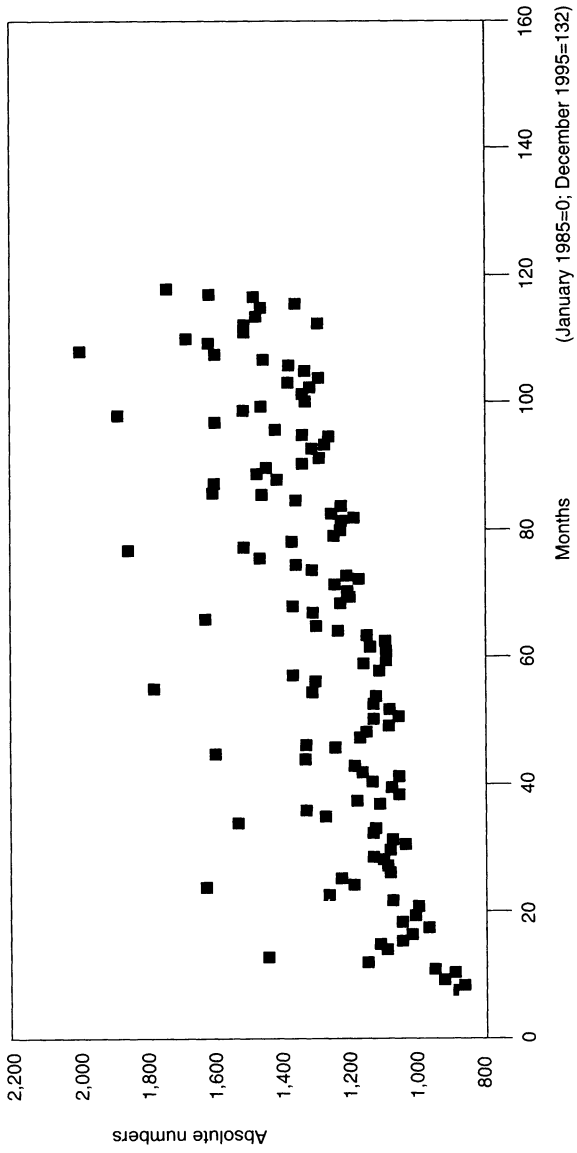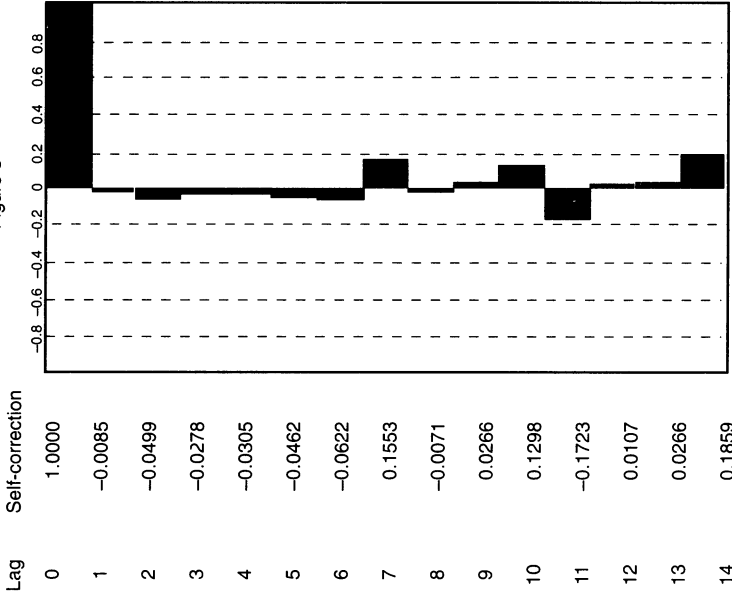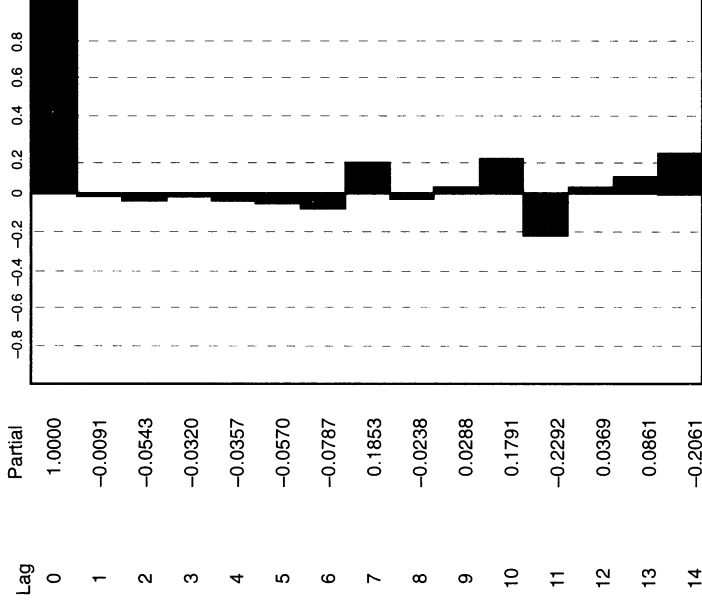
IV. CAUSES OF DEATH IN MEXICO AND ITS INCREASE IN LIFE EXPECTANCY

Alejandro Mina Valdés

1. INTRODUCTION

The study of general death rates (all the causes together) is generally utilized in the analysis of this demographic phenomenon because of the availability of data on deaths that consider all the causes of death together, and the difficulty of obtaining data separating deaths into specific causes. If, in addition, one considers the fact that obtaining tables of simple and multiple death rates is uncommon after the overall death rates have been obtained, then the lack of knowledge of the actual impact of causes of death by age and gender is enormous.

This article seeks to use one of the simplest methods for drawing up death rate tables and accurately determining the impact of death rates by specific causes, after pointing out the international classification of causes of death and those that have the greatest impact on Mexico's population, before presenting the methodology and results obtained for the Mexican case, highlighting the increases in life expectancy by age and gender, which would be obtained in Mexico after eliminating the specific cause of death under consideration.

2. IMPACT OF DEATH RATES BY CAUSES IN MEXICO

The overall death rate in Mexico declined considerably between the middle of the 20th century and the beginning of the 21st century. The death rate, which was 16 per thousand in the mid-20th century, was estimated at 6 per thousand in the late 1980s and at 4 per thousand in the year 2003. Sixty years ago, over half (53%) of the annual deaths involved the under-fives, who now account for 25% of the total number of deaths.

The reduction of death rates in Mexico in the 20th century has increased life expectancy at birth, which has risen from 36 years during the first two decades of the 20th century to 75 years in the year 2000, producing an increase of 39 years. The immediate effect has been a reduction in the probability of death among the Mexican population at every age, with a notable decrease in child mortality rates from 182 deaths of infants under the age of one for every thousand births in the early 20th century to 22 per thousand by the year 2000.

As for gender differences, as in other countries, female mortality is lower than male mortality in Mexico, with the greatest differences occurring during people's productive ages. In the early 1950s, death rates for men and women ages 20 to 59 were similar, whereas by the late 1980s, male mortality was higher than female mortality (with men's deaths accounting for 67% of the total number of deaths in this age cohort). The main causes of death among the Mexican population during the second half of the 1980s involved illnesses suffered by adults and senior citizens (heart diseases, accidents and cancer) although several deaths were caused by children's diseases (such as intestinal and respiratory infections). The greatest differences were due to the greater incidence of cancer in women and the higher accident rate in men.

An analysis of the age structure in deaths from particular causes shows that in the 1980s, among infants under the age of one, deaths from intestinal infections and infections that originated during the perinatal period had the greatest impact. In the early 21st century, accidents have the greatest impact on the deaths of infants under the age of one, whereas deaths from respiratory illness and infectious and parasitic diseases have declined consid-

erably. Nevertheless, there have been no significant changes in perinatal death rates, which reflects the lack of adequate care for women during pregnancy and childbirth.

For children between the ages of 1 and 4, the causes of death are similar to those among infants under the age of 1, with a significant reduction in deaths from accidents, whereas deaths associated with malnutrition have a considerable impact, linked primarily to poverty. It is worth noting that among infants ages 1 to 4, congenital anomalies are the third leading cause of death.

Among the Mexican population ages 5 to 14, there has been a reduction in the number of deaths from infectious and parasitic diseases coupled with an increase in deaths from malignant tumors, as well as accidents and violent deaths (aggressions).

For men ages 15 to 29, the number of deaths due to accidents and violence (homicides) have remained stable, while there has been an increase in the number of deaths from suicides and AIDS (HIV). The leading causes of death among women ages 15 to 29 during the beginning of this century have been accidents, malignant tumors and complications associated with maternity.

For adult Mexicans between the ages of 30 and 64, the main causes of death are associated with digestive diseases, malignant tumors, cardiovascular illness and accident, with diabetes mellitus having an increasing impact. The situation is similar among adults over the age of 65, the three main causes of death being cardiovascular disease, diabetes mellitus and tumors and to a lesser extent, deaths caused by digestive disorders and respiratory diseases.

Over the past 25 years, life expectancy in Mexico has increased from 67 years (64 for men and 70 for women) to 74 years (72 for men and 77 for women), with an increase of 1.2 years in life expectancy at birth during the period from 1990 to 1995 due to the reduction of the risk of dying from chronic and degenerative diseases.

The increase in life expectancy among the Mexican population is primarily due to the reduction of death rates among adults ages 30 to 64 (with a 2.5-year increase in men and a 2-year increase in women). Life expectancy at birth has also increased by 2 years over the past 25 years as a result of the reduction in infant mortality rates.

The reduction in the number of deaths due to infectious and parasitic diseases has also increased life expectancy at birth, together with the decline in deaths from respiratory and cardiovascular disease. Conversely, the increase in the number of deaths from diabetes mellitus, congenital anomalies and malignant tumors has prevented further increases in life expectancy at birth.

It is worth noting the differences between men and women in deaths from cancer. Women are more likely to die from tumors in the reproductive apparatus (which account for 31.6% of deaths from cancer) than men (10.9%). Conversely, men are more likely to die from tumors in the respiratory tract (20.4% as opposed to 8.2% of women) linked to greater tobacco consumption.

Gender differences in causes of death are far more noticeable among the adult population. Between the ages of 15 and 44, women die mainly from malignant tumors, accidents and obstetric complications, whereas men die mainly from accidents and violence.

Further differences emerge when youth and adults are analyzed separately. Women ages 15 to 25 die mainly from accidents and obstetric complications, whereas men die from accidents and violence (which account for 73.5% of the number of annual deaths).

Women ages 25 to 44, however, die firstly from malignant tumors, secondly from accidents, thirdly from heart disease and fourthly from obstetric complications, whereas men in this age group continue to die from accidents and violence (which account for 54.2% of all deaths) and from cirrhosis and other liver disorders as well as heart diseases.

Child mortality has significantly decreased in recent decades, although it still displays relatively high levels. In the late 1960s, a rate of 85 deaths was estimated for every thousand live births, a figure that fell to 47 per thousand in the mid-1980s and 24 per thousand in 1990. This decline in mortality is reflected in all states (neonatal and post-neonatal) and is accompanied by a fall in death rates among all children under the age of five. Nevertheless, infant deaths as a whole continue to account for a significant percentage of total annual deaths (26% in 1990).

Post-neonatal death rates have declined more swiftly than neonatal rates, although the former continue to be high. It is a well-known fact that the death rates of children ages 1 to 11 months

(post-neonatal) are more sensitive to non-specialized health actions designed to combat infectious diseases, whether intestinal or respiratory (which still accounted for 37% of all the deaths of children under the age of 1 in 1990).

3. METHODOLOGY USED TO ESTIMATE INCREASES IN LIFE EXPECTANCY

The Cerisola[1] method allows one to measure the increase in life expectancy at a specific age (x), in the event that a group of causes of death have been eliminated.

Assumptions of the method:

1) Deaths from a particular cause i, of persons of a specific age (x) (nD^i x), are not uniformly distributed over the year.

2) Persons saved from dying from a particular cause have the same likelihood of dying from another cause as any other individual in the population.

3) When a cause of death is eliminated or reduced, this does not modify the probability of dying from another cause.

Basic Information:

Estimating life expectancy once a certain group of causes has been eliminated uses:

1) The average number of deaths, by age groups, gender and classified causes.

2) The number of survivors of an exact age x (lx) and the deaths ($d(x, x + n)$) in each age group, drawn from the abbreviated table of death rates corresponding to the year of observation.

a) Calculation Procedure

The deaths in each age group are broken down as follows:

[1] See Elsa Cerisola (1968), *Argentina: Análisis de la mortalidad por causa,* Santiago, Chile, CELADE, serie C, No. 109.

$$nDx = \sum_i nD_x^i$$

where nD_x^i is the expected number of deaths for each group of causes and age, obtained by applying the percentage distribution of registered deaths according to groups of causes by age and gender to the number of deaths by age and sex in the life tables.

The probability between the ages of x and $x + n$ once the i cause has been eliminated is calculated as follows:

$$nq_x^i = \frac{d(x,\ x+n) - d^i(x,\ x+n)}{lx - \dfrac{d^i(x, x+n)}{2}}$$

where:

$d(x, x + n) - d^i(x, x + n)$: is the total number of deaths from different causes from i between the ages of x and $x + n$.

$lx - \dfrac{d^i(x, x+n)}{2}$: are the survivors at an exact age, with the exception of those that died from cause i.

Thus, the probability of survivors of age x at the age of $x + n$ once cause i has been eliminated is calculated as:

$$nP_x^i = 1 - nq_x^i = \frac{lx + n + \dfrac{d^i(x, x+n)}{2}}{lx - \dfrac{d^i(x, x+n)}{2}}$$

Finally, the remaining values of the table of deaths from specific causes is calculated using the following relations:

$$l^i_{xx}n + n = l_i \, nP^i_x$$

$$_1L^i_o = Kol^i_o + (1 - k_o)l^i_1$$

$$_4L^i_1 = K(1, 4)l^i_1 + (4 - k(1, 4)l^1_5$$

$$_5L^1_5 = \frac{5}{2}(l^1_x + l^1_x + 5)$$

$$_+L_{80} = \frac{l^1_{80}}{+M_{80}}$$

$$T^1_x = \sum_{l=x}^{w} {}_nL^i_x$$

$$^0e^i_x = \frac{T^i_x}{l^i_x}$$

4. Principal Causes of Death in Mexico

The three main causes of death in Mexico in the year 2000 nationwide are: *a)* tumors, *b)* endocrine, nutritional and metabolic diseases and *c)* diseases of the circulatory system (see Appendix I).

Deaths from all causes, from the three main causes and from the remaining causes are shown in Table 1, for men, women and the total population, registered in the year 2000.

Table 2 shows the increases in life expectancy by age for men and women, eliminating each of the three main causes of death, as well as the sum of the three causes and the remaining causes. It shows that when the three main causes of death in Mexico are given for the year 2000, the greatest increase in life expectancy occurs when heart disease is eliminated, producing an increase of

Table 1
Mexico: Total Number of Deaths by Five-Year Groups, 2000

Age	Heart disease	Malignant tumor	Diabetes mellitus	Sum of three causes	Remainder	Total
Total	68,712	55,006	46,614	170,332	267,223	437,555
Under one year	229	84	5	318	38,244	38,562
1-4 years	101	469	10	580	6,382	6,962
5-9 years	67	547	13	627	2,830	3,457
10-14 years	75	555	31	661	3,057	3,718
15-19 years	193	627	77	897	6,491	7,388
20-24 years	299	671	126	1,096	8,898	9,994
25-29 years	420	827	237	1,484	9,807	11,291
30-34 years	597	1,158	333	2,088	9,920	12,008
35-39 years	946	1,633	609	3,188	10,767	13,955
40-44 years	1,398	2,268	1,150	4,816	10,680	15,496
45-49 years	1,976	2,995	2,055	7,026	11,032	18,058
50-54 years	2,795	3,821	3,299	9,915	11,152	21,067
55-59 years	3,826	4,459	4,771	13,056	12,436	25,492
60-64 years	5,329	5,611	6,233	17,173	13,674	30,847
65-69 years	6,787	6,583	7,035	20,405	15,572	35,977
70-74 years	7,982	6,863	6,791	21,636	17,735	39,371
75-79 years	9,093	6,249	5,996	21,338	19,599	40,937
80-84 years	8,482	4,468	3,796	16,746	18,144	34,890
85 and over	17,858	5,023	3,944	26,825	39,078	65,903
Unspecified	259	95	103	457	1,725	2,182

Males						
	34,490	26,455	20,864	81,809	162,493	244,302
Under one year	132	43	4	179	21,614	21,793
1-4 years	47	236	6	289	3,437	3,726
5-9 years	34	310	4	348	1,677	2,025
10-14 years	37	300	11	348	1,904	2,252
15-19 years	115	381	30	526	4,580	5,106
20-24 years	180	405	60	645	6,743	7,388
25-29 years	263	422	133	818	7,562	8,380
30-34 years	370	480	198	1,048	7,689	8,737
35-39 years	580	580	359	1,519	8,329	9,848
40-44 years	910	722	650	2,282	8,105	10,387
45-49 years	1,250	960	1,071	3,281	8,174	11,455
50-54 years	1,714	1,424	1,622	4,760	7,814	12,574
55-59 years	2,330	1,924	2,286	6,540	8,299	14,839
60-64 years	3,036	2,687	2,834	8,557	8,543	17,100
65-69 years	3,726	3,375	3,036	10,137	9,373	19,510
70-74 years	4,154	3,662	2,987	10,803	10,062	20,865
75-79 years	4,597	3,483	2,603	10,683	10,830	21,513
80-84 years	3,861	2,402	1,500	7,763	9,280	17,043
85 and over	7,024	2,606	1,436	11,066	17,270	28,336
Unspecified	130	53	34	217	1,208	1,425

Table 1
(end)

Age	Heart disease	Malignant tumor	Diabetes mellitus	Sum of three causes	Remainder	Total
Females	34,222	28,551	25,750	88,523	104,730	193,253
Under one year	97	41	1	139	16,630	16,769
1-4 years	54	233	4	291	2,945	3,236
5-9 years	33	237	9	279	1,153	1,432
10-14 years	38	255	20	313	1,153	1,466
15-19 years	78	246	47	371	1,911	2,282
20-24 years	119	266	66	451	2,155	2,606
25-29 years	157	405	104	666	2,245	2,911
30-34 years	227	678	135	1,040	2,231	3,271
35-39 years	366	1,053	250	1,669	2,438	4,107
40-44 years	488	1,546	500	2,534	2,575	5,109
45-49 years	726	2,035	984	3,745	2,858	6,603
50-54 years	1,081	2,397	1,677	5,155	3,338	8,493
55-59 years	1,496	2,535	2,485	6,516	4,137	10,653
60-64 years	2,293	2,924	3,399	8,616	5,131	13,747
65-69 years	3,061	3,208	3,999	10,268	6,199	16,467
70-74 years	3,828	3,201	3,804	10,833	7,673	18,506
75-79 years	4,496	2,766	3,393	10,655	8,769	19,424
80-84 years	4,621	2,066	2,296	8,983	8,864	17,847
85 and over	10,834	2,417	2,508	15,759	21,808	37,567
Unspecified	129	42	69	240	517	757

Table 2
Mexico: Increases in Life Expectancy Obtained by Eliminating Causes
of Death, 2000

Age	Without heart disease	Without malignant tumors	Without diabetes mellitus	Without sum of the three causes	Without the remaining causes
			Men		
0	0.73	0.60	0.50	1.81	2.04
1	0.73	0.61	0.51	1.86	−1.00
5	0.76	0.60	0.52	1.86	1.64
10	0.76	0.61	0.52	1.88	1.96
15	0.76	0.61	0.52	1.88	1.96
20	0.77	0.62	0.53	1.89	1.93
25	0.76	0.62	0.52	1.89	1.90
30	0.78	0.62	0.52	1.89	1.89
35	0.76	0.62	0.52	1.89	1.85
40	0.76	0.62	0.52	1.89	1.82
45	0.75	0.61	0.51	1.86	1.75
50	0.45	0.31	0.21	1.59	1.58
55	0.66	0.52	0.41	1.68	1.55
60	0.62	0.49	0.36	1.55	1.45
65	0.57	0,44	0.31	1.39	1.37
70	0.51	0.37	0.26	1.20	1.24
75	0.40	0.27	0.19	0.91	0.98
80	0.21	0.16	0.11	0.51	0.52
			Women		
0	0.67	0.52	0.59	1.87	1.53
1	0.68	0.53	0.61	1.92	−1.29
5	0.69	0.51	0.61	1.91	1.11
10	0.70	0.52	0.61	1.94	1.45
15	0.70	0.53	0.61	1.94	1.46
20	0.70	0.53	0.62	1.94	1.44
25	0.70	0.53	0.61	1.94	1.42
30	0.70	0.52	0.62	1.93	1.41
35	0.70	0.51	0.62	1.92	1.40
40	0.69	0.50	0.61	1.90	1.40
45	0.69	0.47	0.60	1.86	1.38
50	0.68	0.45	0.59	1.81	1.37
55	0.67	0.42	0.55	1.72	1.33
60	0.65	0.40	0.51	1.65	1.29
65	0.62	0.36	0.45	1.51	1.23
70	0.56	0.31	0.38	1.30	1.13
75	0.44	0.22	0.28	0.98	0.87
80	0.22	0.14	0.17	0.54	0.44

0.73 years for men and 0.67 years for women. The elimination of deaths from malignant tumors for men and deaths from diabetes mellitus for women leads to an increase in life expectancy at birth of 0.60 years for men and of 0.59 years for women.

Of the three leading causes of death, the one whose elimination yields the greatest increase in life expectancy for men is diabetes mellitus, and for women is malignant tumors, producing an increase in life expectancy at birth of 0.50 years for men and 0.52 years for women.

If the three causes of death mentioned earlier were eliminated, this would produce an increase in life expectancy at birth of 1.81 years for men and 1.87 years for women. It is worth noting that the effect of eliminating the remaining causes of death yields a 2.04-year increase in life expectancy for men and a 1.53-year increase in life expectancy at birth for women.

By way of a conclusion, below is a summary of the impact, during the past ten years in Mexico, of the causes of death by age group. Thus, the greatest exposure to death occurs in the groups under the age of 1, between 1 and 4 and at 65 or over. The population under the age of 1 must primarily be protected from infections originating in the perinatal period due to obstetric complications in either pregnancy or childbirth, external factors such as the mother's medical care, childbirth and consequences of the infant's care, such as weight, nutrition, respiratory and cardiovascular disorders and temperature regulation, to mention just a few. The second group of factors from which they must be protected includes falls, poisoning, traumatisms and all kinds of accidents. The third group of risk factors includes endocrine, nutritional and metabolic diseases, such as thyroid and pancreatic diseases, diabetes, malnutrition, obesity and metabolic disorders.

It is worth noting that parents' role in ensuring their child's health is vital, meaning that they should be given specific advice from doctors and health personnel on how to protect children from these life-threatening diseases.

Children ages 1 to 4 should be protected from falls, poisoning, traumatism and all kinds of accidents, while signs of tumors anywhere in the body should receive medical care. Diseases of the circulatory system should also be promptly treated.

Between the ages of 5 and 24, the main cause of death is accidents, followed by diseases of the circulatory apparatus, such as cardiac and rheumatic diseases, high blood pressure, cardiopulmonary and cardiovascular diseases, hemorrhages, and problems of the arteries, arterioles and capillary vessels such as embolisms and thrombosis. The third cause of death is malignant tumors, whether in specific places or otherwise, such as the lips, pharynx, digestive, respiratory, and intrathoracic organs, skin, genital organs and urinary tract.

The main causes of death among the population ages 25 to 34 involve problems of the circulatory system or apparatus, malignant tumors and accidents.

Among the group ages 35 to 44, the main causes of death include diseases of the circulatory system, followed by tumors and then disorders of the digestive system such as appendicitis, hernia, peritonitis, colitis, cirrhosis, and pancreatitis, as well as endocrine, nutritional and metabolic diseases.

The most common causes of death among the Mexican population ages 45 to 64 include illnesses caused by the circulatory system, tumors and endocrine, nutritional and metabolic diseases, such as thyroid and pancreas disorders, diabetes, malnutrition, obesity and metabolic disorders.

Among the group aged 65 or over, the leading causes of death are heart problems, together with endocrine and nutritional diseases and tumors.

Determining the impact of diseases on death rates in Mexico will enable health resources to be oriented towards reducing the main causes of death, which will have a direct effect on the increases in life expectancy by age and gender.

5. References

Camposortega Cruz, Sergio (1992), *Análisis demográfico de la mortalidad en México, 1940-1980*, Mexico, Centro de Estudios Demográficos y de Desarrollo Urbano, El Colegio de México.

Consejo Nacional de Población (1999), *La situación demográfica de México. Veinticinco años de transición epidemiológica de México*, Mexico, Conapo.

Corona, Rodolfo, René Jiménez and Alberto Minijín (1982), *La mortalidad*

en México, Mexico, Instituto de Investigaciones Sociales, Universidad Nacional Autónoma de México.

Instituto Nacional de Estadística, Geografía e Informática (2001), *Indicadores sociodemográficos de México (1930-2000)*, Mexico, INEGI.

———— (undated), *Defunciones en los Estados Unidos Mexicanos (1976-2000)*, Mexico, INEGI.

———— (1998), "Clasificación estadística internacional de enfermedades y problemas relacionados con la salud," *Estadísticas Demográficas*, Vol. 1, No. 12, CIE-10th revision, Mexico.

Mina Valdés, Alejandro (2001), "Elaboración y utilidad de la tabla abreviada de mortalidad," *Vínculos Matemáticos*, No. 138, 4th edition, Mexico, Facultad de Ciencias, Universidad Nacional Autónoma de México.

———— (2001), "Funciones de supervivencia empleadas en el análisis demográfico", *Papeles de Población*, No. 28, April-June, Mexico, CIEAP-UAEM.

Pérez, Ruy (2001), "La evolución de la medicina: La ciencia mexicana en el siglo xx", *Revista de la Academia Mexicana de Ciencias*, Vol. 52, No. 3, October.

APPENDIX I

Classification of Causes of Death

Disease classification is defined as a system of categories to which diseases are assigned according to established criteria, determined by the use that will be made of the statistics compiled according to this classification.

The statistical classification of the causes of death dates from the 18th century, while early reviews were based solely on the modification of causes.

The tenth revision of the International Statistical Classification of Diseases and Health-Related Problems, known as the CIE-10, is the most recent one. In this classification, infections have been grouped together in the most suitable way for general epidemiological purposes and health care evaluation.

The papers included in CIE-10, requested by the World Health Organization (WHO), began to be compiled in September 1983 in Geneva, its headquarters, and were governed by regular meetings of the directors of the WHO Collaborating Centers, for the classification of disease. These centers are located in the following cities: Caracas, Venezuela; Canberra, Australia; London, England; Hyattsville, USA; Beijing, China; Le Vecinet, France; Uppsala, Sweden; São Paulo, Brazil, and Moscow, Russia. Policy guidelines were determined by various special meetings, particularly the ones held by the Committee of CIE-10 Experts, in 1984 and 1987.

In addition to the technical contributions of several groups of specialists and individual experts, numerous observations and suggestions were submitted by the WHO member states and regional offices.

The traditional structure of the CIE has been preserved, the difference being that the previous numerical code has been replaced by an alphanumerical one, certain immunity mechanism disorders have been grouped together with diseases of the blood and hematopoietic organs and new chapters have been created for eye diseases and related disorders, ear infections and the mastoid process. Moreover, the classification of external causes and factors that influence the state of health and contact with health

services, which previously appeared in the appendices, have now been incorporated into the main section of classification.

These meetings produced the concept of a family of classifications, built around the CIRE nucleus, which would deal with the central needs of traditional mortality and morbidity statistics. The main innovation in the proposals was the use of a system of alphanumeric codification, consisting of a letter followed by three digits, giving a total of four characters.

The main causes of death in Mexico are:

II. Tumors. This group classifies all tumors, whether or not they are functionally active, and identifies large morphological groups of malignant tumors and cancer. This chapter contains the following groups:

- Primary malignant tumors in a specific anatomical site, except for the lymphatic, hematopoietic and other tissues (lip, mouth cavity, pharynx, digestive, respiratory and intra-thoracic organs, bones and articular cartilage, skin, tissues, breast, genital organs, urinary tract, eye, encephalon, thyroid and other endocrine glands).
- Malignant tumors in poorly defined, secondary or unspecified places, described as disseminated, spreading or extending, without mentioning the origin, where the primary site is regarded as unknown.
- Malignant tumors described as primary tumors of the lymphatic tissue, hematopoietic organs and related tissues (Hodgkin's disease, Non-Hodgkin's lymphoma, follicular, diffuse, peripheral, cutaneous and non-specific, multiple myeloma, malignant tumors with plasmatic cells, leukemia, etc.).
- Primary malignant tumors in independent, multiple sites.
- In situ tumors (carcinoma in mouth cavity, esophagus, stomach and other digestive organs, respiratory system, middle ear, skin, breast, cervix of the uterus, other genital organs and melanoma).
- Benign tumors (in the mouth, colon, ear, inter-thoracic organs, bones, etc.).
- Tumors with uncertain or unknown behavior.

IV. Endocrine, nutritional and metabolic diseases: these indicate the functional activity of ectopic endocrine tumors and tissues or the hypofunction or hyperfunction of endocrine glands associated with tumors and other infections classified elsewhere.

The main disease in this section is diabetes mellitus (insulin-dependent, non-insulin-dependent, associated with malnutrition).

IX. Diseases of the circulatory system: excludes transitory cerebral ischemic attacks and related syndromes, systemic disorders of the conjunctive tissue and tumors. This section contains the following groups:

- Acute rheumatic fever (with and without cardiac complications and rheumatic chorea).
- Chronic rheumatic cardiac diseases (diseases of the mitral, aortic and tricuspid valve).
- Hypertension diseases (hypertension, heart and hypertension renal diseases).
- Ischemic heart diseases (angina pectoris, myocardial infarction, subsequent complications of heart attacks and other ischemic heart diseases).
- Cardiopulmonary disease and pulmonary circulation diseases (pulmonary embolism and other diseases of the pulmonary vessels).
- Other forms of heart disease (acute pericarditis, endocarditis, non-rheumatic disorders of the mitral, aortic and tricuspid valve, myocarditis, cardiomyopathy, auriculoventricular blockage and blockage of the left branch of the right side, cardiac arrest, paroxistic tachycardia, fibrillation and atrial flutter, cardiac insufficiency, etc.).
- Cerebrovascular diseases (sub-arachnoid and intra-encephalic hemorrhage, cerebral infarct, occlusion and stenosis of the precerebral arteries, consequences of cerebrovascular disease).
- Disease of the arteries, arterioles and capillary vessels (atherosclerosis, aneurism, aortic dissection, embolism and arterial thrombosis).

- Diseases of the veins and vessels and lymph nodes, not classified elsewhere (phlebitis, thrombosis of the vena porta, etc.).
- Other disorders and unspecified disorders in the circulatory system hypotension and other disorders of the circulatory system).

The remaining causes of death include:

I. Certain infectious and parasitic diseases. Includes diseases generally recognized as contagious or transmissible.

III. Diseases of the blood and hematopoietic organs and certain disorders affecting the immunity mechanism.

V. Mental and behavioral disorders. Includes disorders of psychological development, cerebral illness, injuries or other brain traumas leading to cerebral dysfunction.

VI. Diseases of the nervous system.

VII. Diseases of the eye and related disorders.

VIII. Ear infections and the mastoid process.

X. Diseases of the respiratory system.

XI. Diseases of the digestive system.

XII. Diseases of the skin and subcutaneous tissue.

XIII. Diseases of the osteo-muscular system and conjunctive tissue.

XIV. Diseases of the genito-urinary system.

XV. Pregnancy, childbirth and puerperium.

XVI. Certain diseases originating in the perinatal period. Includes infections that originate in the perinatal period, although death may take place later.

XVII. Congenital malformations, deformities and chromosomic anomalies.

XVIII. Abnormal clinical and laboratory symptoms, signs and findings, not classified elsewhere. Includes abnormal symptoms, signs and results of clinical and research procedures and less clearly-defined infections, including symptoms that suggest two or more diseases or various systems of the human body, which have been insufficiently studied to enable a final diagnosis to be reached.

XIX. Traumatisms, poisoning and other consequences of external causes.

XX. External causes of morbidity and mortality. Includes the classification of environmental events and adverse circumstances.

Appendix II
Table 1
Mexico: Death Rates from Diabetes Mellitus, Men, 2000

Age	Di	D	Di/D	d	di	lx Table	nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	4	21,921	0.0002	4,062	1	100,000	0.040613	0.959387	100,000	97,292	7,298,572	72.99	72.49	0.50
1-4	6	3,748	0.0016	591	1	95,938	0.006150	0.993850	95,939	381,864	7,201,280	75.06	74.55	0.51
5-9	4	2,037	0.0020	130	0	95,347	0.001361	0.998639	95,348	476,413	6,819,415	71.52	71.00	0.52
10-14	11	2,265	0.0049	135	1	95,216	0.001411	0.998589	95,217	475,747	6,343,002	66.62	66.10	0.52
15-19	30	5,136	0.0059	190	1	95,081	0.001987	0.998013	95,082	474,934	5,867,255	61.71	61.19	0.52
20-24	60	7,431	0.0081	254	2	94,891	0.002655	0.997345	94,892	473,828	5,392,321	56.83	56.30	0.53
25-29	133	8,429	0.0158	289	5	94,638	0.003006	0.996994	94,639	472,482	4,918,493	51.97	51.45	0.52
30-34	198	8,788	0.0226	412	9	94,349	0.004268	0.995732	94,354	470,750	4,446,011	47.12	46.60	0.52
35-39	360	9,906	0.0363	517	19	93,936	0.005304	0.994696	93,946	468,460	3,975,262	42.31	41.79	0.52
40-44	651	10,448	0.0623	822	51	93,420	0.008253	0.991747	93,438	465,217	3,506,802	37.53	37.01	0.52
45-49	1,073	11,522	0.0931	376	35	92,598	0.003683	0.996317	92,649	462,265	3,041,585	32.83	32.32	0.51
50-54	1,625	12,648	0.1285	2,273	292	91,262	0.021742	0.978258	92,257	453,837	2,579,320	27.96	27.75	0.21
55-59	2,290	14,926	0.1534	3,569	548	88,989	0.034058	0.965942	89,278	438,090	2,125,483	23.81	23.40	0.41
60-64	2,839	17,200	0.1650	5,310	876	85,420	0.052172	0.947828	85,958	417,304	1,687,393	19.63	19.27	0.36
65-69	3,041	19,624	0.1550	7,893	1,223	80,110	0.083900	0.916100	80,963	385,881	1,270,089	15.69	15.38	0.31
70-74	2,992	20,987	0.1426	12,292	1,752	72,217	0.147737	0.852263	73,389	337,342	884,209	12.05	11.79	0.26
75-79	2,607	21,639	0.1205	17,961	2,164	59,925	0.268459	0.731541	61,548	263,464	546,867	8.89	8.70	0.19
80+	2,941	45,645	0.0644	41,964	2,704	41,964	0.966714	0.033286	43,838	283,403	283,403	6.46	6.35	0.11

Table 2
Mexico: Death Rates from Malignant Tumors, Men, 2000

Age	Di	D	Di/D	d	di	lx Table	Nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	43	21,921	0.0020	4,062	8	100,000	0.040542	0.959458	100,000	97,297	7,308,620	73.09	72.49	0.60
1-4	236	3,748	0.0631	591	37	95,938	0.005773	0.994227	95,946	381,986	7,211,323	75.16	74.55	0.61
5-9	311	2,037	0.1525	130	20	95,347	0.001156	0.998844	95,384	476,552	6,829,337	71.60	71.00	0.60
10-14	301	2,265	0.1327	135	18	95,216	0.001230	0.998770	95,237	475,839	6,352,785	66.71	66.10	0.61
15-19	382	5,136	0.0743	190	14	95,081	0.001850	0.998150	95,099	475,010	5,876,945	61.80	61.19	0.61
20-24	406	7,431	0.0546	254	14	94,891	0.002531	0.997469	94,905	473,890	5,401,935	56.92	56.30	0.62
25-29	423	8,429	0.0502	289	14	94,638	0.002901	0.997099	94,651	472,536	4,928,045	52.07	51.45	0.62
30-34	481	8,788	0.0547	412	23	94,349	0.004128	0.995872	94,363	470,807	4,455,509	47.22	46.60	0.62
35-39	581	9,906	0.0587	517	30	93,936	0.005182	0.994818	93,960	468,522	3,984,702	42.41	41.79	0.62
40-44	723	10,448	0.0692	822	57	93,420	0.008192	0.991808	93,449	465,260	3,516,180	37.63	37.01	0.62
45-49	962	11,522	0.0835	376	31	92,598	0.003722	0.996278	92,655	462,270	3,050,920	32.93	32.32	0.61
50-54	1,427	12,648	0.1128	2,273	256	91,262	0.022128	0.977872	92,253	453,740	2,588,650	28.06	27.75	0.31
55-59	1,928	14,926	0.1292	3,569	461	88,989	0.035017	0.964983	89,243	437,789	2,134,910	23.92	23.40	0.52
60-64	2,692	17,200	0.1565	5,310	831	85,420	0.052689	0.947311	85,873	416,980	1,697,122	19.76	19.27	0.49
65-69	3,382	19,624	0.1723	7,893	1,360	80,110	0.082247	0.917753	80,919	386,101	1,280,141	15.82	15.38	0.44
70-74	3,669	20,987	0.1748	12,292	2,149	72,217	0.142572	0.857428	73,521	338,605	894,040	12.16	11.79	0.37
75-79	3,490	21,639	0.1613	17,961	2,897	59,925	0.257611	0.742389	61,921	266,021	555,435	8.97	8.70	0.27
80-+	5,018	45,645	0.1099	41,964	4,613	41,964	0.941835	0.058165	44,488	289,413	289,413	6.51	6.35	0.16

Table 3
Mexico: Death Rates from Heart Diseases, Men, 2000

Age	Di	D	Di/D	d	di	lx Table	nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	132	21,921	0.0060	4,062	25	100,000	0.040379	0.959621	100,000	97,308	7,321,597	73.22	72.49	0.73
1-4	47	3,748	0.0126	591	7	95,938	0.006083	0.993917	95,962	381,904	7,224,289	75.28	74.55	0.73
5-9	34	2,037	0.0168	130	2	95,347	0.001341	0.998659	95,354	476,434	6,842,385	71.76	71.00	0.76
10-14	37	2,265	0.0164	135	2	95,216	0.001395	0.998605	95,219	475,756	6,365,951	66.86	66.10	0.76
15-19	115	5,136	0.0225	190	4	95,081	0.001953	0.998047	95,083	474,946	5,890,195	61.95	61.19	0.76
20-24	181	7,431	0.0243	254	6	94,891	0.002612	0.997388	94,895	473,846	5,415,249	57.07	56.30	0.77
25-29	264	8,429	0.0313	289	9	94,638	0.002958	0.997042	94,643	472,503	4,941,403	52.21	51.45	0.76
30-34	371	8,788	0.0423	412	17	94,349	0.004183	0.995817	94,358	470,781	4,468,900	47.36	46.60	0.76
35-39	582	9,906	0.0588	517	30	93,936	0.005181	0.994819	93,954	468,509	3,998,119	42.55	41.79	0.76
40-44	913	10,448	0.0874	822	72	93,420	0.008033	0.991967	93,449	46,297	3,529,610	37.77	37.01	0.76
45-49	1,255	11,522	0.1089	376	41	92,598	0.003619	0.996381	92,670	462,331	3,064,312	33.07	32.32	0.75
50-54	1,720	12,648	0.1360	2,273	309	91,262	0.021555	0.978445	92,263	453,894	2,601,981	28.20	27.75	0.45
55-59	2,339	14,926	0.1567	3,569	559	88,989	0.033928	0.966072	89,295	438,162	2,148,087	24.06	23.40	0.66
60-64	3,047	17,200	0.1772	5,310	941	85,420	0.051433	0.948567	85,970	417,491	1,709,925	19.89	19.27	0.62
65-69	3,740	19,624	0.1906	7,893	1,504	80,110	0.080505	0.919495	81,027	386,718	1,292,434	15.95	15.38	0.57
70-74	4,170	20,987	0.1987	12,292	2,442	72,217	0.138738	0.861262	73,661	339,646	905,716	12.30	11.79	0.51
75-79	4,614	21,639	0.2132	17,961	3,830	59,925	0.243595	0.756405	62,198	268,813	566,070	9.10	8.70	0.40
80-+	10,926	45,645	0.2394	41,964	10,045	41,964	0.864042	0.135958	45,328	297,257	297,257	6.56	6.35	0.21

Table 4
Mexico: Multiple Death Rates, Sum of Three Causes, Men, 2000

Age	Di	D	Di/D	d	di	lx Table	nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	179	21,921	0.0082	4,062	33	100,000	0.040294	0.959706	100,000	97,314	7,429,959	74.30	72.49	1.81
1-4	290	3,748	0.0773	591	46	95,938	0.005685	0.994315	95,971	382,033	7,332,645	76.41	74.55	1.86
5-9	349	2,037	0.1713	130	22	95,347	0.001130	0.998870	95,393	476,580	6,950,612	72.86	71.00	1.86
10-14	349	2,265	0.1540	135	21	95,216	0.001200	0.998800	95,239	475,853	6,474,033	67.98	66.10	1.88
15-19	527	5,136	0.1027	190	20	95,081	0.001793	0.998207	95,102	475,031	5,998,180	63.07	61.19	1.88
20-24	647	7,431	0.0870	254	22	94,891	0.002444	0.997556	94,910	473,924	5,523,150	58.19	56.30	1.89
25-29	820	8,429	0.0973	289	28	94,638	0.002757	0.997243	94,659	472,590	5,049,226	53.34	51.45	1.89
30-34	1,051	8,788	0.1196	412	49	94,349	0.003846	0.996154	94,377	470,908	4,576,635	48.49	46.60	1.89
35-39	1,523	9,906	0.1538	517	79	93,936	0.004660	0.995340	93,986	468,711	4,105,727	43.68	41.79	1.89
40-44	2,288	10,448	0.2190	822	180	93,420	0.006879	0.993121	93,498	465,689	3,637,016	38.90	37.01	1.89
45-49	3,290	11,522	0.2855	376	107	92,598	0.002903	0.997097	92,777	462,766	3,171,327	34.18	32.32	1.86
50-54	4,773	12,648	0.3774	2,273	858	91,262	0.015581	0.984419	92,329	455,423	2,708,560	29.34	27.75	1.59
55-59	6,557	14,926	0.4393	3,569	1,568	88,989	0.022686	0.977314	89,840	442,026	2,253,137	25.08	23.40	1.68
60-64	8,580	17,200	0.4988	5,310	2,649	85,420	0.031646	0.968354	86,970	424,217	1,811,112	20.82	19.27	1.55
65-69	10,164	19,624	0.5179	7,893	4,088	80,110	0.048741	0.951259	82,717	397,305	1,386,894	16.77	15.38	1.39
70-74	10,832	20,987	0.5161	12,292	6,344	72,217	0.086147	0.913853	76,205	355,503	989,589	12.99	11.79	1.20
75-79	10,711	21,639	0.4950	17,961	8,891	59,925	0.163489	0.836511	65,996	290,309	634,086	9.61	8.70	0.91
80-+	18,879	45,645	0.4136	41,964	17,356	41,964	0.739280	0.260720	50,128	343,777	343,777	6.86	6.35	0.51

Table 5
Mexico: Death Rates, Diabetes Mellitus, Women, 2000

Age	Di	D	Di/D	d	di	lx Table	Nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	1	16,835	0.0001	3,596	0	100,000	0.035958	0.964042	100,000	97,603	7,702,190	77.02	76.43	0.59
1-4	4	3,249	0.0012	567	1	96,404	0.005874	0.994126	96,404	383,804	7,604,587	78.88	78.27	0.61
5-9	9	1,438	0.0063	91	1	95,837	0.000944	0.999056	95,838	478,961	7,220,783	75.34	74.73	0.61
10-14	20	1,472	0.0136	74	1	95,747	0.000762	0.999238	95,747	478,551	6,741,822	70.41	69.80	0.61
15-19	47	2,291	0.0206	109	2	95,673	0.001116	0.998884	95,674	478,101	6,263,271	65.46	64.85	0.61
20-24	66	2,616	0.0253	164	4	95,564	0.001673	0.998327	95,566	477,426	5,785,170	60.54	59.92	0.62
25-29	104	2,922	0.0357	204	7	95,401	0.002062	0.997938	95,404	476,521	5,307,744	55.63	55.02	0.61
30-34	135	3,284	0.0412	259	11	95,197	0.002609	0.997391	95,204	475,382	4,831,223	50.75	50.13	0.62
35-39	251	4,123	0.0608	333	20	94,938	0.003295	0.996705	94,949	473,935	4,355,841	45.88	45.26	0.62
40-44	501	5,129	0.0977	519	51	94,606	0.004951	0.995049	94,625	471,907	3,881,906	41.02	40.41	0.61
45-49	987	6,629	0.1488	773	115	94,087	0.006997	0.993003	94,138	468,916	3,409,999	36.22	35.62	0.60
50-54	1,682	8,526	0.1972	1,257	248	93,313	0.010829	0.989171	93,429	464,328	2,941,084	31.48	30.89	0.59
55-59	2,492	10,695	0.2330	1,844	430	92,056	0.015400	0.984600	92,303	457,352	2,476,756	26.83	26.28	0.55
60-64	3,408	13,801	0.2469	3,039	750	90,212	0.025474	0.974526	90,638	446,381	2,019,403	22.28	21.77	0.51
65-69	4,010	16,532	0.2425	5,348	1,297	87,173	0.046817	0.953183	87,914	427,514	1,573,023	17.89	17.44	0.45
70-74	3,814	18,579	0.2053	9,911	2,035	81,825	0.097469	0.902531	83,092	392,353	1,145,509	13.79	13.41	0.38
75-79	3,402	19,500	0.1745	16,756	2,923	71,914	0.196341	0.803659	73,850	329,110	753,155	10.20	9.92	0.28
80-+	4,817	55,632	0.0866	55,158	4,776	55,158	0.954748	0.045252	57,794	424,045	424,045	7.34	7.17	0.17

Table 6

Mexico: Death Rates from Tumors, Women, 2000

Age	Di	D	Di/D	d	di	lx Table	nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	41	16,835	0.0024	3,596	9	100,000	0.035874	0.964126	100,000	97,608	7,694,991	76.95	76.43	0.52
1-4	233	3,249	0.0718	567	41	96,404	0.005460	0.994540	96,413	383,938	7,597,382	78.80	78.27	0.53
5-9	237	1,438	0.1651	91	15	95,837	0.000793	0.999207	95,878	479,097	7,213,444	75.24	74.73	0.51
10-14	255	1,472	0.1735	74	13	95,747	0.000639	0.999361	95,761	478,617	6,734,347	70.32	69.80	0.52
15-19	246	2,291	0.1075	109	12	95,673	0.001017	0.998983	95,686	478,154	6,255,730	65.38	64.85	0.53
20-24	266	2,616	0.1018	164	17	95,564	0.001542	0.998458	95,576	477,481	5,777,576	60.45	59.92	0.53
25-29	406	2,922	0.1388	204	28	95,401	0.001842	0.998158	95,417	476,605	5,300,095	55.55	55.02	0.53
30-34	679	3,284	0.2068	259	54	95,197	0.002159	0.997841	95,225	475,542	4,823,490	50.65	50.13	0.52
35-39	1,055	4,123	0.2558	333	85	94,938	0.002612	0.997388	94,991	474,204	4,347,948	45.77	45.26	0.51
40-44	1,548	5,129	0.3019	519	157	94,606	0.003833	0.996167	94,690	472,334	3,873,745	40.91	40.41	0.50
45-49	2,038	6,629	0.3074	773	238	94,087	0.005697	0.994303	94,243	469,486	3,401,411	36.09	35.62	0.47
50-54	2,401	8,526	0.2815	1,257	354	93,313	0.009697	0.990303	93,551	464,898	2,931,925	31.34	30.89	0.45
55-59	2,539	10,695	0.2374	1,844	438	92,056	0.015313	0.984687	92,408	457,636	2,467,027	26.70	26.28	0.42
60-64	2,928	13,801	0.2122	3,039	645	90,212	0.026635	0.973365	90,646	446,139	2,009,391	22.17	21.77	0.40
65-69	3,213	16,532	0.1943	5,348	1,039	87,173	0.049723	0.950277	87,809	426,619	1,563,252	17.80	17.44	0.36
70-74	3,206	18,579	0.1725	9,911	1,710	81,825	0.101283	0.898717	82,838	390,940	1,136,633	13.72	13.41	0.31
75-79	2,770	19,500	0.1421	16,756	2,380	71,914	0.203266	0.796734	73,538	327,085	745,693	10.14	9.92	0.22
80-+	4,490	55,632	0.0807	55,158	4,451	55,158	0.957952	0.042048	57,296	418,608	418,608	7.31	7.17	0.14

Table 7

Mexico: Death Rates from Heart Disease, Women, 2000

Age	Di	D	Di/D	D	di	lx Table	nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	97	16,835	0.0058	3,596	21	100,000	0.035756	0.964244	100,000	97,616	7,710,291	77.10	76.43	0.67
1-4	54	3,249	0.0167	567	9	96,404	0.005784	0.994216	96,424	383,848	7,612,675	78.95	78.27	0.68
5-9	33	1,438	0.0230	91	2	95,837	0.000928	0.999072	95,846	478,986	7,228,827	75.42	74.73	0.69
10-14	38	1,472	0.0259	74	2	95,747	0.000753	0.999247	95,748	478,558	6,749,841	70.50	69.80	0.70
15-19	78	2,291	0.0342	109	4	95,673	0.001100	0.998900	95,675	478,107	6,271,283	65.55	64.85	0.70
20-24	119	2,616	0.0457	164	7	95,564	0.001638	0.998362	95,568	477,438	5,793,176	60.62	59.92	0.70
25-29	158	2,922	0.0539	204	11	95,401	0.002023	0.997977	95,407	476,539	5,315,738	55.72	55.02	0.70
30-34	228	3,284	0.0694	259	18	95,197	0.002532	0.997468	95,208	475,410	4,839,200	50.83	50.13	0.70
35-39	367	4,123	0.0891	333	30	94,938	0.003196	0.996804	94,956	473,976	4,363,790	45.96	45.26	0.70
40-44	490	5,129	0.0955	519	50	94,606	0.004963	0.995037	94,635	471,928	3,889,813	41.10	40.41	0.69
45-49	729	6,629	0.1099	773	85	94,087	0.007316	0.992684	94,136	468,838	3,417,886	36.31	35.62	0.69
50-54	1,085	8,526	0.1273	1,257	160	93,313	0.011767	0.988233	93,399	464,034	2,949,048	31.57	30.89	0.68
55-59	1,502	10,695	0.1404	1,844	259	92,056	0.017243	0.982757	92,215	456,709	2,485,014	26.95	26.28	0.67
60-64	2,302	13,801	0.1668	3,039	507	90,212	0.028148	0.971852	90,469	445,353	2,028,304	22.42	21.77	0.65
65-69	3,073	16,532	0.1859	5,348	994	87,173	0.050233	0.949767	87,673	426,167	1,582,951	18.06	17.44	0.62
70-74	3,842	18,579	0.2068	9,911	2,050	81,825	0.097292	0.902708	82,794	391,645	1,156,784	13.97	13.41	0.56
75-79	4,513	19,500	0.2314	16,756	3,878	71,914	0.184039	0.815961	73,864	331,358	765,139	10.36	9.92	0.44
80-+	15,513	55,632	0.2789	55,158	15,381	55,158	0.837980	0.162020	58,679	433,781	433,781	7.39	7.17	0.22

Table 8
Mexico: Multiple Death Rates, Three Main Causes, Women, 2000

Age	Di	D	Di/D	d	di	lx Table	nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	139	16,835	0.0083	3,596	30	100,000	0.035668	0.964332	100,000	97,622	7,830,440	78.30	76.43	1.87
1-4	292	3,249	0.0898	567	51	96,404	0.005355	0.994645	96,433	383,988	7,732,817	80.19	78.27	1.92
5-9	280	1,438	0.1946	91	18	95,837	0.000765	0.999235	95,888	479,129	7,348,830	76.64	74.73	1.91
10-14	314	1,472	0.2132	74	16	95,747	0.000608	0.999392	95,764	478,631	6,869,701	71.74	69.80	1.94
15-19	372	2,291	0.1624	109	18	95,673	0.000954	0.999046	95,689	478,176	6,391,070	66.79	64.85	1.94
20-24	452	2,616	0.1729	164	28	95,564	0.001420	0.998580	95,582	477,525	5,912,894	61.86	59.92	1.94
25-29	668	2,922	0.2285	204	47	95,401	0.001650	0.998350	95,428	476,680	5,435,369	56.96	55.02	1.94
30-34	1,043	3,284	0.3176	259	82	95,197	0.001857	0.998143	95,244	475,659	4,958,689	52.06	50.13	1.93
35-39	1,674	4,123	0.4059	333	135	94,938	0.002085	0.997915	95,020	474,400	4,483,030	47.18	45.26	1.92
40-44	2,541	5,129	0.4954	519	257	94,606	0.002772	0.997228	94,740	472,709	4,008,629	42.31	40.41	1.90
45-49	3,755	6,629	0.5665	773	438	94,087	0.003570	0.996430	94,344	470,237	3,535,920	37.48	35.62	1.86
50-54	5,169	8,526	0.6062	1,257	762	93,313	0.005326	0.994674	93,751	466,418	3,065,683	32.70	30.89	1.81
55-59	634	10,695	0.6109	1,844	1,127	92,056	0.007842	0.992158	92,816	460,375	2,599,265	28.00	26.28	1.72
60-64	8,639	13,801	0.6260	3,039	1,902	90,212	0.012733	0.987267	91,334	450,994	2,138,889	23.42	21.77	1.65
65-69	10,296	16,532	0.6228	5,348	3,331	87,173	0.023592	0.976408	89,063	435,449	1,687,896	18.95	17.44	1.51
70-74	10,862	18,579	0.5847	9,911	5,795	81,825	0.052153	0.947847	85,116	406,685	1,252,447	14.71	13.41	1.30
75-79	10,684	19,500	0.5479	16,756	9,180	71,914	0.112525	0.887475	77,558	353,449	845,762	10.90	9.92	0.98
80-+	24,809	55,632	0.4460	55,158	24,598	55,158	0.713037	0.286963	63,822	492,313	492,313	7.71	7.17	0.54

Table 9
Mexico: Death Rates, Multiple, Remaining Causes, Men, 2000

Age	Di	D	Di/D	d	di	lx Table	nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	21,776	21,921	0.9934	4,062	4,035	100,000	0.000274	0.999726	100,000	99,982	7,452,593	74.53	72.49	2.04
1-4	3,463	3,748	0.9239	591	546	95,938	0.000470	0.999530	99,973	386,835	7,352,611	73.55	74.55	-1.00
5-9	1,690	2,037	0.8295	130	108	95,347	0.000233	0.999767	95,893	478,044	6,965,776	72.64	71.00	1.64
10-14	1,918	2,265	0.8468	135	114	95,216	0.000217	0.999783	95,325	476,300	6,487,731	68.06	66.10	1.96
15-19	4,614	5,136	0.8984	190	171	95,081	0.000203	0.999797	95,195	475,642	6,011,431	63.15	61.19	1.96
20-24	6,794	7,431	0.9142	254	232	94,891	0.000230	0.999770	95,062	474,827	5,535,789	58.23	56.30	1.93
25-29	7,619	8,429	0.9038	289	261	94,638	0.000294	0.999706	94,869	473,698	5,060,962	53.35	51.45	1.90
30-34	7,747	8,788	0.8815	412	363	94,349	0.000519	0.999481	94,610	472,276	4,587,263	48.49	46.60	1.89
35-39	8,391	9,906	0.8471	517	438	93,936	0.000843	0.999157	94,300	470,392	4,114,988	43.64	41.79	1.85
40-44	8,166	10,448	0.7816	822	642	93,420	0.001929	0.998071	93,857	467,741	3,644,595	38.83	37.01	1.82
45-49	8,235	11,522	0.7147	376	269	92,598	0.001160	0.998840	93,240	464,326	3,176,854	34.07	32.32	1.75
50-54	7,873	12,648	0.6224	2,273	1,415	91,262	0.009477	0.990523	92,491	457,219	2,712,528	29.33	27.75	1.58
55-59	8,361	14,926	0.5602	3,569	1,999	88,989	0.017840	0.982160	90,397	444,496	2,255,309	24.95	23.40	1.55
60-64	8,607	17,200	0.5004	5,310	2,657	85,420	0.031548	0.968452	87,401	425,317	1,810,812	20.72	19.27	1.45
65-69	9,443	19,624	0.4812	7,893	3,798	80,110	0.052357	0.947643	82,725	396,602	1,385,496	16.75	15.38	1.37
70-74	10,137	20,987	0.4830	12,292	5,937	72,217	0.091767	0.908233	75,916	353,764	988,894	13.03	11.79	1.24
75-79	10,911	21,639	0.5042	17,961	9,056	59,925	0.160741	0.839259	65,590	289,706	635,130	9.68	8.70	0.98
80-+	26,749	45,645	0.5860	41,964	24,592	41,964	0.585557	0.414443	50,293	345,424	345,424	6.87	6.35	0.52

Table 10

Mexico: Multiple Death Rates, Remaining Causes, Women, 2000

Age	Di	D	Di/D	d	di	lx Table	nqxi	npxi	lxi	Lxi	Txi	exi	ex	Increase
0	16,713	16,835	0.9927	3,596	3,570	100,000	0.000266	0.999734	100,000	99,982	7,795,747	77.96	76.43	1.53
1-4	2,960	3,249	0.9110	567	517	96,404	0.000525	0.999475	99,973	388,310	7,695,764	76.98	78.27	-1.29
5-9	1,159	1,438	0.8060	91	73	95,837	0.000184	0.999816	96,353	480,432	7,307,455	75.84	74.73	1.11
10-14	1,159	1,472	0.7873	74	58	95,747	0.000164	0.999836	95,819	478,876	6,827,023	71.25	69.80	1.45
15-19	1,920	2,291	0.8383	109	91	95,673	0.000184	0.999816	95,731	478,467	6,348,146	66.31	64.85	1.46
20-24	2,166	2,616	0.8278	164	136	95,564	0.000296	0.999704	95,655	477,978	5,869,680	61.36	59.92	1.44
25-29	2,256	2,922	0.7720	204	157	95,401	0.000488	0.999512	95,536	477,225	5,391,702	56.44	55.02	1.42
30-34	2,242	3,284	0.6828	259	177	95,197	0.000864	0.999136	95,354	476,173	4,914,477	51.54	50.13	1.41
35-39	2,450	4,123	0.5942	333	198	94,938	0.001425	0.998575	95,115	474,794	4,438,304	46.66	45.26	1.40
40-44	2,588	5,129	0.5045	519	262	94,606	0.002722	0.997278	94,803	472,878	3,963,510	41.81	40.41	1.40
45-49	2,872	6,629	0.4333	773	335	94,087	0.004664	0.995336	94,348	469,992	3,490,632	37.00	35.62	1.38
50-54	3,355	8,526	0.3934	1,257	495	93,313	0.008193	0.991807	93,648	465,492	3,020,640	32.26	30.89	1.37
55-59	4,158	10,695	0.3887	1,844	717	92,056	0.012292	0.987708	92,549	458,682	2,555,149	27.61	26.28	1.33
60-64	5,156	13,801	0.3736	3,039	1,135	90,212	0.021234	0.978766	90,924	448,052	2,096,466	23.06	21.77	1.29
65-69	6,230	16,532	0.3768	5,348	2,015	87,173	0.038678	0.961322	88,296	430,244	1,648,414	18.67	17.44	1.23
70-74	7,711	18,579	0.4150	9,911	4,114	81,825	0.072679	0.927321	83,801	399,198	1,218,170	14.54	13.41	1.13
75-79	8,813	19,500	0.4519	16,756	7,572	71,914	0.134801	0.865199	75,878	345,245	818,971	10.79	9.92	0.87
80-+	30,824	55,632	0.5541	55,158	30,562	55,158	0.616804	0.383196	62,220	473,726	473,726	7.61	7.17	0.44

Table 1

Mexico: Infant and Child Mortality Rates, 1967-1997 (per thousand live births)

Period	Child mortality (1)			M. Neonatal (2) Both sexes	M. Postneonatal (3) Both sexes	Mortality of 1-15 years old Both sexes	Mortality of under-fives Both sexes
	Both sexes	Female	Male				
1967-1971	84.7	81.9	87.5	43.9	40.8	33.4	115.3
1972-1976	70.2	59.8	80.0	39.0	31.2	22.8	91.4
1977-1981	66.6	62.5	70.5	33.4	33.2	16.7	82.7
1982-1987	46.9	43.2	50.4	26.0	20.8	14.5	60.7
1988-1992	36.4	33.5	39.1	25.9	16.2	11.3	47.1
1993-1997	27.1	25.0	29.2	19.3	12.0	8.4	35.1

Sources: Secretaría de Salud, Dirección General de Planificación Familiar, SSA/Institute for Resource Development-Macro Systems, Inc., Columbia, Maryland, USA/DHS, Mexico, *Encuesta Nacional sobre Fecundidad y Salud*, 1987, Mexico, July 1989.

Table 2
Mexico: Evolution of Death Rates, 1950-2000

Age	1950-1955		1970-1975		1985-1990		1995-2000	
	Rate	*%*	*Rate*	*%*	*Rate*	*%*	*Rate*	*%*
Women								
0-4	46.8	53.7	20.7	45.6	10.1	27.0	8.5	26.5
5-19	3.2	7.6	1.3	5.9	0.6	4.3	0.5	4.0
20-59	7.4	19.9	4.1	19.0	2.5	22.1	2.1	22.5
60 and over	52.2	18.8	43.3	29.4	37.8	46.6	31.8	47.0
All	15.3	100.0	8.2	100.0	5.0	100.0	4.2	100.0
Men								
0-4	49.3	52.9	23.9	45.9	12.5	25.8	10.1	24.7
5-19	3.5	7.8	1.6	6.5	1.1	6.2	0.9	5.8
20-59	9.8	23.2	6.2	23.9	5.2	33.5	4.2	34.3
60 and over	57.1	16.2	48.2	23.7	45.1	34.5	36.3	35.2
All	16.9	100.0	9.7	100.0	6.7	100.0	5.4	100.0

Sources: CELADE, *Boletín Demográfico*, Vol. 21, No. 42, Santiago de Chile, 1988, and own calculations.

Table 3
Mexico: Principal Causes of Death, 2000
(rates per hundred thousand)

Causes	Men		Women		
	Rate	%	Rate	%	Total %
All causes	482.5	100.0	378	100.0	43.1
Indefinite causes	15.1	3.1	15.2	4.0	39.8
All definite causes	467.5	100.0	362.8	100.0	43.2
Heart diseases	54.1	11.6	56.09	15.5	50.4
Accidents	76.0	16.3	21.33	5.9	21.6
Malignant tumors	35.5	7.6	42.67	11.8	54.2
Intestinal infection from specific organisms and indefinite causes	29.1	6.2	27.73	7.6	48.4
Diabetes mellitus	21.4	4.6	28.98	8.0	57.1
Influenza and pneumonia	24.4	5.2	21.87	6.0	46.8
Homicide, surgery, legal and war operations	31.1	6.6	3.022	0.8	8.7
All other causes	196.0	41.9	161.2	44.4	44.7

Source: Own calculations.

Table 4

Mexico: Causes of Death from Tumors, 1990

Causes	Men		Women		
	Rate	%	Rate	%	Total %
Cervix of uterus tumor	—	—	3.62	18.6	100.0
Breast tumor	—	—	1 768	9.1	100.0
Placenta and uterus tumor	—	—	754	3.9	100.0
Prostate tumor	1.80	10.9	—	—	—
Stomach tumor	1.95	11.8	1.87	9.6	49.0
Leukemia and other tumors of lymphatic tissue and hematopoietic organs	2.08	12.6	1.56	8.0	42.9
Trachea, bronchus and lung tumor	3.01	18.3	1.4	7.2	31.8
Colon tumor	493	3.0	594	3.1	54.6
Lip, mouth cavity and pharynx tumor	354	2.1	187	1.0	34.6
Rectum, rectosigmoidean and anus tumor	149	0.9	176	0.9	54.2
Other malignant tumors	6.65	40.3	7.52	38.6	53.1
Total deaths from malignant tumors	16.50	100.0	19.5	100.0	54.2
Subtotal cancer of reproductive apparatus	1.80	10.9	6.14	31.6	—

Source: PAHO, *Las condiciones de salud en las Américas*, 1990.

V. IS THE NATURE OF CONSENSUAL UNION IN LATIN AMERICA CHANGING?

The Examples of Brazil, Mexico and the Dominican Republic*

Julieta Quilodrán

The variations in customs associated with conjugal life, as well as the diversity of the new arrangements that are beginning to emerge in the western world never cease to surprise us. It is not only the fact that the end of marriage — in the form of divorce and separations — has replaced widowhood, the most surprising fact is the rejection of marriage, in other words, the questioning of an institution that for centuries dictated the way a conjugal couple should be formed.[1] The ideal, lifelong couple reached its peak during the mid-20th century when the decline in mortality permitted the extension of the couple's life expectancy and divorce was only accepted in exceptional cases. Since then, divorce has overtaken widowhood, meaning that there are now couples that do not last very long, but whose members are "recycled" fairly quickly, through new unions. The survival of both spouses who can form new unions, leads, particularly if they have had offspring, to the existence of complex family structures. If one adds the changes in the quality or nature of the marital bond — whether legal or

  [1] See Roussel (1975, 1989, 1992), Leridon and Gokalp (1988), Villeneuve-Gokalp (1990), Santow and Bracher (1990), Bumpass and Cherlin (1991), Bozon (1990), Cherlin (1992).

informal — whose role is to establish a degree of order within the family, then the situation becomes even more complicated.

The above mentioned changes were fairly widely experienced by families in developed countries in the West during the second half of the 20th century. It is what authors such as Van de Kaa (1987) and Lesthaeghe (1995a, 1998) have called the second demographic transition, a notion that basically includes the changes experienced to date by societies that have completed their demographic transition (DT) or are approaching this situation. This involves modifications resulting from worldwide social, economic and cultural changes. The incorporation of the cultural dimension into the interpretation of demographic phenomena has enabled researchers to advance in the explanation of the latter, while recording the various paths taken by the demographic transition. This is undoubtedly an innovation in a field that was long dominated by economic interpretations (Kirk, 1996). All societies that have experienced this transition originally had a demographic regime characterized by high fertility and mortality. This process is regarded as having been completed when fertility and mortality reach levels that only guarantee the replacement of the population. However, the forms adopted by this process have varied greatly over time, both as regards the levels of these variables at the beginning and the ways they were modified and the time required to do so. This explains why certain authors such as Tabutin (1995) speak of demographic transitions in the plural to express their diversity. Consequently, once the demographic transition has been completed, it would hardly be realistic to expect to have homogeneous societies regarding the formation of conjugal couples and familial organization, among other social dimensions.

Marriage rates in Latin America, despite its geographical diversity, are closer to the European model or that of countries populated by European migrants, than those of Africa and Asia. They are based on a monogamous model, with a relatively late age at first union, which is comparatively stable, with an intensity, which is slightly higher among men, of approximately 950 per 1,000. At the same time, marriage is not imposed on offspring by their families, no dowry is paid, and there are no rules preventing women from remarrying. The originality of the Latin American model lies

in the presence of consensual union. To varying degrees, this phenomenon has been present everywhere since the colonial period, even though it has only recently emerged in countries in the Southern Cone such as Argentina, Chile and Uruguay. This "informality" related to the formation of conjugal unions is usually accompanied by a significant proportion of prenuptial conceptions, as well as greater instability than in marriage (Henriquez, 1989; Quilodrán, 1985, 1992, 1999; Rosero-Bixby, 1996; Castro Martín, 1997, 2001).

Nowadays, Latin America, with the exception of Bolivia, Guatemala and Haiti, can be classified as a region that is about to complete its demographic transition. In general, the average number of children per women has halved over a period of approximately 25 years, usually as a result of the massive adoption of contraceptive methods. Nevertheless, this decline began before the implementation of public birth control programs in the 1960s and even earlier in certain countries (Southern Cone). Prior to the existence of contraceptives, abortion was commonly used as a method for controlling the number of offspring (Frejka, Taquín and Toro, 1996).[2] Thus it is hardly surprising that in such a context, modern contraceptive methods were *not* rapidly adopted; the mood was ripe. Conversely, marriage rates did not play a key role in the reduction of fertility in the region. In certain countries, women may have opted for abortion as a solution rather than reducing their time of exposure to the risk of having children by delaying their age at first conjugal union. In other countries, the early introduction of contraceptive methods may have prevented women from practicing abortion on a wide scale. In fact, reducing fertility by postponing the conclusion of unions, attempted in the 1960s, was a fairly difficult way to modify a situation that was becoming urgent at that time: the survival of an excessively large number of offspring.

The postponement of age at first union in Latin America began a few years later after the start of the decline in fertility and was particularly modest when compared with the delays in this age observed in other parts of the world such as the Magreb and Southeast Asia (McCarthy, 1982). As for DT itself, despite the dif-

---

[2] Abortion is illegal in Latin American countries, except for Cuba, except when the mother's life is at risk or the mother was raped.

ferences that exist between the demographic transitions of this region and those of developed countries, they share certain characteristics regarded as being typical of the second demographic transition, or simply the post-transitional phase of classic transition: fertility rates nearing replacement levels, an increase in consensual or informal unions, divorces and separations as well as births outside a union. The range of theories advanced to explain these changes come from various economic, sociological and anthropological disciplines as well as the demographic dynamic itself, through its effects on the balance of marriageable populations and, more broadly, the functioning of marriage markets.

The aim of this paper is to determine whether the specific consensual union found in Latin American marriage patterns remains, has been replaced by the consensual union model of post-transitional countries or is at a stage in which both models coexist. Our hypothesis is that the presence of consensual unions in Latin America and the social acceptance it enjoys should facilitate the adoption of the modern consensual union model, with the first stage including the coexistence of the two models, one traditional, one modern. The problem is to determine the presence of modern consensual union and its relative importance regarding traditional consensual union. It is essential to make this distinction since the populations that adopt each of these types of consensual union have very different socio-economic conditions.

In order to attempt to verify this hypothesis, three countries were selected on the basis of: 1) the stage of DT at which they are located, 2) the proportion of women in consensual unions, and 3) the recent evolution of these proportions. The data sources selected were the demographic and health surveys (DHS) from the late 1990s taken at almost the same time. The countries chosen were Brazil, Mexico and the Dominican Republic.

This article begins with a brief review of the formation of conjugal unions in Latin America, focussing on the existence of the traditional consensual union. We then establish the differences between this type of consensual union and modern consensual union. The data analysis begins with the presentation of the generational evolution of the first consensual unions, stressing the relative importance of consensual unions. It then goes on to ex-

plore the first births, and the frequency with which children are born outside a couple living in consensual union or marriage or to single mothers. Finally, educational attainment is used to establish the distinction between the group of mothers in traditional and what might be called modern consensual unions.

1. A BIT OF HISTORY

An unavoidable fact of Latin American history is the conquest and colonization it experienced in the late 15th century by the Spanish and Portuguese Crowns. These two great powers of the time — from the 16th to the 18th century — conquered territories but, more importantly, implemented a cultural project through evangelization. The aim was to convert the indigenous population, which was sometimes extremely numerous, as in the case of the Mexican plains, Colombia, Ecuador, Peru and Bolivia, to Catholicism. Priests also tried to keep immigrants from Spain or Portugal within the framework of this same religion, and when slaves arrived from black Africa, they sought to ensure that their owners respected certain rules about the cohabitation of families. As part of this wide-ranging project of acculturation, the Crown and the Catholic Church found common ground: the interests of temporal and spiritual power reinforced each other in order to govern the conquered territories. According to Burguière (1986), the imposition of the Christian marriage model was an essential means of incorporating the autochthonous population that the colonizers had brought with them. The taste for ritual that prevailed among the indigenous people meshed perfectly with the Catholic marriage ceremony, hence its importance as a vehicle for the new culture. At the same time, Gruzinski (1991) adds that since that time, the Christian world anticipated the importance of individual decision and the value of personal experience (such as choice of spouse, sin) instead of the community values embraced by the indigenous population.

At the time when the Spaniards disembarked in America, their marriage model was shifting towards what is known as the "western marriage model." Concubinage as well as illegitimacy were

still extremely widespread in that country. The reproduction of these habits in the American context was not difficult, particularly with the imbalances that arose in the marriage markets (McCaa, 1996). According to the information available, European immigrants were mainly men (ten men for one woman) as were African slaves, although among the latter the ratio was more balanced (two men for every woman). Moreover, the distance from the metropolis and the size of the vast American territories reduced the colonizers' possibility of bringing their European families with them and of marrying people of the same origin. Under these conditions, the Church and society as a whole found it difficult to enforce the rules that prevailed in the metropolis. According to Gonzalbo (1998), the colonial order displayed an extraordinary degree of tolerance towards "irregularities" such as unequal marriages,[3] illegitimate births and separations between the members of a couple. It was precisely this "disorder" that made miscegenation possible, particularly since it was not until the end of the 18th century that laws were passed prohibiting marriage with members of the slave population.

According to Curtin (1969),[4] between 1451 and 1870, Brazil imported 3.7 million slaves, whereas in Spanish America, including the Caribbean islands such as Cuba, Puerto Rico and the Dominican Republic, this figure did not exceed 1,600,000. Although several studies have been conducted on the families of slaves in the English – and French – speaking Caribbean, far fewer have been undertaken on the Hispanic part. Nevertheless, each region incorporated this population differently and it is important to understand the link between the slave past and certain current family arrangements. In any case, the studies coincide to a certain extent on the acculturation project that the colonial powers wished to impose on Latin America through evangelization in the Catholic religion. Despite the amount of will involved, this project was only partly successful, at least as regards direct marriage with the sanction of the Church. Consensual or informal union continued to exist, particularly in the Caribbean and "oriental and Atlantic Latin America, that of hot, moist plains..." (Charbit, 1987); in other words, Central

---

[3] Marriages between persons of different racial groups.
[4] Quoted by Y. Charbit (1987: 15).

America, Venezuela, the Colombian coast and the Gulf of Mexico.[5] In short, Latin America had its own, distinct model of consensual union: relatively stable unions with almost as many offspring as in marriages and a propensity towards legalization that reduced illegitimacy (children born out of wedlock).

With the inheritance of three centuries of colonization, Latin America bore the marks of its biological and cultural miscegenation. Couple formation benefited from certain concessions and, more broadly, the acceptance of certain de facto situations that the Church was forced to tolerate in order to adapt to the particularities of this new world. Consensual union was an example of a domain — the consecration of all conjugal unions — in which the Church, as mentioned earlier, was only partially successful. In fact, consensual union formed part of the customs of the populations living on American soil — Spaniards, Portuguese, Indians and Africans — which explains their persistence over time. Added to these historical reasons is the inherent flexibility of these unions, which makes them more likely than formal unions to accept the transgression of the rules in force. Consequently, the marriage pattern that was progressively constructed under the influence of the western European model displayed and continues to display some of the features of indigenous and African marital and familial customs in addition to those brought over by European immigrants.

In Mexico at least, pre-nuptial cohabitation among the pre-Hispanic population was common as were divorce and even polygamy, which was practiced by the ruling classes.[6] Moreover, marriage was a community affair. In the case of the population of African origin, one of the reasons recently put forward to justify consensual union is the lack of interest in both men and women in engaging in a Catholic marriage (Gautier, 2000). According to this author, "historical conditions can be said to have reduced and rendered useless the control that was usually wielded more over women's than men's sexuality." In the parts of Africa from which

[5] This last region formed part of the model known as the Gulf-Caribbean (Quilodrán, 1989).

[6] See Cook and Borah (1966), Alberro (undated), Aguirre Beltrán (1981), Calvo (1991), Castañeda (1991), Margadant (1991) and Carrasco (1991).

the slaves originated, women's ability to be mothers was much
more highly valued than virginity, polygamy was accepted, to-
gether with divorce, while the cohabitation of spouses was not
compulsory.

Nowadays, or more specifically, since the mid-20th century,
consensual union is acknowledged by the national statistics sys-
tems of Latin American countries as a means of forming a conju-
gal couple. Its presence in social life since the colonial era undoubt-
edly influenced its introduction into censuses as a marital status
category. This decision, together with the inclusion of the marital
status category of "consensual union" in the fertility surveys con-
ducted in the region has enabled us to trace its development over
the past fifty years. The analyses conducted show that, until re-
cently, the existence of this type of union constituted the main
difference between Latin American marriage patterns and those
of other continents. This does not mean, however, that its pres-
ence is uniform in all the countries in the area. In fact, there are
significant differences between the proportions of consensual
unions, which reached a maximum of 53.5% in 1960, and declined
slightly in 1990, although the highest proportion has not varied.
At one end of the spectrum is the Dominican Republic and Guate-
mala, with the highest proportions (over 50%), and on the other,
Argentina and Chile (with fewer than 10%). What is new in the
developments of the past twenty years is the increase in these pro-
portions in countries where they were historically low (11.6% in
Chile as opposed to 6.7%). In Brazil, which had a rate of 6.7%, like
that of Chile and Argentina, figures more than doubled to 15.3%
in 1990, an increase only exceeded by Colombia, where the rate
rose from 20% in 1960 to 46% in 1990. Nevertheless, nowadays Latin
America continues to be divided into three main groups of coun-
tries, as it was 50 years ago, regarding the levels of consensual
unions. Despite the changes experienced by these proportions, the
countries have not altered their relative positions, maintaining
the same distances from each other as before (Camisa, 1997; Rosero-
Bixby, 1996; Quilodrán, 1985, 1999; Castro Martín, 1997).

For many years, marriage evolved towards greater institution-
alization, in other words, towards the consolidation of legal mar-
riage. The proportions of consensual unions declined or remained

stable at least until the 1970s in the countries where they were most common. Thus, the rate in Guatemala was halved while the figure for Venezuela was reduced by 16%. At the same time, the increases in the rest of the countries in this same group did not exceed 10%, except for Colombia, which progressed rapidly.

Conversely, consensual unions increased more in countries that had had lower levels (Southern Cone) without ever exceeding 20% of the population living in some kind of conjugal union. Thus, the part of Latin America where marriage was the norm (Southern Cone, Brazil) is now experiencing a degree of de-institutionalization of marriage. Moreover, these are countries where divorce arrived late or has just arrived, as in the case of Chile.

In short, despite a certain degree of laxity in the marital precepts derived from the Council of Trent, it is possible to advance the hypothesis that the western model of a monogamous, freely accepted, indissoluble and relatively late marriage was progressively established in Latin America during the colonial period. It was during this period that, in my opinion, the "marriage transition" took place. This gradual transition explains the fact that the region did not experience the brusque changes in age at first union or in the dissolution of unions that took place elsewhere during the DT. Here, there was no need to break away from the imposition of a spouse or to advocate the regulation of marriage since the time when the latter was established as a legal institution (in canon or civil law) during the colonial period. This does not mean, however, that no unresolved matters remain, such as, for example, gender equality. The difference lies in the fact that the solution, in this case, goes beyond legal aspects, requiring the modification of behavior, which is far more difficult to achieve.

2. CONSENSUAL UNION: THE TRADITIONAL AND MODERN MODEL

This section focuses on the principal features of the traditional or secular model and the modern one, which has been called the post-transitional model. The aim is not to continue using the same denomination for a category comprising two populations that are different from a socio-economic point of view, although fairly simi-

lar as regards demographic features. It begins by questioning the definition of consensual union or cohabitation, which are the terms used indistinctly in the literature on the subject, which is generally expressed as "the means of forming a conjugal couple without involving the Registry Office or the Church."

The demographic characteristics common to both models of consensual unions involve the following:

- Earlier age at first union than for marriage
- Present particularly at younger ages (15-24 years)
- Nearly always of shorter duration than marriage
- More unstable than marriage
- Greater propensity to subsequent unions

Moreover, an early union also implies a younger age at first intercourse. Conversely, an early beginning of one's sex life no longer constitutes an obstacle to one's entry into a first union. Nevertheless, the reluctance of young people in Latin America to use contraceptives, which must have a cultural origin (Villarreal, 1998), would explain the small decline in fertility rates recorded at very young ages (15-19) in comparison with other age groups. Another difference between traditional and modern consensual union is that in the latter, reproduction is a fairly recent phenomenon. Conversely, women in a traditional consensual union have always had almost as many children as married women.

Despite the parallelism found in the demographic features of the two consensual union models, the indicators considered vary greatly between marriage and consensual union and between countries. Apropos of this, it is important to recall that consensual union constitutes an earlier, less stable and also less frequent type of union than marriage. The difference between the traditional and modern forms lies mainly in their temporality, at the moment when each of them becomes important within the scenario of couple formation. Added to this is the fact that *marriage* constitutes the analytical category of reference for nuptiality and fertility in developed countries where consensual union is a relatively recent phenomenon, whereas in the Latin American context, the category used is *marital union*, since it involves a notion that in-

cludes both marriage and consensual unions. It could not be otherwise, since a significant proportion of the reproduction of the population in this last region is produced by couples living in consensual union.

Although the moment when this phenomenon arises is crucial, the essential difference between the two types of consensual union, as mentioned earlier, are the socio-economic features of the population groups linked to both of them.

Comparison of Sociodemographic Features of Marriages
and Consensual Unions

Traditional consensual union	Modern consensual union
• Low educational attainment	• High educational attainment
• Women working in less advantaged sectors	• Skilled work
• Largely rural	• Urban
• Frequent, rapid legalization	• Legalization
• Influence of religious practice on legalization	• Influence of religious practice on legalization

The demographic literature on this issue shows that women in consensual unions in Latin America are often poorer than women who marry (Quilodrán, 1998; Henríquez, 1989; Greene and Rao, 1995; Castro Martín, 1997). Conversely, women from developed countries have a very different status with consensual union frequently offering a temporary alternative to marriage. In fact, developed countries offer both women and men the possibility of prolonging their studies and expanding their options and living space. A woman from those countries has the power to negotiate within the sphere of her conjugal and occupational life, which women from developing countries lack or do not have enough of. They can choose the conjugal arrangement that best suits them: direct marriage or one of a range of forms of consensual union (living together before marriage, a substitution of marriage or "living apart together"). If they opt for this last choice — consensual union — their probabilities of having a child outside wedlock or of separating increase, as does the possibility of becoming the head of the household. Yet even in this situation, they have advantages

over women from developing countries, since they have qualifi-
cations that earn them higher salaries which enable them to cope
with the situation of being a single woman and mother, in addi-
tion to greater power to negotiate social assistance or help from
the father in looking after their children. This relative indepen-
dence also increases their likelihood of finding another partner.

At the other extreme, poor women from developing countries
have very few options: their limited educational baggage as a re-
sult of having left school early makes them vulnerable. This situ-
ation often leads them to accept a precarious, informal, unstable
conjugal union such as consensual union, or even to become single
mothers. This shortage of educational capital also limits their
power to negotiate the job market. This means that they often end
up alone, with poorly paid jobs and sole responsibility for their
children, without being able to ask the latter's father for help, ei-
ther because he is unemployed and does not earn an income or
simply because it is difficult to force a man with whom one has
weak conjugal links to pay alimony. Nevertheless, these women
need help to be able to support their families, which is why they
tend to enter subsequent unions that are as precarious as the first,
thereby perpetuating their conditions of poverty.

There are obviously other variables apart from poverty that
intervene in the negotiation and make the conjugal arrangement
acceptable to the woman's partner, because otherwise there would
be no poor married couples. In any case, the essentially individual
nature of the choice of spouse in Latin American societies further
reduces women's negotiating power, particularly when they are
poor. This is compounded by the influence of macro factors such
as those identified by Greene and Rao (1995) for Brazil. Accord-
ing to these authors, the rapid increase of women in consensual
unions in this country is a result of the "marriage squeeze" caused
by the decrease in mortality. The excess of women this has pro-
duced leads in turn to the recycling of men through new unions.
Since divorce did not exist, most of these unions will have been
consensual unions. The inherent informality of these unions has
encouraged their proliferation.

3. THE COUNTRIES COMPARED AND THE DATA USED[7]

As mentioned earlier, countries were selected on the basis of three criteria: their stage in TD, the intensity and the length of the consensual union as a socially acknowledged phenomenon. The countries chosen were the Dominican Republic, Brazil and Mexico. For the first two countries, data from the 1996[8] DHS were used, whereas for Mexico, figures from the 1997 ENADID[9] were utilized. The Mexican survey includes reproductive and marital histories, whereas the DHS unfortunately only include reproductive histories, which forced the analysis to be limited to women with a single union that existed at the time of the interview. This restriction led us to establish the hypothesis that in the countries considered, women who remarried or were unmarried (i.e. widowed, separated or divorced) entered their first union and had their first child at the same age as women with subsisting unions. This assumption partly affected our estimates of ages at first union of the older generations, but not of young women, among whom the proportions of women with interrupted unions were extremely low.

Of the three countries, Brazil is the only one that has virtually completed the cycle (97%) by reaching a population replacement level (2.1 children per woman) achieved without the assistance of any explicit government program or policy designed to reduce fertility. Nevertheless, the Dominican Republic and Mexico are also nearing this goal (Table 1). In 2000, the average number of offspring per woman in the three countries was 2.4, 3.1 and 2.7 respectively (PRB, 2000). At the same time, fertility levels for teenagers (15-19) were among the lowest in Latin America. Nevertheless, the proportions of births out of wedlock or before marriage reflect fairly widespread sexual activity before the union (whether marriage or consensual union). In addition, over half — nearly 90% in the Dominican Republic — of the women who had had their first sexual relationship before the age of 18 made the transition to conjugal life before this age; in other words, they rapidly entered some form of union after their first sexual relationship (UNFPA, 2001).

[7] The age structures by the three countries compared are not significantly different according to the χ^2 test.
[8] Demographic Health Survey.
[9] National Survey on Demographic Dynamics.

Table 1
Countries by Stage of Demographic Transition and Marriage
Rate Model. Data for the 1990s
(women)

	Achieved	Advanced	
Indices	Brazil	Dominican Republic	Mexico
Stage of DT (%)[1]	97.0	89.0	88.0
e_o (women)[2]	71.0	73.1	75.5
1st Sex. rel.[3]			
< 20 years	55.3	60.0	—
• Before union (%)	23.5	8.8	—
• Mean age	19.5	18.7	18.0
1st Conjugal union[4]			
• % Not single (15-19)	13.8	22.4	14.8
• Mean age[5]	21.1	19.3	19.9[5]
Contraception (%)			
< 20 years[6]	14.8	10.1	7.7
Fertility 15-19 years			
• Rate[7]	82.4	91.2	76.6
TGF[8]	2.4	2.4	2.7
First transitions			
Experienced < 18 years[9]			
• 1st Sex. rel. / 1st union	65.1	89.7	50.0[10]
• 1st Union / NHV[10]	61.8	57.5	44.0[10]

[1] J. Courbage (2000), "Y aura-t-il encore une fécondité de tiers–monde dans le monde?," Colloque International de l'AIDELF, Byblos, Lebanon.

[2] UN (1998), *World Population Prospects*, N.Y., 1999.

[3] For the 13 countries included, the mean is 42%, the gap between the mean ages 1.5 years, between 18.1 and 19.6. The age for men is lower, between 16 and 17, Guzmán *et al.* (2001), *Diagnóstico sobre la salud reproductiva de jóvenes y adolescentes en América Latina y el Caribe* (Table V. 4).

[4] Guzmán *et al.* (2001), Table V. 7 and Graph V. 1.

[5] Encuesta Nacional sobre Fecundidad y Salud (ENFES), DHS/Secretaría de Salud, 1989.

[6] Guzmán *et al.* (2001), Table IV. 12

[7] Guzmán *et al.* (2001), Table II. 2.

[8] Population Reference Bureau, *2000 World Population Data Sheet.*

[9] Guzmán *et al.* (2001), *op. cit.*

[10] Before 20, data for 1987.

The proportion of women in the Dominican Republic that are either married or living in a consensual union is much higher (40%) than that of the other two countries; conversely, the proportions of pre-nuptial conceptions and births outside a union among married women or those living with their partners are lower in this country. Moreover, ever since the generations born in the 1940s in the Dominican Republic, the gap between the first sexual relationship and the first conjugal unions has not exceeded 0.7 years. In the other two countries, this difference has remained at approximately 2 or 3 years. In Brazil alone it is gradually increasing. The median age at first intercourse oscillates between 18 and 19 for women ages 20 to 40 at the time of the interview, and was closer to 19 in urban settings and approximately 22 among the wealthier sectors. At 18, one out of three women had already begun their sex lives, according to information provided by the DHS surveys from the late 1990s (UNFPA, 2001).[10]

Since we are interested in identifying the changes undergone by consensual unions over time, the methodological strategy we chose was a longitudinal approach, comparing two groups of generations, those that were under 30 at the time of the interview and those at the end of their reproductive lives (women ages 45-49); and distinguished the behavior observed according to the nature of the initial conjugal link: marriage or consensual union.

4. EVOLUTION OF MARRIAGE RATES ACCORDING TO TYPE OF FIRST UNION

The data in Graph 1 show that the age at marriage has fallen in both Brazil and the Dominican Republic. Conversely, in Mexico, the younger generations, born around 1970, have slightly postponed their age at first union. These same data show that at 20, the proportions of women in some sort of union in the generations ages 25-29 are 42.2% higher in Brazil and 12% higher in the Dominican Republic than in the generations born in the early

[10] For data on Latin American countries that have DHS III surveys, consult Guzmán, Hakkert, Contreras and Moyano, *Diagnóstico sobre salud sexual y reproductiva de los adolescentes en América Latina y el Caribe* (UNFPA, 2001).

Graph 1
Accumulated Proportions of Women by Age at First Conjugal Union
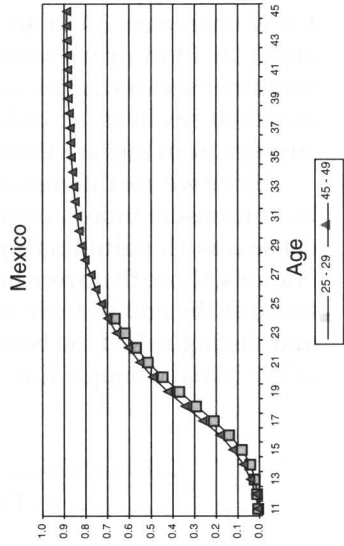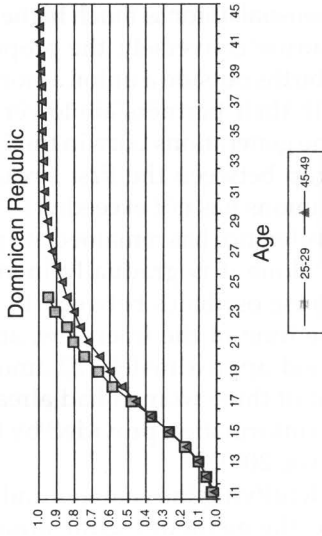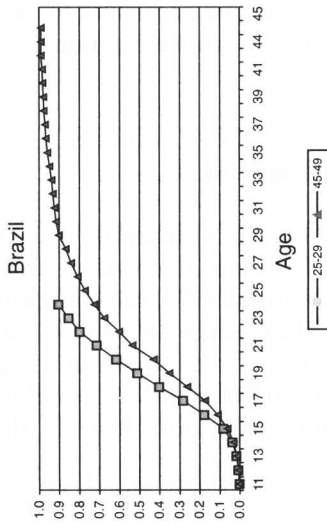
1950s. These differences are even greater if one considers the fact that women ages 45-49 who are still in their first union must have entered their first union at a later age than those who separated from their partners before the age of 30, who are not included here by definition.

Including the type of union shows that only consensual unions have increased (Graph 2). In Brazil, this type of union virtually did not exist 30 years ago (3.5%) whereas in the Dominican Republic, the advantage it already had over marriages has continued to increase (42%). In Mexico, despite the reduction of marriage rates among younger women, the relative importance of consensual unions has increased to 25% in the group ages 25-29, which is 75% higher than among the older generations in the survey (45-49). This means that the reduction in marriages at an early age is being paralleled by a relative increase in consensual unions at the same age: in other words, women who form early unions are becoming increasingly inclined to engage in informal unions.

The median ages estimated (Table 2) confirm the fact that women tend to enter consensual unions at an earlier age than marriage — between 1.4 and 2.5 years earlier — in both the Dominican Republic and Mexico. Conversely, Brazil has seen a decrease in both age at first marriage and first union, with an average decrease of 1.3 years in age of marriage and of 3.4 years among those in a consensual union. Despite this, women tend to enter consensual unions in Brazil later than they do marriage, unlike those in the other two countries.

In any case, it would be extremely risky to conclude from the data for just three countries that the age at first marriage is decreasing in Latin America, although this is certainly true for Brazil and the Dominican Republic. This phenomenon was observed in the data from the 1990 Mexican census, but only among men from certain regions (Quilodrán, 1998).

Graph 2
Accumulated Proportion of Women by Age at First Conjugal Union and Type of Union

Brazil

Dominican Republic

Mexico
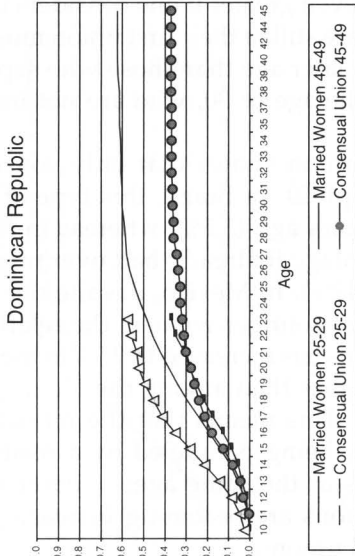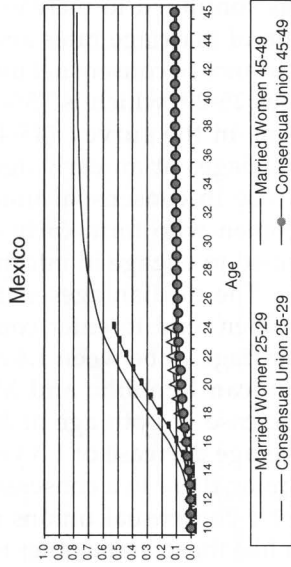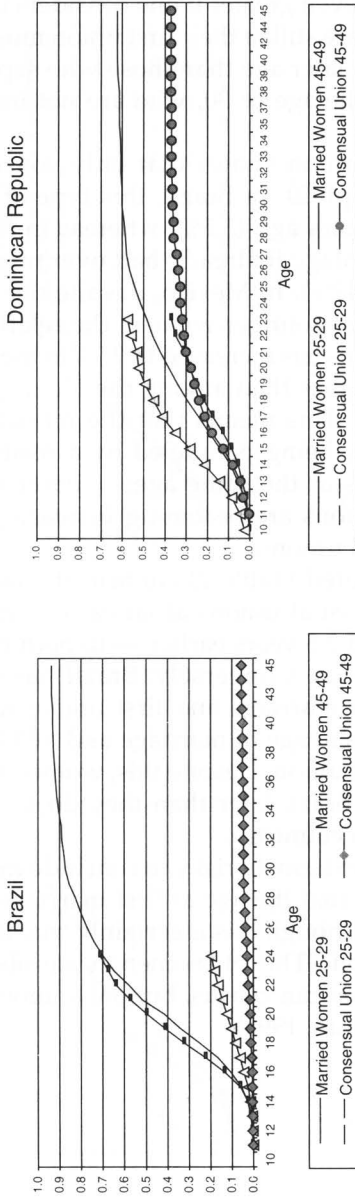
Table 2
Mean Ages at First Conjugal Union and Motherhood[1]

Country			Age group/generation	
			25-29	45-49[2]
Brazil				
	Total	1st Union	19.7	20.8
		1st Experience of motherhood	19.9	21.4
	Married	1st Union	19.2	20.5
		1st Experience of motherhood	20.0	21.5
	Consensual union	1st Union	19.9	23.3
		1st Experience of motherhood	19.3	21.4
Dominican Republic				
	Total	1st Union	18.7	18.5
		1st Experience of motherhood	19.8	20.0
	Married	1st Union	20.2	19.5
		1st Experience of motherhood	21.1	20.3
	Consensual union	1st Union	17.7	17.5
		1st Experience of motherhood	18.9	19.0
Mexico				
	Total	1st Union	19.5	19.3
		1st Experience of motherhood	20.1	20.2
	Married	1st Union	19.8	19.4
		1st Experience of motherhood	20.2	20.2
	Consensual union	1st Union	18.4	18.0
		1st Experience of motherhood	19.5	19.6

[1] First live-born child.
[2] Experience before 30 years of women who have only been involved in a single union and were living with their partners at the time of the interview.

5. FIRST EXPERIENCE OF MOTHERHOOD

According to the data in Table 2, the age at which women have their first child is also falling, albeit at different rates in different countries, particularly in Brazil (1.5 years earlier) and almost imperceptibly in Mexico and the Dominican Republic (0.1 and 0.2 years respectively). Generally speaking, very few generational changes have been observed, with the exception of Brazil, and they suggest a slight lowering of the age at which conjugal life begins, while the age at the birth of the first child is tending to fall slightly in both the Dominican Republic and Mexico. In any case, this age is far below the mean age for developed countries in Western Europe and the United States (US), which are moving in the opposite direction. There, women born in the 1950s generation had their first child between 24 and 25, whereas those from the 1960s had their first child between 26 and 27 and those born in the late 1960s had theirs at 27. In fact, the mean ages for Latin American countries are closer to those of East Europe (22-23) (Sardon, 2000).

However, those who most lowered the age at which they have their first child are Brazilian women in consensual unions, with a maximum of 2.1 years between the two generations. The Dominican Republic constitutes an exception, since it is the only case where those responsible for delaying the mean age of maternity are married women (0.8 years more). No changes have been observed in Mexico and the gap between the two types of union has remained constant in the three countries.

At the same time, the data in Graph 3 show, among other things, a decrease in age at first births, particularly among women in consensual unions in the younger generations. These decreases range from 10 to 15% in each of the ages between 18 and 25. Conversely, the age at which married women in Brazil have their first child has barely dropped, whereas in Mexico it has dropped slightly more, although this decrease stops at 20. By contrast, in the Dominican Republic women are postponing the age at which they have their first child, unlike women in consensual unions.

Graph 3

Accumulated Proportion of Women by Age at First Experience of Motherhood and Nature of First Union
(per 100 women living in a consensual union)

Brazil

Dominican Republic

Mexico
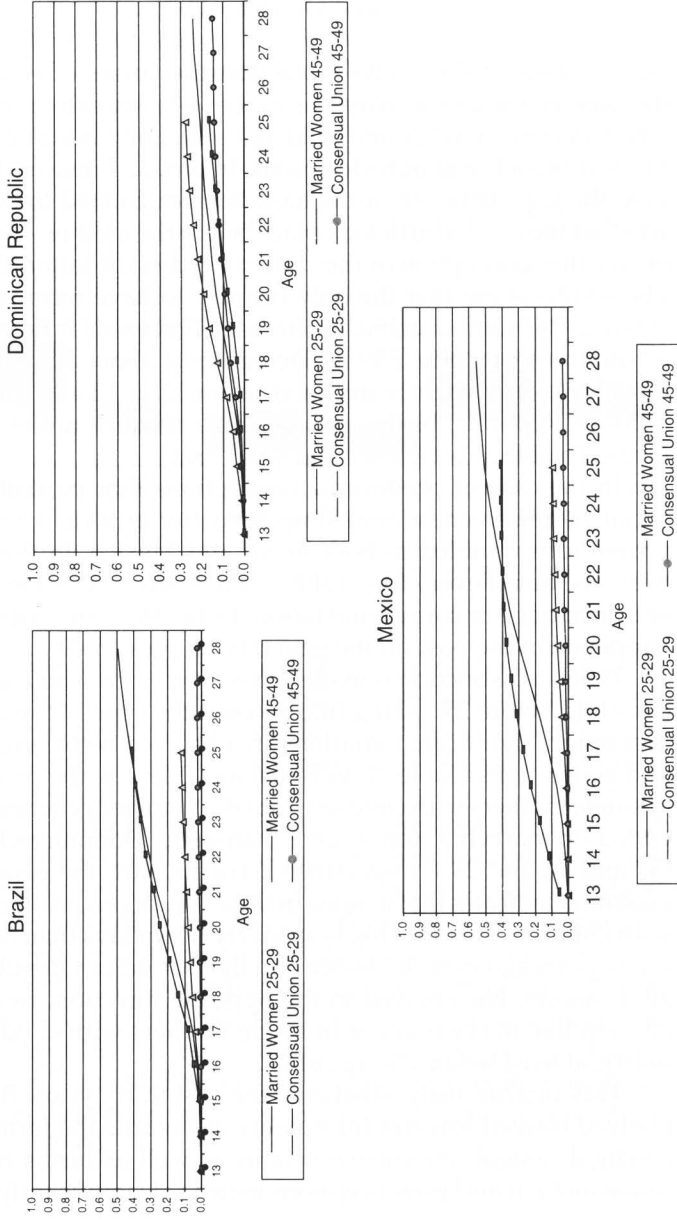
6. BIRTHS OUTSIDE A UNION

At this stage of the analysis, the question arises of whether the decrease in the age at marriage, and to a lesser extent, in the age when a woman has her first child, is also accompanied by a greater proportion of births outside unions. In order to answer this question, the gaps between births have been calculated to determine whether the child's birth took place before the mother's first union or whether conception of the child preceded the latter (Graph 4). The results show that the only country to have recorded an increase in the number of births before the first union is Brazil, where it rose from 9 to 14% (59%), placing it just above Mexico, where rates have only slightly declined (from 13 to 12.4%). In the Dominican Republic, births outside some form of union have remained stable at between 3 and 4 per cent.

In the case of pre-nuptial conceptions that partially reflect social permissiveness regarding sexuality outside a union, the proportions doubled in both Brazil and Mexico. In these countries, one out of every five children was conceived before the parents' marriage or consensual union, rather than one out of ten, as happened in the past (in the generations ages 45-49).

When a distinction is made between women who had at least one child before 25, taking into account the type of the woman's first union, significant variations are observed between countries and generations (Table 3). In Brazil and Mexico, the proportions of single mothers with children from the younger generations who ended up marrying were higher than in the Dominican Republic (57 and 46 and 28% respectively). For its part, the generational evolution indicates that women in these conditions, in other words, with children, are more likely to marry nowadays than they were thirty years ago in both Mexico and the Dominican Republic. Brazil, however, has evolved in the opposite direction, recording a 20% decline in the number of single mothers with children who marry, at least before the age of 25.

This analysis shows that over the past thirty years, Brazil has evolved towards greater informality as regards the formation of conjugal unions: consensual unions as well as births outside a union and prenuptial conceptions increased significantly. Mexico

Graph 4
First Births Outside a Union and Prenuptial Conceptions
(percentages)

☐ Births outside a union	■ Prenuptial conceptions	▨ Births and conceptions after 1st union
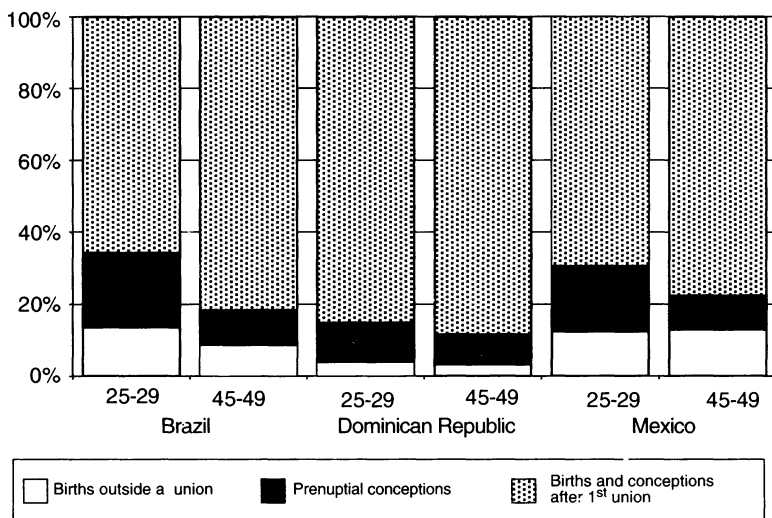
has evolved in a similar direction, although to a lesser degree as regards the increase of consensual unions and prenuptial conceptions. Conversely, the Dominican Republic has changed less; the first child is often conceived within a union (85%) although this is often a consensual union.

In order to complete the picture of births outside a union, it should be added that the proportion of single women in relation to the set of women in each age group never exceeds 5%. Moreover, fertility outside marriage in the three countries compared is lower than fertility outside marriage in developed countries. In the early 1990s, fertility outside marriage never exceeded 20% in any of these countries, while the figures for the same date were in the order of 28% in the US (*Pop. Bulletin*, 2000), 40% in France and 25.5% in Canada. The levels of the proportions of prenuptial conceptions were close, however, to those of women in the US (Census Bureau, 1999).

Table 3
First Births Outside a Union and Prenuptial Conceptions Before
the Age of 25 in Women by Generation

		Countries		
		Brazil	Dominican Republic	Mexico
Births outside union	25-29	13.7	3.8	12.4
	45-49	8.6	3.3	13.0
Single mothers who subsequently marry	25-29	56.8	28.4	45.5
	45-49	71.2	21.9	25.8
Prenuptial conceptions	25-29	20.4	10.9	18.2
	45-49	9.6	8.2	9.3
Prenuptial births and conceptions	25-29	34.1	14.7	30.6
	45-49	15.2	11.5	22.3
Single mothers*	25-29	3.5	1.6	4.4
Children born outside marriage	25-29	20.5	16.5	17.7
	45-49	17.9	17.9	15.6

* Per 100 women in each group of generations.

7. INFLUENCE OF WOMEN'S EDUCATIONAL ATTAINMENT ON COUPLE FORMATION

The data from Table 4 leave no doubt about the lower level of educational attainment of women in consensual unions compared with married women. This statement, often repeated by several authors, is still valid.[11] Despite the improvements in educational attainment in the region as a whole, reflected in the shift in the female population towards categories of higher educational attainment, the gap between the educational attainment of married women and those in consensual unions persists and in some cases has increased in the countries analyzed. Indeed, the proportions of women in consensual unions in the categories of "no school-

[11] A recent study in Mexico showed, once again, the comparatively unfavorable condition of women living in consensual unions.

Table 4
Women by Level of Educational Attainment by Nature of First Union
per Generation*

	Country					
	Brazil		Dominican Republic		Mexico	
	25-29	45-49	25-29	45-49	25-29	45-49
No schooling						
M	4.2	13.3	2.1	9.0	0.5	2.6
CU	9.2	26.5	13.2	25.1	1.6	5.5
Primary School						
M	33.4	49.8	29.2	64.2	36.7	69.0
CU	40.9	41.3	60.1	69.3	49.5	74.0
Secondary School						
M	57.6	29.5	42.2	15.5	39.5	15.8
CU	47.8	28.1	24.2	4.7	37.3	12.7
> Secondary school						
M	4.8	7.4	26.5	11.2	23.3	12.6
CU	2.1	4.1	2.6	0.9	11.5	7.8

* By 100 women in each generation group and type of union.

ing" or "elementary education" are even higher among the younger than the older generations. In other words, women aged 25 to 29 who have not completed elementary school or never been to school (or did so for a short period of time) live in consensual unions more often than the older generations did (45-49).

This phenomenon also occurs, albeit to a lesser extent, for secondary education in both Mexico and the Dominican Republic. Conversely, in Brazil, the proportion of consensual unions in relation to marriages regardless of educational attainment has increased over time. The preference for marriage is extremely marked among women who have completed more than secondary school in the three countries. At this level of educational attainment, there are two to ten times more married women than those living in consensual unions, whereas among younger women who have only completed elementary school, the ratio is one married woman to at least 1.2 women living in a consensual union.

An analysis of the intensity of changes between the generations selected according to the type of first union shows that con-

sensual union is advancing more rapidly than marriage between younger women who have completed secondary school: virtually double (90% to be precise) in the Dominican Republic and 16% in Mexico. The reverse is true in Brazil, where the proportion of marriages is advancing more quickly than that of consensual unions among women who have completed secondary school (15%). Nor is there a homogeneous trend among women who have completed more than secondary school. At this level, consensual unions are increasing more quickly than marriage in the Dominican Republic alone. These evolutions are showing that the widespread increase in educational attainment that has taken place in the countries compared is not leading to a single pattern in the evolution of types of first union. Consensual union is undoubtedly gaining ground among the younger generations with secondary and higher studies, particularly in the Dominican Republic. This increase has been less pronounced in Mexico, and is restricted to women who have completed secondary school. Conversely, in Brazil, the number of marriages is increasing more quickly than that of consensual unions among the more educated groups of women.

The above results are merely signs of what may become a widespread increase in the number of consensual unions among women with higher educational attainment. Although these results do not enable one to speak of a true coexistence between traditional and modern models, they contribute sufficient elements to be able to state that the changes that are occurring are doing so in this direction.

The doubt that persists, given the short time that has elapsed since consensual unions began to increase, is whether women with higher educational attainment currently living in consensual unions will legalize them with the same intensity with which less educated women of previous generations did.[12] Will higher educational attainment enable women living in consensual unions to "opt" or "decide" to remain in them or, conversely, will the independence this gives them reduce their power to negotiate the legalization of their relationship when they so wish?

[12] Approximately 50% in Mexico.

8. CONCLUSION

Historical reasons often dating back to the region's colonial past explain why consensual union has played a relatively important role in family formation for centuries. This kind of union actually constitutes part of the culture in the sense that it represents an alternative means of constituting a family and having children. The flexibility provided by its informality — the absence of rituals associated with the celebration of marriage — serves and served in the past to avoid the social and legal impediments associated with marriage. The intrinsic features of consensual union effectively lend it the power to adapt that may facilitate changes in the sphere of marriage. This is precisely why it is reasonable to expect that once these changes have occurred, it may decline.

In the late 1960s, young people in more developed countries began to cohabit without going through marriage, and without having obtained a legal or ecclesiastic sanction for their union. The persistence of this attitude in the face of marriage has led to the de-institutionalization of marriage, regarded as one of the most salient characteristics of the post-transitional phase of DT. Thus, since Latin American countries are currently completing their own demographic transition, one wonders whether they will adopt the same behavior as developed countries during the post-transitional phase (second DT) or whether, on the contrary, they will experience this phase without essentially changing their marital models, as was the case during what one might call classic DT. For some years now, the evolution of the indices of the moment has shown that the situation has begun to change and that consensual union and the voluntary interruption of unions (through separation or divorce) are on the increase.

This paper and the hypothesis formulated about the coexistence of traditional and modern consensual union is part of the previous context. The fact that consensual union is not a new phenomenon in Latin America forces one to analyze whether its expansion corresponds to the establishment of a consensual union model that exists in the developed world or whether, on the contrary, what is likely to occur is an increase of the traditional model. The former is associated with the behavior of the most privileged

classes in relative terms, while the latter is associated with the more disadvantaged sectors of the population.

In order to establish a link between the progress of DT and the de-institutionalization of marital life, we chose three countries at different stages of transition, which also possess different levels of consensual unions. For each of them, we conducted a comparative analysis of the evolution of age at first union, age at birth of first child, and prenuptial conceptions and births outside union, according to the woman's first type of union. Moreover, the propensity to enter marriage or a consensual union according to the level of educational attainment served to estimate the presence of modern consensual unions. Thus, the more the proportion of women in consensual unions had increased in the categories with higher educational attainment, the more frequent this last type of union would be.

Despite the variations between countries, we found that age at marriage had fallen, particularly in Brazil, whereas in the Dominican Republic, after a brief period of time, it returned to the higher level that was common among generations born in the 1950s (Quilodrán, 1992). Conversely, in Mexico, unions — whether consensual or marriage — continue to be postponed. What is common to the three countries is the tendency to have the first child earlier and the increase in the proportion of women who have or conceive their first child before a union; what varies is the intensity. Thus, in the Dominican Republic these levels are only half what they are in Mexico and Brazil (approximately 15 and 30% respectively). In addition, the composition is different: in Mexico and Brazil, approximately 40% of cases correspond to births outside a union, whereas in the Dominican Republic this proportion is barely over 25%. What these differences show is that the sex and reproductive lives of young women in the Dominican Republic are developing more quickly than in the other two countries, within consensual unions although not necessarily marriages.[13] The reason for this is the traditionally lower age at first union in this country, which in itself reduces the gap between puberty and conjugal

[13] If marriage is used as a reference, we find that the proportion quadruples from 3.8% to 16.5%; in other words, 77% of children of order 1 are born out of wedlock, in the Dominican Republic, twice the rate observed for Mexico and Brazil.

cohabitation, leaving women less exposed to the risk of conceiv-
ing outside a union. Indeed, the lapse between a woman's first
sexual relationship and her first conjugal union is extremely short
in the Dominican Republic: 0.7 years compared with two or three
years in the other countries. At the same time, Mexico appears to
be a country where sexual and reproductive activity outside a
union has traditionally been tolerated, whereas in Brazil this ap-
pears to be a recent phenomenon.

The inclusion of the type of union shows that consensual
unions are primarily responsible for the increase in nuptiality reg-
istered in Brazil, whereas in Mexico, where age at marriage has
not been reduced, they constitute an increasingly large propor-
tion of unions at early ages. In Mexico and the Dominican Repub-
lic, however, age at first union is always lower than age at mar-
riage. Moreover, the opportunities to marry for a woman in these
countries who already has a child are higher than they were in
previous generations, particularly in Mexico.

In countries that have not completed their DT — Mexico and
the Dominican Republic — but where consensual union forms part
of the local culture as mentioned earlier, the increase in this type of
union is spreading to more highly educated sectors of the popula-
tion (who have completed secondary school and over). In Brazil,
where consensual union barely existed thirty years ago, its ex-
pansion is restricted to women that have completed secondary
school, and is occurring at a slower rate than in Mexico and the
Dominican Republic.

In short, the characteristics associated with traditional con-
sensual union are beginning to change in Latin America. Never-
theless, the results obtained are not yet sufficient to state that the
transformations obtained correspond to those of the post-transi-
tional phase currently being experienced by developed countries.
Women are more educated, but their age at first union is lower
today than it was twenty years ago, while their age at the birth of
their first child has remained unchanged. What appears to be hap-
pening is the redefinition of traditional consensual unions through
the incorporation of certain elements of modern consensual union.
Women are undoubtedly more highly educated and the greater
empowerment that this entails may lead them to opt more fre-

quently for a consensual union and to do so at an earlier age as a means of demonstrating their independence to their partners and to the prevailing norms in general. Nevertheless, failure to postpone the arrival of the first child, or even giving birth earlier, despite young women's knowledge of contraceptives, may be linked to the significance attributed to motherhood in the construction of identity and the speed with which they wish to make the transition to adulthood.

In keeping with the above, the difference between the consensual union model of the countries compared here and the prevailing model in developed countries, particularly the kind that emerged at the beginning of the process, persists in that it involves a type of union that continues to represent the crucible of a family, rather than merely that of a relatively transitory conjugal couple.

9. References

Aguirre Beltrán, G. (1981), *La población negra en México. Estudio etnohistórico*, Mexico, Centro de Estudios Históricos de Agrarismo en México, Secretaría de la Reforma Agraria.

—— (1989), *La población negra de México*, Mexico, Fondo de Cultura Económica.

Alberro, S. (undated), "El amancebamiento en los siglos XVI y XVII: un medio eventual de medrar," Mexico, El Colegio de México (mimeo).

Bozon, Michel (1990), "Les femmes et l'écart d'âge entre conjoints: une domination consentie-2. Modes d'entrée dans la vie adulte et représentations du conjoint," *Population*, No. 2, pp. 327-360.

Bumpass, L. L., J. A. Sweet and A. Cherlin (1991), "The Role of Cohabitation in Declining Rates of Marriage," *Journal of Marriage and the Family*, 53, pp. 913-927.

Burguière, A. (1986), *Histoire de la famille*, Paris, A. Colin.

Calvo, T. (1991), "Matrimonio, Iglesia y sociedad en el occidente de México," *Familias novohispanas, siglos XVI al XIX*, Mexico, Centro de Estudios Históricos, El Colegio de México, pp. 101-108.

Camisa, Z. (1997), *La nupcialidad de las mujeres solteras en América Latina*, Series A, No. 1034, Costa Rica, Centro Latinoamericano de Demografía.

Carrasco, P. (1991), "La transformación de la cultura indígena durante la Colonia. Los pueblos de indios y las comunidades," *Lecturas de His-*

toria Mexicana 2, Mexico, Centro de Estudios Históricos, El Colegio de Mexico, pp. 1-29.

Castañeda, C. (1991), "La formación de la pareja y el matrimonio," *Familias novohispanas, siglos XVI al XIX*, Mexico, Centro de Estudios Históricos, El Colegio de México, pp. 73-90.

Castro Martín, Teresa (1997), "Marriages without Papers in Latin America," *International Population Conference*, Beijing, IUSSP, pp. 941-960.

—— (2001), "Matrimonios sin papeles en Centroamérica: persistencia de un sistema dual de nupcialidad," en Rosero-Bixby (ed.), *Población del Istmo 2000*, Centroamericano de Población, Universidad de Costa Rica.

Census Bureau (1999), "Trends in Premarital Childbearing. Special Studies," *Current Populations Reports, 1930 to 1994*, US, Demographic Programs, US Deparment of Commerce, Economics and Statistics Administration.

Charbit, Yves (1987), *Famille et nuptialité dans la Caraïbe*, Travaux et Documents, Cahier No. 114, Paris, Institut National d'Études Démographiques (INED)/ Presses Universitaires de France (PUF).

Cherlin, A. (1992), "Marriage, Cohabitation, Sexual Behavior, and Childbearing in North America," *Actas de la Conferencia sobre el Poblamiento de las Américas*, Veracruz 92, Vol. 3, IUSSP, Liège, pp. 223-243.

Cook and Borah (1966), "Marriage and Legitimacy in Mexican Culture: Mexico and California," *California Law Review*, No. 2, pp. 946-1008.

Frejka *et al.* (1996), *The Role of Induced Abortion in the Fertility Transition of Latin America*, Oxford, Clarendon Press.

Garenne, M., and J. Halifax (2000), "La fécondité prémaritale en Afrique Sudsaharienne," *La Chronique du Ceped*, No. 39, Centre Français sur la Population et le Dévelopement.

Gautier, A. (2000), "Les familles esclaves aux Antilles françaises, 1635-1848", *Population*, No. 6, pp. 975-1001, Paris.

Gómez de León, J. (2001), "Los cambios en la nupcialidad y la formación de familias: algunos factores explicativos," *La población de México, tendencias y perspectivas demográficas hacia el siglo XXI*, Mexico, FCE/ Conapo.

Gonzalbo, P. (1998), "El desorden de una sociedad ordenada," *Familia y orden colonial*, Mexico, El Colegio de México.

Greene, M., and V. Rao (1995), "The Marriage Squeeze and the Rise in Informal Marriage in Brazil," *Social Biology*, Vol. 42, Nos. 1-2, pp. 65-82, Port Angeles, US.

Gruzinski, S. (1991), *La colonización de lo imaginario: sociedades, indígenas y occidentalización en el México español, siglos XVI-XVIII*, Mexico, Fondo de Cultura Económica.

Guzmán *et al.* (2001), *Diagnóstico sobre salud sexual y reproductiva de ado-lescentes en América Latina y el Caribe*, Mexico, Grupo de apoyo del Fondo de Población de las Naciones Unidas (UNFPA).

Henríquez, M. E. (1979), "Legal and Consensual Unions: Their Fertility Implications in Latin America," *Nuptiality and Fertility*, Belgium, IUSSP/Ordina Editions, pp. 271-285.

——— (1989), "Brazil: Changes in Nuptiality and their Fertility Implications," *International Population Conference*, New Delhi, IUSSP, pp. 163-174.

Kauffmann, Lesthaeghe and Meekers (1988), "Les caractéristiques et tendances du mariage," in D. Tabutin, *Population et sociétés en Afrique au Sud du Sahara*, Paris, L'Harmattan, pp. 217-247.

Kirk, Dudley (1996), "Demographic Transition Theory," *Population Studies*, Vol. 50, No. 3, pp. 361-387, Cambridge University Press.

Leridon, H., and C. Villeneuve-Gokalp (1988), "Les nouveaux couples: Nombre, caractéristiques et attitudes," *Population*, No. 2, pp. 331-367, Paris.

Lesthaege, R. (1995a), "La deuxième transition démographique dans les pays occidentaux: une interprétation," *Transitions démographiques et sociétés*. Chaire Quetelet 1992. Paris, Institut de Démographie, Université Catholique de Louvain-la-Neuve, Academia/L'Harmattan.

——— (1995b), "The Second Demographic Transition," in Mason and Jensen (coords.), *Gender and Family: Change in Industrialized Countries*, Oxford, IUSSP.

——— (1998), "On Theory Development and Applications to the Study of Family Formation," *Population and Development Review* 24 (1), New York.

Margadant, G. (1991), "La familia en el derecho novohispano," *Familias novohispanas, siglos XVI al XIX*, Mexico, Centro de Estudios Históricos, El Colegio de México, pp. 27-56.

McCaa, R. (1996), "Matrimonio infantil, Cemithualtin (familias complejas) y el antiguo pueblo nahua," *Historia Mexicana*, 46 (1), pp. 3-70, Mexico, Centro de Estudios Históricos, El Colegio de México.

McCarthy, J. (1982), "Differentials in Age at First Marriage," *Comparative Studies* 19, London, WFS.

Muriel, J. (1991), "La transmisión cultural en la familia criolla novohis-pana," *Familias novohispanas, siglos XVI al XIX*, Mexico, Centro de Estudios Históricos, El Colegio de México, pp. 190-122.

Population Bulletin (2000), "Measuring Cohabitation" and "Rates of First Marriage, Remarriage, and Divorce, 1960 to 1997," *Population Bulletin*, Vol. 55, No. 4, Population Reference Bureau.

Population Reference Bureau (2000), "2000 World Population Data Sheet," Washington, D.C., US.

Quilodrán, J. (1979), "La nupcialidad en las áreas rurales de México," *Demografía y Economía*, Vol. 13, No. 3 (43), Mexico, El Colegio de México, pp. 27-67.

———— (1985), "Modalités de la formation et évolution des unions en Amérique Latine," *International Population Conference*, Florence, IUSSP, pp. 269-280.

———— (1989), "México, diferencias de nupcialidad por regiones y tamaños de localidad," *Estudios Demográficos y Urbanos*, 1 (2), Mexico, El Colegio de México, pp. 595-613.

———— (1990), "Entrance into Marital Union and into Motherhood by Social Sectors," in M. Bronfman, B. García, F. Juárez, O. de Oliveira and J. Quilodrán, *Social Sector and Reproduction in Mexico*, New York, Demographic and Health Survey (DHS)/The Population Council, pp. 4-8.

———— (1991), *Niveles de fecundidad y patrones de nupcialidad en México*, Mexico, El Colegio de México.

———— (1992), "La vida conyugal en América Latina: contrastes y semejanzas," *Actas de la conferencia sobre el poblamiento de las Américas*, Vol. 3, Veracruz, International Union for the Scientific Study of Population (IUSSP), pp. 245-264.

———— (1998), "Le mariage au Mexique: Evolution nationale et typologie régionale," Belgium, L'Harmattan, Bruylant-Academia.

———— (1999), "L'union libre en Amérique Latine: aspects récents d'un phénomène séculaire," *Cahiers Québécois de Démographie*, Vol. 28, Nos. 1-2, Spring-Autumn, pp. 53-80.

———— (1999), "Un siglo de matrimonio en México," in *La población de México, tendencias y perspectivas demográficas hacia el siglo XXI*, Mexico, FCE/Conapo.

———— (2000), "Atisbos de cambios en la formación de las parejas conyugales a fines del milenio," *Papeles de Población*, No. 25, Mexico, Centro de Investigación y Estudios Avanzados de la Población (CIEAP) / Universidad Autónoma del Estado de México (UAEM), pp. 9-33.

Rosero-Bixby, L. (1996), "Nupciality Trends and Fertility Transition in Latin América," in Guzmán *et al.*, *The Fertility Transition in Latin America*, Buenos Aires, International Union For the Scientific Study of Population.

Roussel, L. (1975), *Le mariage dans la société française*, No. 73, Paris, INED/PUF.

———— (1989), *La famille incertaine*, Paris, éd. Odile Jacob.

———— (1992), "La famille en Europe occidentale: Divergences et convergences" (The Family in Western Europe: Divergences and Convergences), *Population*, Vol. 47 (1), pp. 303-315.

Santow, G., and M. Bracher (1990), "The Family Histories of Australian Women," *European Journal of Population*, No. 6, pp. 227-256.

Sardon, J. P. (2000), "La conjoncture démographique: L'Europe et les pays développés d'outre mer," *Population*, Nos. 4-5, pp. 727-764, Paris.

Solís, P. (2002), "Cambios recientes en la formación de uniones consensuales en México," *El amanecer del siglo y la población mexicana*, Mexico, CRIM/UNAM/SOMEDE, pp. 357-378.

Tabutin, D. (1988), "Réalités démographiques et sociales de l'Afrique d'aujourd'hui et de demain: une synthèse," *Population et sociétés en Afrique au sud du Sahara*, Paris, L'Harmattan, pp. 17-50.

―――― (1995), "Un demi siècle de transitions démographiques dans les régions du Sud," *Transitions démographiques et sociétés*, Louvain-la-Neuve, Belgium, Chaire Quetelet, 1992, pp. 33-70.

Van de Kaa, D. (1987), "Europe's second demographic transition," *Population bulletin*, Vol. 42, No. 1, New York, Population Reference Bureau.

Villarreal, M. (1998), "*Adolescent Fertility: Socio-cultural Issues and Programme Implications*," Rome, Population Programme Service, Food and Agriculture Organisation of the United Nations (FAO) (mimeo).

Villeneuve-Gokalp, C. (1990), "Du mariage aux unions sans papiers: histoire récente des transformations conjugales," *Population*, No. 2, pp. 265-297, Paris.

VI. A REFLECTION ON CONTRACEPTIVE USE IN MEXICO IN LIGHT OF REPRODUCTIVE RIGHTS*

Juan Guillermo Figueroa Perea
Blanca Margarita Aguilar Ganado

After the International Conference on Population and Development held in Cairo, Egypt, in September 1994, one of the fundamental changes in public policies related to the reproductive behavior of the population was the agreement to use concepts and categories such as health and reproductive rights as reference paradigms for defining, evaluating and implementing social actions that accompany the population's reproductive experiences. This implies — among other things — ensuring that the population policies and government programs previously called family planning cannot continue to be evaluated from a logic focussing on the changes in demographic growth (or on the goals defined for this purpose) but must instead promote the dimension of the human rights and integral health of those for whom their interventions are designed.

This constitutes a significant paradigmatic change since, during their initial stage, family planning programs in Mexico encouraged the dissemination of contraceptive use and the measurement of their acceptance as an important means of influencing changes in fertility levels. This led in some cases to critical situations from the logic of human rights, since researchers have docu-

mented the imposition of various types of contraceptive, particularly the IUD and female sterilization. The latter constitutes the contraceptive choice of nearly half of all the women that use contraceptives in the country, which has raised the question of whether this is the result of their decisions or instead reflects the preferences of institutional agents.

After the Cairo conference, the first court for the defense of reproductive rights was held (May, 1996) followed, a few months later, by the creation of the National Commission of Medical Arbitration. In this context, the official discourse of the Ministry of Health, the National Population Council and the Mexican Social Security Institute, among other key institutions in the definition of actions linked to reproductive behavior, have incorporated informed consent as one of the means of ensuring respect for the populations' reproductive rights and contributing in a more integral fashion to their health in the reproductive sphere.

This text includes a review of the dynamics of the use of female sterilization in Mexico from the start of government family planning programs in the 1970s. The reconstruction of events presented here seeks to illustrate some of the possible problems that occur in contraceptive practice when various social actors with different expectations, needs and languages interact. An important part of the series of reflections presented involves highlighting the crucial role played by feminist groups that defend women's rights and the research processes that have been sensitive to feminist proposals in the process of enriching the dialog with those responsible for defining government policies and policies that influence the population's reproductive processes. These policies and programs have incorporated new approaches and planning and evaluation approaches and criteria into their activities, within which particular emphasis is placed on reproductive health and rights.

This is especially important since the last thirty years in Mexico have seen the development of institutional family planning programs within which contraception for women has played a key role. The dynamics of the use of contraceptives in Mexico has meant that two out of every three women living in any kind of consensual union are using some form of contraceptives. Nearly half of all the

population that uses contraceptives are women who have been sterilized, with the remaining contraceptive methods accounting for considerably smaller proportions, such as vasectomy, which accounts for approximately 2% at the national level (see Table 1). This has been partly attributed to the social processes of feminization of reproduction and its analysis (Figueroa and Rojas, 2000) and to the population's specific practices and demands, while recognizing the emphasis that has been given at various times to the activities targeting women in the policies and programs linked to fertility regulation (Tuirán, 1988; Cervantes, 1996).

1. Female Sterilization as a Social Problem

The early 1970s saw the start of the offering of contraceptives through government family planning programs, after various decades of high fertility levels during which contraceptive use was restricted by the Health Code. This was associated with two general population laws (established in the 1930s and 1940s respectively) within which population growth and the existence of large families were promoted (Brachet, 1984).

Family planning programs were largely legitimized after 1973 when Article IV of the Mexican Constitution was modified to recognize each person's right to decide on the number of children he or she wished to have and the best time for this. In 1976, the first national survey was carried out that yielded information on the level of contraceptive use in various population groups, although it should be noted that measurement has always focussed on women of childbearing age, particularly married women or those living in some kind of consensual union. In the mid-1970s, 30% of women of childbearing age living in some kind of consensual union (WCAU) reported using some form of contraceptives while just under 10% of this population had resorted to female sterilization. The most commonly used contraceptive methods were oral hormones, the rhythm and withdrawal methods and, to a slightly lesser extent, IUDs (Table 1).

The six years that elapsed between this groundbreaking survey and the National Demographic Survey carried out by the

National Population Council in 1982 coincide with the first administration with a demographic policy and a national family planning plan that established goals for demographic growth to be attained at various stages of this administration, and in which these goals translated into specific numbers of contraceptive users (focussing on women once again) that were expected to be able to be covered so that fertility levels, combined with mortality rates, would generate planned growth rates (Cervantes, 1996 and 1999).

Some authors have reported that this estimate of goals at the institutional and national level translated into specific goals at the level of medical units, hospitals and even health service personnel, which appears to have led to intensive campaigns to incorporate people according to the numerical data that guided the evaluation of the program rather than focussing on education and information, or a collective reflection on the advantages of reducing the final number of offspring of people who were of childbearing age at that time (De Barbieri, 1982; Miró, 1982; Tuirán, 1988; Lamas, 1990 and 1993; Figueroa, Aguilar and Hita, 1994; Cervantes, 1996). There is, however, another interpretation that this first government period with an explicit demographic policy, a national family planning program including contraceptive use goals to be attained and health service programs established at the main government institutions responded to a latent need that had existed for several years beforehand among the population and which required greater dissemination and access to contraceptive methods. This meant that the significant increases observed during this period responded to what the population had been wanting for some time (Martínez Manautou, 1982).

A combination of these two dynamics meant that by the end of 1982, contraceptive use had spread to virtually half the target population for these programs (approximately half of WCAU). By this time, the use of female sterilization had tripled (in relation to the first survey carried out just six years earlier), becoming the second most commonly used method among the Mexican population, which can partly be explained by the higher age of contraceptive users and their high parity, but also by certain preferences in the promotion and offering of services by the health institutions themselves (Figueroa, 1988).

It was during this period that there began to be talk of irregu-
larities in the way surgical contraception was offered, together
with the detection of cases of women who had not been informed
about what method they were to be given or else received incom-
plete information. In the National Demographic Survey (NDS) some
women declared that they were using the method to space their
pregnancies, or that it was the only method they knew of when
they chose it (NDS Report, Conapo, 1983). However, the cases that
were frequently mentioned were published in newspaper articles
or journals that were immediately discredited by certain govern-
ment authorities, particularly because of their feminist origin. They
were given hardly any importance, partly because there was no
academic research on the issue and partly because they came from
a feminist movement that had yet to be acknowledged as an in-
terlocutor, as well as the fact that the women had not yet explic-
itly made any demands of either doctors or institutions. All this
took place in a context in which there were no Human Rights
Commissions or National Commission for Medical Arbitration,
far less any kind of independence between the departments of
justice and centralized government of which these institutions
constituted an important part (Llera, 1990).

    This was cc ipounded by the fact that this administration
(1976-1982) managed to reduce fertility levels, in keeping with
the demographic goals achieved in demographic policy and the
National Family Planning Plan, which led to a triumphalist inter-
pretation of the success of the intervention and downplayed any
criticisms that might arise of cases of forced sterilization, largely
arguing that the population's demands were being successfully
met. In 1982, the NDS showed a slightly different picture, since the
data revealed a significant increase in the use of female steriliza-
tion, as well as a bias in the way it was offered, which concen-
trated mainly on marginalized groups (Bronfman, López and
Tuirán, 1986).

    However, the combination of a change of administration and
the fact that the NDS data were not published in time due to staff
changes at the institution where it had been undertaken prevented
these references from being incorporated into the design of the
following family planning program for the period 1983-1988, dur-

ing which the Second World Population Conference, held in Mexico City in 1984, would take place. As a result of the conference, United Nations acknowledged the need to reward the Mexican government for its successful population policy, measured largely through the decrease in demographic growth, and without following up any of the criticisms of the means of promoting contraceptive methods, particularly female sterilization.

Throughout 1984, and over the following years, some of those who had taken part in the National Demographic Survey and were now academics (Bronfman, López and Tuirán, 1986) submitted and published a more detailed analysis of the use of female sterilization in Mexico, explaining these biases in term of social groups that had been observed using the data from this survey, but also examining the cases of women who reported using this method for spacing pregnancies, despite the fact that it was an irreversible method. This reflected a degree of misinformation that warranted examining in greater detail.

At the same time, a group of researchers from the Ministry of Health, employed by the Head Family Planning Offices, used the National Survey on Risk Factors in Hormonal Contraception carried out in 1984 (Secretaría de Salud, 1988) to test a module designed for sterilized women and identified cases in parts of Chiapas where women admitted that they had been sterilized without their knowledge or said that "they had done something to them after the birth of their last child which had stopped them from getting pregnant again," without necessarily mentioning sterilization.

With these two sets of data as a research reference, but also because of its internal knowledge of the emphasis that government institutions placed on demographic goals as the criteria for evaluating activities linked to the offer of contraception, the Head Office of Population Studies and Services at the Ministry of Health's Head Family Planning Offices designed a special module with a set of questions to be given to women that had been sterilized within the framework of the National Survey on Fertility and Health (NSFH) to be undertaken in 1987 (Figueroa, 1988) just one year before the end of a new governmental administration in Mexico.

An unusual feature of the NSFH was that it was undertaken by a government institution within a research area that tracked the development of family planning programs, mainly from a social science perspective, combined with the continuous generation of statistical data. For this reason, the design of a special module for sterilized women sought to characterize some of the features of their decision-making process, the information they had received before being operated, their participation in the fact of resorting to this irreversible method, the evaluation of whether they had read and signed an informed consent form, their age, the number of live children they had given birth to before deciding to choose sterilization, their belonging to a specific social or socio-economic group and their previous experience in the use of other contraceptives as well as certain subsequent evaluations of their feelings and perceptions about having been sterilized (Figueroa, 1994b). The survey also has the advantage of including members of the population from various social sectors in the country, since its breakdown ensured a representative selection of regions, urban and rural settings and educational attainment (Palma *et al.*, 1989).

The results of the NSFH showed that the level of contraceptive use continued to rise in various sectors of society while female sterilization was already the method favored by the largest sector of the population (36.2%) that used contraceptives (Palma *et al.*, 1990). At the same time, the comparison of sterilized women with other groups of users showed that they had greater parity, were older and had had more experience with contraception, yet at the same time displayed significant differences regarding their evaluation of the quality of service and respect for women's rights at the time of making the decision to choose the method in question (Figueroa, 1988).

Ten per cent of the national sample of sterilized women admitted that they had not participated in this decision, 25% had not been given sufficient information before they were sterilized while over 40% admitted that they had not read or signed an informed consent form. In fact, over three quarters were sterilized just after giving birth, despite international recommendations on the advisability of allowing a few months to elapse after this event,

to be sure of the infant's survival and to enable women to recover from childbirth before choosing a permanent form of contraception. The situation was more critical regarding these indicators among more socially vulnerable groups, such as women with low educational attainment from rural areas (Figueroa, 1994a). When these characteristics were linked to women's subsequent satisfaction at being operated on, it was found that the lower their degree of participation in the decision, the lower their amount of information and the lower the incidence of informed consent, the higher the percentage of women that were dissatisfied with the fact of being operated on, which, once again, was more common among women in rural zones with low educational attainment (Figueroa, 1994a, and Tuirán, 1994).

One of the research and analysis questions raised at the time concerned the possible link between these characteristics; in other words, were the women more dissatisfied because of irregularities in the quality of services and the lack of recognition of their rights or did they state these irregularities largely because of their dissatisfaction at having used an irreversible method? The research instrument was not sensitive enough to be able to demonstrate one of these two possible answers, but what was clear was that the percentage of the population that acknowledged certain irregularities revealed the need for a closer follow-up of the way these contraceptives were being offered, particularly by taking into account the population's perception. One way of doing this was to discuss the issue with health service providers while another involved reviewing the information and training instruments and the informed consent forms used in the institutional environment for the acceptance of the method and the way it was offered. Further information was also required on the way the population decided on the contraceptive method it would use.

The researchers responsible for the NSFH had the opportunity to discuss the results with health service providers from various government institutions, where reactions were extremely varied, although initially they tended to discredit the data when they realized that at bottom, they were being questioned about and even accused of violating women's rights and responded by pointing out that those who had not conducted the research were unaware

of the context in which health services were offered. Concerned by a possibly erroneous interpretation of the process that was being researched and documented, the researchers took advantage of several national and regional meetings of the Ministry of Health's family planning program to talk to the program coordinators and interact with those who were directly involved in offering contraceptives to the population. What began to emerge was the perception of other service providers of the pressure they felt due to institutional evaluation criteria, which was compounded by the pressure that they themselves felt, that any contraceptive intervention — albeit unilateral — was for the good of the population, even if the population did not always perceive this as such, as happened in other medicalized spheres of health (Figueroa, 1991).

Another aspect explored by the social researchers at the Ministry of Health (within the Head Family Planning Office) consisted of reviewing the informed consent forms in an attempt to assess what the service providers used when they offered contraceptives and, conversely, what people were offered before they opted for an irreversible method. This was also part of the concern to understand elements of the decision-making of women who opted for female sterilization. This proved that the informed consent forms for female sterilization were indistinguishable from those for other types of surgical operations carried out at the various institutions, referring to the risks of other types of medical practice, which are necessary in emergency situations but very different from what happens with contraception. In other words, the forms did not guarantee the dual purpose of informed consent: protecting those who intervene in the process and ensuring that the person that accepts the intervention has sufficient information on what he or she is accepting. Indeed, these forms would appear to be designed more for the protection of health service providers than to support the decision of possible users.

The researchers also reviewed the materials used to train providers of services linked to contraception, in which a key role was played by the materials designed by the Mexican Social Security Institute, through its Head Offices (as they were known at the time) of Family Planning Services and close collaboration with the Mexi-

can Academy of Research on Medical Demography (AMIDEM). Since
1986, teaching guides had begun to be published, explaining the
way each type of contraceptive should be offered and establish-
ing the guidelines to be followed. Researchers were surprised to
find that the guides did not mention any counter-indications for
bilateral tubal occlusion, "except when the woman is pregnant, in
which case one should wait until the pregnancy has concluded
before proceeding to sterilize the women." Conversely, the counter-
indications for vasectomy included the fact that the potential user
"might not be physically or psychologically mature" or "might
have made the decision on the basis of erroneous information" or
that "he might not be sure of his decision or be a psychopath" in
addition to a counter-indication of a physiological nature (AMIDEM,
1986a and 1986b).

This fact was particularly striking because of the different cri-
teria used for women and men, with greater protection being pro-
vided for the latter. The question we asked was whether the no-
ticeably unequal percentages of surgical contraceptive use in men
and women could merely be explained by the way in which indi-
viduals that use contraceptives make their decisions or by the
emphases and priorities of contraceptive service providers and,
through the latter, of family planning policies and programs.

These elements revealed a clear violation of women's rights,
through the obvious minimization of their decision-making cap-
acity, making it essential to radically transform the environment
in which services linked to female sterilization were offered. Dur-
ing researchers' attempts to explore these processes, a survey was
conducted on the determinants of contraceptive practice (EDEPAM)
in which 1,500 of the 9,300 women interviewed during the 1987
National Survey on Fertility and Health were re-visited. With this
new group, the researchers sought to examine more detailed, spe-
cific components of the ways women made decisions about con-
traceptives (Figueroa *et al.*, 1988). Attempts were made both to
understand the elements women consider when choosing contra-
ceptives and deciding on the number of children they wish to have
and in discussing their level of satisfaction with contraceptive use,
particularly in situations where the data show that they were not
taken into account, did not participate in the decision, had failed

to receive sufficient information and had not signed an informed consent form.

We also wondered whether there might not be cases where the women said they were satisfied, despite their negative description of the process, simply because they had never been taken into account in other spheres of their daily lives. Thus, if they had not been taken into account in institutional health spheres, where doctors are usually perceived as authority figures, this did not constitute an additional negative element in their satisfaction levels. Another hypothesis was that they found sterilization to be such a positive experience that although they were not very satisfied with the procedure followed to obtain it, their final evaluation of the process was positive. This did not constitute a sufficient reason to stop researching the quality of the process of accepting contraceptive methods.

The EDEPAM data showed that sterilization was in fact the method preferred by women, both those who had not been sterilized (whether or not they used a particular method) and those who had already undergone this experience and were asked to imagine a hypothetical situation in which they would have to indicate the contraceptive method of their choice. Women in all the groups showed an overwhelming preference for female sterilization. It is interesting to note that this was followed by so-called "traditional" (rhythm and withdrawal) or "local" (condoms and spermicides) methods, rather than the methods classified by health institutions as modern (such as IUDs and all the hormonal methods) regardless of the fact that these methods, together with sterilization, are the ones most intensely promoted by government programs (Cervantes, 1999).

2. FEMALE STERILIZATION AS AN OBJECT OF PUBLIC POLICIES

Data from various surveys showed a far more complex panorama than we had imagined, revealing an apparent coincidence between the preferences of the contraceptive-using population and even those that did not use contraception and the method favored

by various family planning programs. A particularly striking fact was that the following methods of choice were very different from women's expectations, compared with those favored by health institutions, where even the "traditional, local methods" (so-called by the institutions, not by the women users) had hardly any importance. For this reasons, we also wondered whether the coincidence between the contraceptives promoted and those women actually preferred was due to the programs' sensitivity in satisfying the population's needs or whether it was a mere coincidence. Might this not be due to the fact that the population saw advantages in the promotion of these, regardless of the irregular procedures involved in their dissemination and ensuring their acceptance, as the series of data produced until then appeared to show?

Working for a government institution enabled us to discuss the data on the acceptance of female sterilization with various groups of service providers and we were struck by the over-reaction we found among program coordinators and certain health service providers, who argued that "that was not true, that the women were exaggerating and that they were given information but did not understand, which was why they said that they had not been informed." These comments made us realize that this was a situation which needed to be more widely documented (Figueroa, 1994b). Our interest increased when some of the service providers most closely involved with the running of the programs said that they felt that these data underestimated the incidence of the irregularities that took place regarding the rights of contraceptive users and in the criteria used to determine the quality of services. These service providers said that all this was due to the institutional pressure to meet certain contraceptive goals, since this was regarded as an obligatory condition for reducing population growth, on the basis of what had been established in the population policies and family planning programs in force at the time. This occurred regardless of the fact that since 1988, a number of scholars had questioned the level of population growth reported, since the NSFH demonstrated higher levels, making it impossible to continue talking about a "successful demographic policy" on the basis of the parameters mentioned earlier (Figueroa, Aguilar and Hita, 1994).

This produced a crisis in family planning programs. On the one hand, the NSFH data revealed serious irregularities in the offer of irreversible contraceptives to women while on the other, these programs no longer seemed "as successful" in their attempts to reduce fertility levels (Figueroa, 1991). Moreover, major research projects had already been undertaken, the publication of whose results was used by women's and human rights' movements to demand that government policies and programs undertake an in-depth review of their procedures for monitoring the quality of health services and, respect for women's reproductive rights.

After constant discussions with groups of service providers, program directors and feminists, and in view of the impossibility of undertaking a new survey within the institution itself to follow-up the data outlined earlier, the area of population studies and services in the Ministry of Health decided to design a research project on the quality of service, a concept that was gaining increasing currency, but interpreted from a more social perspective. In addition to acknowledging the importance of documenting the technical competence of providers, the availability of methods, the quality of the relationship between service providers and users, among other characteristics, this study emphasized the power relations that take place between providers and those who use their services and between these providers and the logic of public policies and the criteria for evaluating these programs, which these providers had to meet through their everyday activities. The aim was to stop demonizing the providers unilaterally and regarding them as individuals who had personally decided to sterilize women and instead to place them in an institutional context that pressured them to do this and, in some cases, insinuated that their job security depended on this.

When we began to use the concept of "health service providers' rights" in relation to institutions and their policies, this produced a significant change in the reaction of various doctors, nurses and social workers to the data on female sterilization, since they felt that disseminating this information might help the criteria for institutional evaluation to respect the decisions of female contraceptive users, while relieving the pressure on health service providers.

During the development and thematic definition of this re-
search project, we were visited by a delegation from the United
Nations Fund for Population Activities (UNFPA) which was seek-
ing to undertake an evaluation of the family planning programs
in Mexico, since it had received information (from the NSFM, for
example,) in terms of certain irregularities in service provision.
The UN felt it was vital to undertake an assessment of these proce-
dures, particularly in view of the upcoming International Confer-
ence on Population and Development in Cairo, Egypt, that would
evaluate interventions in population policy and family planning
programs, emphasizing the human rights levels and specifically
questioning the over-simplification of the success of these programs
merely on the basis of demographic goals (Figueroa, 1998).

This evaluation proved that many of the contraceptive meth-
ods used in Mexico were based more on service providers' prefer-
ences than on the choices of contraceptive users. It also revealed
something that may seem obvious, i.e. that "if the aim was really
to ensure an improvement in the quality of service — as had been
argued in the content of certain public programs — it was essential
to ensure that assessment criteria would focus on the quality of
care, not simply or mainly on the decline in fertility levels or the
increase in the use of contraceptives (Figueroa, 1998).

In 1994, when several field work tests had already been de-
signed and evaluated, a new research project was planned that
sought to explore health service users' exercise of their civil rights
in the sphere of family planning, in their links with various ser-
vice providers. However, within a framework in which the latter
establish power relations with the program directors and the as-
sessment criteria of the latter, it was unilaterally cancelled by the
Ministry of Health, despite the fact that financing for the project
had already been approved by two international organizations
(the Ford Foundation and the United Nations Population Fund)
since it was felt that the project questioned the medical model
underlying the population policies and family planning programs
in force at the time (Figueroa, 1996).

By way of a hypothesis, the results of this UNFPA assessment
(which coincide with the data from the research that had been
carried out) and the historical moment prior to another popula-

tion conference, can be said to have encouraged the government to review its informed consent forms and begin to systematize training models linked to the quality of health services. Nevertheless, they also revealed the "political advisability" perceived by government institutions of suspending or postponing the existing processes for generating information that sought to describe the multiple relations that took place between the various social actors linked to fertility regulation, including women, health service providers and those who define and coordinate the programs and policies that influence the population's reproductive processes.

By canceling the project, the authorities wasted a golden opportunity to obtain an accurate diagnosis of the way exchanges took place regarding contraception, together with an analytical interpretation of human rights and joint responsibilities in the exchanges between users and doctors. The project would have constituted a superb resource in the context of the World Population and Development Conference held in Cairo, where efforts were made to establish new assessment criteria based on respect for human rights and more integral decisions in order to expand fertility regulation beyond demographic goals.

Despite this, it is important to mention three international conferences on human rights, population and women's development held in Vienna in 1993, Cairo in 1994 and Beijing in 1995 respectively, since the international political and symbolic referent surrounding this three-year period had created an atmosphere of critical and participatory observation by various groups in civil society on the political and social policy issues that would be discussed in these spheres. One of the key issues was the role of rights in the sphere of reproduction and sexuality.

Indeed, government institutions in Mexico had already begun to implement changes in their informed consent forms, precisely because of the criticisms and demands expressed over a period of several years regarding the procedures for the adoption of contraceptive methods, particularly irreversible methods, but also because of the government's interest in the quality of care. Moreover, the Mexican Social Security Institute had already reclassified some of its activities within the concept of reproductive health, which was gaining currency as a critical interpretation of

the relationship between health and reproduction, as part of the logic of attempting to avoid reductionism and a fragmented view of reproduction. The dissemination of the concept of reproductive health was linked to several demands by feminists and social workers to ensure that the sphere of fertility was dealt with using a more integral point of view in research and programs, and by feminists to respect women's reproductive self-determination.

Moreover, human rights courts were set up at each of the three international conferences held in 1993, 1994 and 1995, at which people who had suffered abuse regarding their reproductive rights were encouraged to share their testimonies, and prove the advances in the civic practice of denunciation and demand accountability from those responsible for government interventions. This had significant repercussions on the Mexican context, since a year after the IV World Conference on Women, on the occasion of the International Day of Women's Health (May 28, 1996), a court was set up for the defense of reproductive rights, at which a group of women from various parts of the country denounced and publicly submitted their cases to institutional authorities and persons from various civil groups, thereby setting a crucial precedent in the Mexican context. This was confirmed a few months later by the creation of a National Commission of Medical Arbitration, at which other cases of violations of people's reproductive rights have been denounced, such as forced sterilization and the imposition of contraceptive methods.

Another positive consequence of these conferences was the consolidation of the term "reproductive health" and the insistence, particularly at the population and development conference in Cairo, on ensuring the processes of informed consent, evaluating the actions of programs and policies linked to reproduction based on people's needs rather than demographic goals that had been translated into goals for contraceptive use. Members of this conference acknowledged the need for a perspective that would renew the interpretation of reproduction in men and women's life projects and enable it to be socialized as a process in which the various actors involved in reproduction are jointly responsible, instead of regarding it as an inevitable project or destination that is in some way limited to the sphere of women. For this reason,

the concept of reproductive health, associated with reproductive rights, acquires crucial analytical and political dimensions, particularly since the way it is implemented in public policies can either strengthen or weaken the issues that attempts were being made to question.

Major administrative changes were implemented in the Mexican context, such as the establishment of a Head Office of Reproductive Health in the Ministry of Health, the emphasis on reproductive rights and the gender perspective in political and public discourse and the reinforcement of a program specifically involving male contraception (such as vasectomy without a scalpel), and undertaking research or more detailed follow-ups of the process of informed consent in contraception.

The 1990s saw the creation of various human rights commissions at the national and regional level, together with medical arbitration commissions, which has made people more aware of their rights and therefore of the need to defend them, and encouraged various social actors to critically follow up policies and programs linked to contraception and, more specifically, female sterilization. This, in turn, has been helped by the increasing dissemination of both academic and government research on informed consent and the exercise of civil rights, within the sphere of reproduction.

The process has included specific surveys carried out during the 1990s by government institutions such as the National Family Planning Survey, the Family Planning Communication Survey (both undertaken by the National Population Council) and the Reproductive Health Survey conducted by the Mexican Social Security Institute (Rojas and Lerner, 2001), as well as feminist groups' monitoring of both policies and programs linked to fertility regulation.

A combination of international agreements, pressure from women's movements and the data yielded by social science research on sterilization processes, together with the existence of human rights commissions and tribunals for denunciations, as well as medical arbitration commissions, have contributed to the creation of an atmosphere in which research is increasingly carried out on these issues by the health institutions themselves, in their documentation of the process of informed consent. This has modi-

fied the informed consent forms in the institutions and, in some cases, led certain doctors to regard demographic goals as an increasingly invalid criterion for evaluating their activities.

During the last five years of the 20th century and the beginning of the 21st century, efforts have been made to train service providers in the sphere of counseling and to sensitize them to the gender perspective, thereby clearly acknowledging people's rights to decide on their reproduction and the context of the latter. At the same time, there has been more dissemination of the concept of human rights and the means that exist to demand respect for the latter, as well as the possibilities of denouncing irregularities. All this provides a more hopeful outlook for the provision of contraceptive methods, such as female sterilization or bilateral tubal occlusion.

3. THE QUEST FOR NEW POLICIES AND PROGRAMS

The above summary enables one to identify certain key moments and social actors in the search to define and ensure the construction of public policies and programs linked to fertility regulation that will respect women's rights.

a) Some of the Social Actors in Conflict

1. The work of the feminist movement was evident in the demands for women's right to reproductive self-determination, even before family planning programs were formally publicized. They subsequently alerted the public to the imposition of contraceptive methods and used the results of academic research to systematically monitor the way in which policies and programs were being carried out. In the 1990s, they participated in the construction of a new term, reproductive health, in light of reflections on reproductive rights, during which they played a key role in both the three human rights courts held at the same number of international conferences and in the organization of the court of reproductive rights in Mexico.

2. Another social actor that has played a crucial, albeit different role are the researchers, who initially expressed the need for family planning programs, before they were officially established in Mexico and were subsequently oddly silent about the abuses that were taking place, preferring to focus on documenting the decreases in fertility levels and the increase in contraceptive use. From the 1980s onwards, they played a greater role in documenting the conditions under which contraceptive use took place, generating crucial information on the problems involved in this issue as well as contributing to the political work of social actors, such as the participants in various women's movements and organizations. From the 1990s onwards, they exercised a greater influence over collective reflection on the meaning and content of the concepts that might orient the relationship between reproduction and rights, whether in the sphere of health institutions or in light of the everyday practices of people that reproduce.

3. Yet another social actor is the health service providers and those responsible for coordinating the programs and policies linked to fertility regulation. In the 1970s, they played an active role in the dissemination of services at the national level and in the promotion of a practice that was relatively unfamiliar to various population groups, particularly when access to it has been restricted by a political interest in population growth. Some of these people adopted the position of incorporating contraception into the medical practices already provided, in an atmosphere permeated by paternalistic relationships between doctors and service users, in which it is often assumed that the only person who knows about the issue is the doctor, who should therefore be responsible for making any decisions required. This led to several abuses in a sphere recognized as being the object of personal decisions. In some cases, this was encouraged by an efficiency-based view of achieving the goals of demographic growth, and the use of contraceptives for short periods, despite the fact that it was customary to have large families. Several service providers, however, also participated in this process of questioning arbitrary interventions in the sphere of people's reproductive decision-making, querying the very categories used to link health to reproduction.

4. Reference to these social actors obviously cannot ignore the basic reference to the leading actor in reproductive processes, namely the men and women that exercise their ability to reproduce at specific points in their personal histories.

b) Some Provisional Conclusions

This description of the process through which the context in which surgical contraception is offered to women and in which they decided to resort to this contraceptive option has been modified, provides lessons that can also be applied to other spheres of everyday life that are the subject of public policies.

One of them concerns the fact that these policies are not neutral, since they respond to particular conceptions of the phenomenon that is the object of the intervention and type of participation expected of those targeted by the policy. This is linked to the roles, responsibilities and spheres of decision assigned to the institutional agents that implement the programs derived from public policies.

This text reveals some of the gender biases (by focussing attention on the use of sterilization by women) that have permeated the way surgical contraception is offered, as well as the government tendency to minimize the demands of certain actors in society, particularly certain women's movements, which have requested a more transparent monitoring of public policy intervention. Ironically, it sometimes happens that policies are recognized as being necessary for the population's well-being, although there is a lack of transparent dialog with other social actors that also defend these positions regarding the well-being of public policy targets. The problem is compounded when attempts are made to negotiate in unequal conditions, when the possibility of making decisions and reaching agreements is unclear, but also when there is no recurrent practice of dialog, in the sense of being able to listen to interlocutors, particularly when they have not been identified as such.

One of the achievements of the women's movement within the sphere of female sterilization, encouraged by social science research and citizenship strategies, such as human rights courts and international consensus, has been to ensure a more sensitive

follow-up of the way irreversible contraceptive methods are chosen by women. It has also contributed to the systematic questioning of the evaluation criteria used in contraception programs and emphasized the need to train personnel at government health institutions in issues such as human rights, gender, reproductive rights and informed consent.

Another positive effect has been the establishment of medical arbitration and human rights commissions, which people are able to use more easily and frequently, making service providers feel more obliged to guarantee the quality of their everyday practices. At the same time, they may even come to regard it as a means of ensuring their job security, since it places limits on institutional pressure, which by focussing on goals for contraceptive use forced them to incorporate female contraceptive users, often ignoring the medical guidelines established for this purpose.

It is worth noting that the Ministry of Health (through the 1995-2000 Reproductive Health and Family Planning Program) tried to provide short-term training for the staff at these institutions in gender, reproductive health and reproductive rights, based on human rights. It was thought, perhaps rather ingenuously, that this could be achieved during the first administration after the change in terminology, partly driven by the pressures and commitments established at the conferences held in Cairo and Beijing in 1994 and 1995 respectively. This is a lengthy process, however, which must be implemented more systematically and critically.

A couple of decades of family planning programs focussed on women and measured on the basis of contraceptive and demographic goals can obviously not be radically changed by the adoption of a new approach in discourse expressed by government institutions, although this certainly helps. At the same time, a perception of the low possibilities of users exercising their civil rights in relation to institutions will not be radically transformed simply because a Human Rights Commission has been created, a court for the Defense of Reproductive Rights has been organized and a Medical Arbitration has been formed. There is obviously a need for changes in the areas surrounding fertility regulation, including the gender relations of those who reproduce and the redefinition of those who are jointly responsible for reproduction.

4. References

AMIDEM (1986a), *Oclusión tubaria bilateral*, Mexico, Temas de Planificación Familiar, Academia Mexicana de Investigación en Demografía Médica.

——— (1986b), *Vasectomía*, Mexico, Temas de Planificación Familiar, Academia Mexicana de Investigación en Demografía Médica.

Barbieri, Teresita de (1982), "Derechos humanos de las mujeres y políticas de población. Una relación compleja," *II Reunión de Investigación Demográfica en México*, Mexico, Conacyt, pp. 785-788.

Brachet, Vivianne (1984), "El proceso social en la formación de políticas: el caso de la planificación familiar en Mexico," *Estudios Sociológicos*, Vol. 2, Nos. 5-6, pp. 308-333, Mexico, El Colegio de México.

Bronfman, Mario, Elsa López and Rodolfo Tuirán (1986), "Práctica anticonceptiva y clases sociales en México: la experiencia reciente," *Estudios Demográficos y Urbanos*, Vol. 1, No. 3, pp. 443- 474, Mexico, El Colegio de México.

Cervantes, Alejandro (1996), "De mujeres, médicos y burócratas: políticas de población y derechos humanos en México," in G. Careaga, J. G. Figueroa and M. C. Mejía (comps.), *Ética y salud reproductiva*, Mexico, UNAM/Porrúa, pp. 317-348.

——— (1999), "Políticas de población, control de la fecundidad y derechos reproductivos: una propuesta analítica," in Brígida García (coord.), *Mujer, género y población en México*, Mexico, El Colegio de México/Sociedad Mexicana de Demografía, pp. 363-429.

Conapo (1983), *Informe de la Encuesta Nacional Demográfica*, Mexico, Consejo Nacional de Población.

Figueroa, Juan Guillermo (1988), "Características de la aceptación de métodos quirúrgicos," *Encuesta Nacional sobre Fecundidad y Salud, Memoria de la Reunión del 30 de septiembre de 1988*, Mexico, DGPF, Secretaría de Salud, pp. 151-192.

——— (1991), "Comportamiento reproductivo y salud: reflexiones a partir de la prestación de servicios," *Salud Pública en México*, Vol. 33, No. 6, pp. 590-601, Mexico.

——— (1994a), "Anticoncepción quirúrgica, educación y elección anticonceptiva," *Memorias de la Cuarta Reunión Nacional sobre Investigación Demográfica en México*, Mexico, Sociedad Mexicana de Demografía, Vol. I.

——— (1994b), "Una propuesta multidisciplinaria para el estudio de la esterilización femenina," *Estudios Demográficos y Urbanos*, Vol. 9, No. 1, pp. 105-128, Mexico, El Colegio de México.

—— (1996), "La práctica de los derechos humanos en la relación entre reproducción y salud," in C. García and H. Hernández (coords.), *Mortalidad, salud y discurso demográfico*, Mexico, Universidad Nacional Autónoma de México, pp. 45-78.

—— (1998), "Análisis ético del entorno de los servicios de salud en el ámbito de la reproducción," in Elisabete Dória and María Isabel Baltar (orgs.), *Saúde reprodutiva na América Latina e no Caribe: temas e problemas*, São Paulo, Brazil, Editora 34, pp. 67-98.

——, A. Cervantes, Y. Palma and R. Aparicio (1988), *Encuesta sobre Determinantes de la Práctica Anticonceptiva en México. Documento metodológico*, Mexico, DGPF, Secretaría de Salud.

——, B. Aguilar and G. Hita (1994), "Una aproximación al entorno de los derechos reproductivos a través de un enfoque de conflictos," *Estudios Sociológicos*, Vol. 12, No. 34, pp. 129-154, Mexico, El Colegio de México.

—— and Olga Rojas (2000), "La presencia de los varones dentro de los procesos reproductivos," in Beatriz Schmuckler (coord.), *Políticas públicas, equidad de género y democratización familiar*, Mexico, Instituto Mora, pp. 42-56.

Lamas, Marta (1990), "Las mujeres y las políticas públicas," *Fem.* 14, No. 86, pp. 7-14.

—— (1993), "La lucha por los derechos reproductivos," *Fem.* 17, No. 122, pp. 14-15.

Llera, Silvia (1990), "La práctica anticonceptiva en México: un atentado contra los derechos humanos de la mujer," Fourth National Meeting of Demographic Research in Mexico, México, El Colegio de México (unpublished).

Martínez Manautou, Jorge (1982), *La revolución demográfica en México*, Mexico, Instituto Mexicano del Seguro Social.

Miró, Carmen (1982), "Los derechos humanos y las políticas de población," Second National Meeting of Demographic Research in Mexico, Mexico, Conacyt, pp. 779-783.

Palma, Yolanda, Juan Guillermo Figueroa, Alejandro Cervantes and Carlos Echarri (1989), *Encuesta Nacional sobre Fecundidad y Salud 1987*, Columbia, Maryland, USA, DGPF, Secretaría de Salud/Institute for Resource Development Inc.

——, Juan Gillermo Figueroa and A. Cervantes (1990), "Dinámica del uso de métodos anticonceptivos en México," *Revista Mexicana de Sociología*, 52, No. 1, pp. 51-81.

Rojas, Olga, and Susana Lerner (2001), "Inventario de encuestas nacionales sobre salud reproductiva: 1990-2000," Working papers, Serie

Sexualidad, Salud y Reproducción, Mexico, Programa Salud Reproductiva y Sociedad, El Colegio de México.

Secretaría de Salud (1988), *Encuesta Nacional sobre Factores de Riesgo en la Anticoncepción Hormonal*, Vol. I, *Documento Metodológico*, Mexico, DGPF, Secretaría de Salud.

Tuirán, Rodolfo (1988), "Sociedad disciplinaria y anticoncepción," *Memorias de la reunión de avances y perspectivas de la Investigación Social en Planificación en México*, Mexico, Dirección General de Planificación Familiar, Secretaría de Salud, pp. 45-58.

——— (1994), "Satisfacción e insatisfacción con la esterilización femenina," *Memorias de la Cuarta Reunión Nacional sobre Investigación Demográfica en Mexico*, Mexico, Sociedad Mexicana de Demografía, Vol. I.

5. APPENDIX

Table 1
Percentage of Mexican Women who Use Contraceptive Methods,
1976-1997
(percentage distribution by method)

	Year					
Contraceptive method	1976	1979	1982	1987	1992	1997
The pill	35.9	33.0	29.7	18.2	15.3	10.0
IUD	18.7	16.1	13.8	19.4	17.7	20.8
Tubal ligation	8.9	23.5	28.1	36.2	43.3	44.7
Vasectomy	0.6	0.6	0.7	1.5	1.4	1.8
Injectables	5.6	6.7	10.6	5.3	5.1	4.6
Condoms	7.0	5.0	4.1	4.7	4.6	5.5
Spermicides and traditional methods (rhythm and withdrawal)	23.3	15.1	13.0	14.7	12.6	12.6
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: INEGI (Instituto Nacional de Estadística, Geografía e Informática), *Panorama socio-demográfico, Estados Unidos Mexicanos*. Mexico, 2000, p. 114. With data from the following surveys: Mexican Fertility Survey 1976, National Survey on Prevalence of Contraceptive Use 1979, National Demographic Survey 1982, National Survey on Fertility and Health 1987, National Survey on Demographic Dynamics 1992 and National Survey on Demographic Dynamics 1997.

VII. PARTICIPATION IN THE LABOR FORCE, WOMEN'S SOCIAL POSITION AND REPRODUCTIVE BEHAVIOR: AN ANALYSIS OF THE PROGRESS ACHIEVED TO DATE

Brígida García
Orlandina de Oliveira

1. INTRODUCTION

The aim of this article is to assess the conceptual and empirical advances regarding the relationship between women's participation in the labor market and their reproductive behavior in developing countries. In order to determine the importance of recent contributions, we have decided to provide a brief summary of the research undertaken before the 1980s. For both this stage and subsequent years, our analysis is not intended to be exhaustive but rather to show the areas of work we regard as most important or which have opened up the most significant and fruitful avenues. It is worth noting that although these areas of work, which warrant special consideration, are not always explicitly acknowledged, they have each influenced scientific knowledge in their own way, as well as population policy design.

In the various sections of this article, we have focussed on the main lines of theory and the most recurrent methodological concerns. We also identified the results we thought were most important for different regions and those that would enable us to increase existing knowledge. Finally, we would like to stress that

203

we always emphasize not only the way the direct relationship between economic activity and reproductive activity is conceived, quantified and interpreted, but also the framework of social relations in which it is immersed, especially as regards women's social position and their relationship with demographic change in the case of developing countries.[1]

2. RESEARCH ON FEMALE EXTRADOMESTIC WORK AND FERTILITY UNTIL THE LATE 1980s

Female participation in the labor market and its relation to fertility has always elicited a great deal of interest among scholars of human reproduction and those concerned with designing policies to modify them. Together with educational attainment, economic activity is probably the most widely used indicator to determine women's social position at various stages of socio-demographic research. Let us take a closer look at the challenges faced at two different times before the last decade of the 20th century.

a) Research in the 1960s and 1970s

Although the bibliography for this period is enormous, our task was facilitated by the existence of summaries covering precisely this period as well as subsequent years (see Mertens, 1972; Standing, 1978 and 1983; Youssef, 1982; Welti and Rodríguez, 1999). The main research problem at this time was to establish a *causal* relationship between extradomestic work and fertility that was partly made possible by the use of contraceptives. This concern arose partly as a result of the demographic policy proposal that gave

[1] The relationship between labor participation, women's social position and demographic behavior has been a constant concern throughout our careers in research (see, for example, García and Oliveira, 1977, 1984 and 1988). In this article, we begin by re-working some of the proposals that have already been put forward and then complement them with an analysis of the most recent bibliography, which includes our current research.

rising levels of women's participation in the job market an important role in the reduction of Third World fertility. Nevertheless, the studies undertaken proved the difficulty of establishing this causal relationship. It is worth indicating the points of departure and what in our view constitute the main findings in this respect.

1. The basic negative relation that was usually posited between participation in the job market and fertility failed to be confirmed at all times and in all places. A major feature of many of the articles on this issue, as well as of existing summaries, is their tendency to regard this result as a dilemma, ambiguity or lack of clarity. Although several studies are aware that the lack of uniformity of results may be due to methodological problems — such as the cross-sectional nature of the data generally used, together with the lack of adaptation of the statistical indicators and methods — surprisingly little importance has been given to the diversity of situations and countries. This diversity refers to women's incorporation into the labor force and to their fertility levels, as well as to economic, social, cultural and demographic aspects.[2]

2. The theoretical and methodological approaches that guided much of this research often failed to clarify the direction of the relation or reduced its significance to a balance between costs and benefits. In the case of the incompatibility between the role of workers and mothers, the scheme may operate in either direction. In other words, it may lead women to use contraceptives and modify their fertility because they wish to work or to look for a job that is compatible with fertility. These mechanisms were not studied in most cases, since the conjectures concerning incompatibility were usually offered as an interpretative reason, and therefore failed to clarify the supposedly causal relationship between work and fertility (Kupinsky, 1977; Standing, 1983).

The rational, economic deliberation behind the economic model of maximizing profits between labor participation and fertility was and continues to be subject to major criticisms. Initially, individuals were characterized as having complete freedom of

---

[2] Unlike the international situation described earlier, the negative relationship between extra-domestic labor and fertility in Mexico was confirmed by several authors during this period (see García España, 1982, and Urbina *et al.*, 1984).

choice, as regards both the labor market and the number of off-spring they wished to have. This analysis failed to incorporate macro-structural or institutional elements of an economic, political or socio-cultural nature that condition and permit individuals' actions. Nor did it consider changes in the labor market or the specificity of the fertility transition in developing countries. Researchers also failed to question the view of men and women who share ideals of family size in households regarded as homogeneous units (Blake, 1968; Clacso, 1974; Leibenstein, 1977; McNicoll, 1980; Przeworski, 1982).

3. Despite these limitations, empirical research conducted during this period made it possible to specify the link between economic activity and fertility in two important ways:

— By highlighting the importance of the type of work performed by women in societies with a prevailing productive heterogeneity, where the separation between house and workplace does not exist in many rural and urban situations. Several studies support the position that lower fertility was only observed among women who performed non-familial, salaried, non-agricultural, modern work "far away from home." There are certainly fewer discrepancies regarding this point, despite the different ways of conceptualizing and measuring the type of employment in question (Mertens, 1972; García and Oliveira, 1977; Kupinsky, 1977; Youssef, 1982; Standing, 1983; Welti, 1989).

— By stressing the need to specify the time reference of work, fertility and possible mutual relations. Many authors were already aware that a woman's current job was probably not what exerted the greatest influence on her reproductive life, although they often lacked the necessary longitudinal information. Standing (1983: 422) pointed out that the studies that sought to link current employment to fertility were the least successful in establishing the direction of the causal link. Within the framework of this discussion, there was considerable support for the suggestion that the incorporation of women's *work experience* prior to or after her marriage or union could at least partly offset the problem of the time sequence between events. Likewise, it was though that the effect of job experience on age at marriage might

be an important, albeit indirect way in which women's extrado-
mestic work could influence her fertility (see the summaries of ar-
ticles on this issue in Standing, 1983).

*b) Analytical Advances in the 1980s: Extradomestic Work, Fertility
and Contraceptive Use from a Comparative International Perspective*

Certain empirical studies on the determinants of fertility during
this period, as in previous ones, were similarly concerned with
clarifying the direction of the link between labor activity and fer-
tility and determining its scope. Nevertheless, we feel that some
of the limitations mentioned earlier were at least partly offset,
particularly as regards the lack of comparability between data,
the type of statistical analysis used and the causal structure
adopted. The advances were partly due to the availability of data
from various fertility survey programs, which made it possible to
undertake comparable analyses for several developing countries
in Africa, Asia, Latin America, the Caribbean and Oceania. Other
contributing factors included the knowledge accumulated on
the issue, the criticism of previous forms of analysis and the
development of theoretical perspectives that sought to incorpo-
rate hypotheses regarded as alternatives into a broader interpre-
tative framework.

The availability of a wide range of basically comparable socio-
economic and demographic information for women and their
spouses in several countries permitted the application of multi-
variate statistical models, which in turn made it possible to quan-
tify the net effect of extradomestic work on fertility by controlling
the influence of a series of other determinants regarded as
theoretically relevant. Thus, for example, Rodríguez and Cleland
(1981) and the United Nations study (1987) take the rural or ur-
ban nature of the place of residence, the woman's education and
the spouse's occupation into account. Rodríguez and Cleland (1981)
also examine the importance of education and position in the
spouse's occupation and establish a causal hierarchy between
the various socioeconomic determinants and analyze both the ad-
ditive and interactive effects of the various factors.

The United Nations study (1987) considers the importance of socio-demographic features such as age, duration and continuation of first marriage and includes macro-social determinants in the analysis by examining the way the relation between extra-domestic work and fertility varies according to certain structural characteristics of countries (such as the level of development, women's social position and the nature of family planning programs). The inclusion of these determinants made it possible to lend specificity to the link studied, which constituted a considerable advance over previous studies which expected to find similar results in socio-cultural and historical contexts as dissimilar and heterogeneous as those in developing countries. This United Nations study also investigated the use of contraceptives by women with different types of occupation through a multivariate analysis that made it possible to control other socio-economic factors that determine birth control. The results reported in previous studies, as well as in the article by Safilios Rothschild (1988) made it possible to advance in empirical knowledge of the issue for several developing countries (including Mexico) in the following respects:

1. In the group of countries analyzed, no significant differences were found between the fertility of women who participated in the labor market and those who did not. Once again, this confirmed the fact that the link is actually established between the type of work performed by the woman — which can be measured in different ways — and fertility. This statement was proved during these years for 24 of the 31 countries included in the United Nations study (1987) where women who worked before or after getting married in modern occupations (i.e. professional or technical) tended to have lower fertility rates than those in the traditional sector (agriculture) or those that did not work. These differences were ratified in the Rodríguez and Cleland study (1981), where the effect of women's position at work (whether salaried or non-salaried) on marital fertility remained significant in 19 of the 27 populations studied after controlling for all the other variables included in the model. Finally, there were similar indications in Safilios Rothschild (1988), which takes into account the percen-

tage of women in the total number of paid workers in 77 develop-
ing countries, regarded by this author as an indicator of women's
higher position in society.

2. Scholars proved the importance of the degree of develop-
ment, the position achieved by women in society and the exis-
tence of family planning programs in understanding the link be-
tween female economic activity and fertility. The United Nations
study (1987), which quite clearly includes the contextual setting,
only found a consistently strong negative association between
employment in the modern sector and fertility among the most
developed countries of Asia, Latin America and the Caribbean,
since this was not the case in Africa. The same study also reported
that the link between occupation in the modern sector and fertil-
ity was clearer in countries where women had a higher position
(greater exposure to education and higher age at first union) and
where there were strong family planning programs.[3]

3. Progress was made as regards knowledge of the direction
of the link between economic participation and fertility, although
once again results were both indirect and insufficient in this re-
spect. It was suggested that the negative statistical link found be-
tween this type of data was due more to the influence of fertility
on extradomestic work, since no significant differences were found
in the use of contraceptives among women who engaged in
modern or traditional occupations and those who did not work.[4]
Nevertheless, the authors were always aware of the different time
of reference involved in the use of contraceptives, work and fer-
tility. In other words, despite the greater methodological and tech-
nical rigor of these cross-sectional studies, one of the problems
found in previous years persisted, namely the need to locate the

[3] These data on contextual aspects are extremely important in the case of
Mexico. Unfortunately, certain multivariate analyses of reproductive behavior
in Mexico undertaken during this period failed to include female work in their
explanatory schemes (see, for example, Potter, Mojarro and Hernández, 1986, and
Welti and Macías, 1986).

[4] In the case of Mexico, there are several studies with cross-sectional infor-
mation that have regarded it as being more appropriate to analyze the effect of
fertility on participation in the labor market as a starting point (see Mier y Terán,
1992; García and Oliveira, 1994, and the discussion summarized in Welti and
Rodríguez, 1999).

moment of economic activity, fertility and mutual relations in women's life cycle.[5]

3. FEMALE EXTRADOMESTIC WORK, WOMEN'S SOCIAL POSITION AND REPRODUCTIVE BEHAVIOR: THE LATEST THEORETICAL AND METHODOLOGICAL ADVANCES

The past few decades have seen the consolidation of various lines of work whose conceptual reflection and empirical analyses have helped clarify the link between female labor participation and reproductive behavior in various social contexts. The most important of these is perhaps the one that focuses on gender inequalities and the link between women's social position and its impact on demographic change. In the previous approach, a transformation of the female social position is seen as an aspect that can *facilitate* the transition to low fertility in the presence of other factors such as a population policy oriented towards family planning, or as an aspect that can condition the impact that other changes may have on demographic behavior. The features of patriarchal societies that are assumed to hamper population change include the benefits that men obtain from women's and children's work, women's financial dependence and therefore the valuation of male offspring as insurance against the risk of widowhood or abandonment or the valuation of motherhood in general as a source of legitimacy, security and satisfaction (see, among others, Cain *et al.*, 1979; Safilios Rothschild, 1980; Caldwell, 1982; Youssef, 1982; Oppong, 1983; Standing, 1983; Boserup, 1985; Cain, 1988; and the analysis and bibliographical systematization in Oppenheim Mason, 1984 and 1995). Some of the authors begin with the premise that these concerns with gender systems and women's subordinate position have not been a central aspect of most of the theories on the transition to fertility but instead have been present in certain major trends in demographic thought, such as those rep-

---

[5] Rodríguez and Cleland's study (1981) analyzed fertility during the previous five years, a procedure that partially offset the problem of the different time frames of the various events.

resented by Caldwell, 1982; Cain, 1982; Dyson and Moore, 1983, and Safilios Rothschild, 1980, 1982 (see Oppenheim Mason, 1984).

In the context of these reflections, a great deal of emphasis is placed not only on the need to clarify what is understood by *women's social position or status* (and also on by related concepts, such as *autonomy and empowerment*) but also on the design and taking of surveys containing specific aspects regarded as crucial to the design of indicators in this respect.[6] In particular, researchers explicitly question whether female labor participation in any form or place (or greater educational achievement) necessarily involves the level of autonomy and power required to achieve changes in reproductive behavior. The authors note, for example, that in certain Asian countries higher educational achievement is not necessarily associated with greater independence in household decision-making. This is due to the fact that in the Islamic world women with a higher level of educational achievement are restricted within their homes, and therefore have fewer possibilities of deciding on central aspects of their lives. Likewise, in many societies, female extradomestic work does not necessarily mean that women are more independent than men, since they sometimes do not control the money they earn or automatically hand it over to their husbands or mothers-in-law (see Oppenheim Mason, 1995). Thus employment and educational achievement are increasingly regarded as *indirect* referents — often called "proxies" in the scientific bibliography in English — of women's social position, autonomy or empowerment, with more time and effort being devoted to the design of *direct* indicators. Some of the *direct* indicators with the greatest support are: women's participation in household decisions; freedom of movement; female access to financial resources; absence of domestic violence; favorable attitudes to gender equity and, finally, a se-

[6] See García (2003), which contains a detailed account of the principal differences between these concepts. The term *women's position or status* refers mainly to a gender stratification, which has to do with the control of various types of resources or the occupational prestige that differentiates men from women. The interpretation of *autonomy* that we regard as the most appropriate refers to personal or group independence and acting in according with one's personal interests. Finally, the concept of *empowerment* refers to the questioning of power and the search to control the various types of resources. It is essential to note that not all scholars agree with these interpretations and that during the following sections we respect each author's choice of terms.

ries of aspects related to choice of spouse, couple formation and the household (see García, 2003).

These proposals contribute to the advance of this field of study in at least two ways: *a)* they reaffirm the idea that the relation between women's participation in the labor market and social position constitutes a question open to research, through which it is possible to determine the meaning and significance of the latter in different historical and cultural circumstances;[7] *b)* they help explain and show the complexity of the network of relations and aspects that should be borne in mind when attempting to determine the possible influence of economic activity on women's social position and their reproductive behavior. We shall now examine some of the results of recent research with these points in mind:

1. Various quantitative studies with an enormous amount of information on economic activity and specific aspects of women's social position show that the link between these aspects may in fact be diverse and multidimensional. For example, in the case of Asia, Niraula and Morgan (2000), who analyze various rural communities in Nepal, do not always find a significant relationship between women's labor participation and certain key variables referring to female autonomy (measured by their participation in household decision-making and freedom of movement). These authors state that the results regarding employment were the only ones that did not fit their hypothesis, in which they posited that salaried work would increase women's power in household decision-making. Since this is not always the case, they cite the importance of the socio-cultural context and the prevailing gender system in being able to determine the effect of economic activity on autonomy, in addition to bearing in mind the type of employment available, the structure of work routines, and the degree of control women have over their salaries (see Niraula and Morgan, 2000).

In other studies carried out in the Asian context, neither female economic activity nor educational attainment show consistent links with female autonomy. In her study on women's status

[7] The debate over the repercussions of the economic activity of women on the female social condition is very broad (see Ariza and Oliveira, 2002, for an analysis of the various existing positions).

in various rural contexts in India, Jejeebhoy (2000) reaches the conclusion that in these contexts, schooling and female labor participation may be weak proxies of female autonomy (measured by variables such as women's authority in decision-making, their mobility and freedom from threats from their spouses and their access to and control of economic resources). In a subsequent study comparing rural communities in India and Pakistan, Jejeebhoy and Sathar (2001) cite the lack of a systematic association between female economic participation (as well as educational attainment) and women's autonomy, although they note that in contexts with relatively egalitarian gender systems — as in the case of the south of India — greater educational attainment and, to a lesser extent, salaried female economic activity during the previous year may be good predictors of a greater level of autonomy.

As for the case of Mexico, studies have shown that participation in the work force influences at least some of the aspects generally associated with female autonomy. Casique (2001) analyzed the impact of women's economic activity nationwide until the mid-1990s on three main aspects: power in household decision-making, autonomy as regards freedom of movement and males' contribution to household tasks. The clearest results were obtained in the case of autonomy or freedom of movement, since wives who had joined the work force (in the week prior to the survey) always showed significantly higher levels of mobility and were not obliged to ask for permission to leave the house, compared with those who were exclusively dedicated to household tasks (bearing in mind an important set of sociodemographic control variables). Results were not consistent, however, in the case of the other dimensions, such as power and male participation in household tasks.[8]

---

[8] In a subsequent study (Casique, 2003), this author modifies her analytical scheme and seeks to determine the impact of female extradomestic work and empowerment (decision-making and freedom of movement) on domestic violence and men's participation in child care. The author initially found that work and greater decision-making placed women at a greater risk of violence. These effects, however, tended to disappear when they are incorporated into variable statistical models referring to the history of violence in childhood experienced by either member of a couple and to male infidelity.

In addition to these substantial findings, Casique has explored the possibly endogenous or circular nature of the relation between extradomestic work at a particular moment in time and different measures of female power and autonomy. In the first study mentioned (Casique, 2001) the author helped clarify this problem by using an additional variable of female labor participation (participation in the prevailing economic activity in the interviewee's community of residence).[9]

In a recent study (García and Oliveira, 2004) of two of the main metropolitan areas in the country (Mexico City and Monterrey), the authors of this article demonstrated the importance of female economic participation in explaining a broader set of aspects linked to the prevailing gender relations in households. In this analysis, we began with the need to continue providing alternatives to the problem of endogeneity or circularity mentioned earlier and to use women's *work experience* during their married lives or as part of a couple as a key aspect that might have influenced their position and relations within households at the time the information was gathered. The results are thought-provoking, since they suggest that work experience was the only aspect of extra-domestic work that significantly contributed to explaining women's greater presence in household decision-making and freedom of movement, as well as the husband's participation in reproductive work and the absence of domestic violence. Being engaged in professional or technical employment and contributing to the family budget also proved to be significant aspects, although not in all the aspects of analysis considered. In short, in the case of Mexican metropolitan areas (and also, to a certain extent, for the country as a whole) there is more evidence than in Asian countries (rural areas) that women's economic activity can influence at least some of the aspects usually associated with their social position.

2. As for the explanation of reproductive behavior, the set of reasons and evidence analyzed here poses various challenges for the design of research that seeks to determine the type of influence that women's labor participation and social position may exert on demographic change. In general, authors can be said to

[9] As we saw earlier, this is a recurrent methodological problem that also occurs when the link between economic participation and fertility is examined.

be increasingly interested in determining the economic and non-economic aspects that contribute most to the explanation of female autonomy and reproductive behavior, as well as in its direct measurement. As for economic aspects, in addition to the type, nature, duration of work participation, female contribution to the family budget and women's participation in important economic decisions, authors have striven to specify certain aspects such as access to and control of any economic resources and the degree to which women feel secure or dependent in this sphere of their personal or family life (see, for example, Balk, 1994; Schuler and Hashemi, 1994; Morgan and Niraula, 1995; Oppenheim Mason and Smith, 1999; Kishor, 2000a; Kritz *et al.*, 2000, Morgan *et al.*, 2002; Kulczycki and Juárez, 2003, and the analysis and bibliographical systematization carried out in García, 2003).[10]

Some of the studies show that the so-called direct indicators of female autonomy (such as women's participation in household decision-making, their freedom of movement and financial contribution to the family budget) may have a significant effect on explaining the number of children a woman has, the desire to have more children and the use of contraceptives (Balk, 1994; Morgan and Niraula, 1995; Kishor, 2000a; Kritz *et al.*, 2000; Oppenheim Mason, 1995). They have also proved the importance of socio-economic aspects (participation in the labor force and educational attainment) on reproductive life in explanatory schemes that take various elements into account, i.e. direct and indirect factors, to use the terminology mentioned earlier (see, for example, Schuler and Hashemi, 1994; Kritz *et al.*, 2000). In these cases, one can posit that economic activity empowers women to achieve other changes or that female autonomy is the route that links socio-economic aspects and reproductive behavior.[11] Nevertheless, the previous panorama would not be complete if we did not also mention that there are studies where neither female autonomy nor socio-economic factors have proved useful in explaining reproductive be-

[10] It is also important to note that major efforts are being made in this respect in the field of child survival (see Kishor, 2000b, and Durrant and Sathar, 2000).

[11] From this perspective, there are those who suggest that the interaction between a person's employment status and the stage of family formation is significant. In other words, working women would tend to begin to use modern contraceptives earlier than non-working women (see Kulczycki and Juárez, 2003).

havior (see Morgan *et al.*, 2002, in their search for explanations of higher fertility levels among Muslim women in Southeast Asia).

Many of the studies mentioned earlier take into account the effects of variables at the individual and contextual level in explaining the variations in reproductive behavior, which reflects the well-known idea that the influence of social institutions and gender systems can be better understood in the contextual sphere (see Oppenheim Mason, 1995; Jejeebhoy, 2000, and the aforementioned results of studies carried out during the1980s). From this perspective, studies examine the role of the various regions, types of communities or contexts where more or less egalitarian relations or gender systems prevail. Once again, the results of these analyses do not point in the same direction. To offer just two contrasting examples: on the one hand, there is Balk's study (1994) on Bangladesh, which concludes that the effects of autonomy are more obvious in contexts that are more clearly characterized by more liberal gender relations. Conversely, Kritz *et al.* (2000), find that socio-economic features and female autonomy have the strongest effect on the demand for offspring in contexts where there is little gender equity, such as Nigeria, where the most highly educated women who also engage in paid employment are pioneers in the adoption of new reproductive ideas.

4. Final Considerations

The theoretical and methodological discussions we have carried out allow us to state that the relationship between female economic activity and reproductive behavior can take place in several directions, be sequential throughout the course of women's lives and fluctuate according to the socio-economic, demographic and cultural features of the contexts analyzed. All the authors agree that this is a complex relationship that forms part of broader processes conditioned by numerous factors, understanding which requires more inclusive theoretical schemes, which should be complemented by various levels and strategies of analysis.

Of the progress achieved to date, we would like to stress the need to *study* rather than to *assume* various types of phenomena

and processes. By this we mean both the macro-structural and the institutional factors and the way they act on the dynamics of labor markets, gender relations and the organization of family life, and the way in which these aspects, in turn, configure the available options as regards work, women's social position and reproductive behavior.

Coping with these challenges requires more research that will combine the use of statistical models with the study of the actors' subjective representations (women, men, couples and other relatives). Structural and institutional factors do not act mechanically on subjects and it is essential to know more about the way in which they help to transform actors' value orientations and preferences and permit changes in their behavior. Studies on perceptions and meanings will contribute to discovering rather than assuming guidelines and choices in this field of study.

In methodological terms, cross-sectional analyses should be complemented by longitudinal ones. There is no doubt that in the past, cross-sectional analyses of the relationship between economic activity and fertility have permitted enormous advances in the knowledge of the phenomenon. These could be enhanced if studies considered additional aspects of fertility and child-raising practices, and extra-domestic work, some of which have already been incorporated into the most recent fertility survey programs. It is, however, necessary to stress the need to analyze longitudinal information that will enable researchers to study the relation between economic activity and women's social position and reproductive behavior throughout the course of their lives.

5. REFERENCES

Ariza, Marina, and Orlandina de Oliveira (2002), "Cambios y continuidades en el trabajo, la familia y la condición de las mujeres," in Elena Urrutia (coord.), *Estudios sobre las mujeres y las relaciones de género en México: aportes desde diversas disciplinas*, Mexico, PIEM, El Colegio de México, pp. 43-86.

Balk, Deborah (1994), "Individual and Community Aspects of Women's Status and Fertility in Rural Bangladesh," *Population Studies*, No. 48, pp. 21-45.

Blake, Judith (1968), "Are Babies Consumer Durables?," *Population Stud-ies*, No. 22, pp. 5-25.

Boserup, Esther (1985), "Economic and Demographic Interrelationships in Sub-Saharan Africa," *Population and Development Review*, No. 3, September, pp. 383-397.

Cain, Mead (1982), "Perspectives on Family and Fertility in Developing Countries," *Population Studies*, No. 36, July, pp. 59-75.

――― (1988), "Patriarchal Structure and Demographic Change," *Con-ference on Women's Position and Demographic Change in the Course of Development*, Oslo, International Union for the Scientific Study of Population (IUSSP), pp. 19-41.

―――, Syeda Rokeya Khanam and Shamsun Nahar (1979), "Class, Pa-triarchy, and Women's Work in Bangladesh," *Population and Devel-opment Review*, Vol. 5, No. 3, pp. 405-438.

Caldwell, John C. (1982), *Theory of Fertility Decline*, London, Academic Press.

Casique, Irene (2001), *Power, Autonomy and Division of Labor in Mexican Dual-Earner Families*, Lanham, New York, Oxford, University Press of America.

――― (2003), "Trabajo femenino, empoderamiento y bienestar de la familia," in *Nuevas formas de familia. Perspectivas nacionales e internacionales*, Montevideo, Universidad de la República and Fondo de las Naciones Unidas para la Infancia (UNICEF), pp. 271-299.

Clacso (1974), *Reproducción de la población y desarrollo, I*, São Paulo, Consejo Latinoamericano de Ciencias Sociales.

Durrant, Valerie L., and Zeba Sathar (2000), *Greater Investments in Chil-dren through Women's Empowerment: a Key to Demographic Change in Pakistan?*, New York, Policy Research Division Working Papers, The Population Council.

Dyson, Tim, and Mick Moore (1983), "On Kinship Structure, Female Au-tonomy, and Demographic Behavior in India," *Population and Devel-opment Review*, No. 9, March, pp. 257-270.

García, Brígida (2003), "Empoderamiento y autonomía de las mujeres en la investigación sociodemográfica actual," *Estudios Demográficos y Urbanos*, Vol. 18 (2), May-August, pp. 221-253.

――― and Orlandina de Oliveira (1977), "Reflexiones teórico metodo-lógicas sobre el estudio de las relaciones entre el trabajo de la mujer y la fecundidad en la Ciudad de México," *Memorias de la Primera Reunión Nacional de Investigación Demográfica en México*, Mexico, Consejo Nacional de Ciencia y Tecnología, pp. 277-293.

――― and Orlandina de Oliveira (1984), "Mujer y dinámica poblacio-

nal en México," *Encuentro*, Vol. 2, No. 1 (5), October-December, pp. 75-107.

————— and Orlandina de Oliveira (1988), "Participación económica femenina y fecundidad: aspectos teóricos y metodológicos," *Memoria de la Reunión sobre Avances y Perspectivas de la Investigación Social en Planificación Familiar en México*, Mexico, Dirección General de Planificación Familiar, Secretaría de Salud, October, pp. 191-196.

————— and Orlandina de Oliveira (1994), *Trabajo femenino y vida familiar en Mexico*, Mexico, El Colegio de México.

————— and Orlandina de Oliveira (2004), "Trabajo extradoméstico femenino y relaciones de género: una nueva mirada," *Estudios Demográficos y Urbanos*, 18 (1), January-April, pp. 145-180.

García España, Felipe (1982), "Algunos diferenciales de la fecundidad en México," *Lecturas en materia de seguridad social. Planificación familiar y cambio demográfico*, Mexico, IMSS, pp. 489-504.

Jejeebhoy, Shireen (2000), "Women's Autonomy in Rural India: Its Dimensions, Determinants and the Influence of Context," in Harriet B. Presser and Gita Sen (eds.), *Women's Empowerment and Demographic Processes*, Oxford, Oxford University Press, pp. 204-238.

————— and Zeba A. Sathar (2001), "Women's Autonomy in India and Pakistan: The Influence of Religion and Region," *Population and Development Review*, 27 (4), pp. 687-712.

Kishor, Sunita (2000a), "Women's Contraceptive Use in Egypt: What Do Direct Measures of Empowerment Tell Us?," paper delivered at the Annual Meeting of Population Association of America (PAA).

————— (2000b), "Empowerment of Women in Egypt and Links to the Survival and Health of Their Infants," in Harriet B. Presser and Gita Sen (eds.), *Women's Empowerment and Demographic Processes. Moving Beyond Cairo*, Oxford, Oxford University Press, pp. 119-156.

Kritz, Mary M., Paulina Makinwa-Adebusoye and Douglas T. Gurak (2000), "The Role of Gender Context in Shaping Reproductive Bahaviour in Nigeria," in Harriet Presser and Gita Sen (eds.), *Women's Empowerment and Demographic Processes. Moving Beyond Cairo*, Oxford, Oxford University Press, pp. 239-260.

Kulczycki, Andrzej, and Lucía Juárez (2003), "The Influence of Female Employment and Autonomy on Reproductive Behaviour in Egypt," in Brígida García, Richard Anker and Antonella Pinnelli (eds.), *Women in the Labour Market in Changing Economies: Demographic Issues*, Oxford, Oxford University Press, pp. 314-330.

Kupinsky, Stanley (1977), "The Fertility of Working Women in the United States: Historical Trends and Theoretical Perspectives," in Stanley

Kupinsky (ed.), *The Fertility of Working Women. A Synthesis of International Research*, New York, Praeger Publishers, pp. 188-249.

Leibenstein, Harvey (1977), "Beyond Economic Man: Economics, Politics, and the Population Problem," *Population and Development Review*, Vol. 3, No. 3, September, pp. 183-199.

McNicoll, Geoffrey (1980), "Institutional Determinants of Fertility Change," *Population and Development Review*, Vol. 6, No. 3, pp. 441-462.

Mertens, Walter (1972), "Investigación sobre la fecundidad y la planificación familiar en América Latina," in *Conferencia Regional Latinoamericana de Población, Actas*, No. 1, Mexico, pp. 193-235.

Mier y Terán, Martha (1992), "Descenso de la fecundidad y participación laboral femenina en México," *Notas de Población*, No. 56, pp. 143-171.

Morgan, S. Philip, and Bhanu B. Niraula (1995), "Gender Inequality and Fertility in Two Nepali Villages," *Population and Development Review*, Vol. 21, pp. 541-561.

————, Sharon Stash, Herbert L. Smith and Karen Oppenheim Mason (2002), "Muslim and Non-Muslim Differences in Female Autonomy and Fertility: Evidence from Four Asian Countries," *Population and Development Review*, Vol. 28, No. 3, pp. 515-537.

Niraula, Bhanu B., and S. Philip Morgan (2000), "Gender Inequality in Two Nepali Settings", Brígida García (ed.), *Women, Poverty, and Demographic Change*, Oxford, Oxford University Press, pp. 42-72.

Oppenheim Mason, Karen (1984), *The Status of Women. A Review of its Relationships to Fertility and Mortality*, Michigan, The Rockefeller Foundation.

———— (1988), "The Impact of Women's Position on Demographic Change During the Course of Development: What Do We Know?," paper delivered at the IUSSP Conference on the Position of Women and Demographic Change in the Course of Development, Asker (Oslo), Norway, 15-18 June.

———— (1995), *Gender and Demographic Change: What do we Know?* Liège, International Union for the Scientific Study of Population (IUSSP).

———— and Herbert L. Smith (1999), "Female Autonomy and Fertility in Five Asian Countries," paper delivered at the Annual Meeting of Population Association of America (PAA).

Oppong, Christine (1983), "Women's Roles, Opportunity Costs, and Fertility," in Rodolfo Bulatao and Ronald D. Lee, *Determinants of Fertility in Developing Countries: A Summary of Knowledge*, Washington, D.C., National Academy Press, pp. 439-473.

Potter, Joseph, Octavio Mojarro and Daniel Hernández (1986), "Influencias de los servicios de salud en la anticoncepción rural de México,"

paper delivered at the *III Reunión Nacional sobre la Investigación Demográfica en México*, Mexico, Sociedad Mexicana de Demografía and El Colegio de México, November 3-6.

Przeworski, A. (1982), "Teoría sociológica y el estudio de la población: reflexiones sobre el trabajo de la Comisión de Población y Desarrollo de Clacso," *Reflexiones teórico-metodológicas sobre las investigaciones en población*, Mexico, El Colegio de México.

Rodríguez, Germán, and John Cleland (1981), "Socio-Economic Determinants of Marital Fertility in Twenty Countries: A Multivariate Analysis," *World Fertility Survey Conference 1980. Record of Proceedings*, Vol. 2, London, July 7-11, pp. 337-422.

Safilios Rothschild, Constantina (1977), "The Relationship Between Women's Work and Fertility: Some Methodological and Theoretical Issues," in Stanley Kupinsky (ed.), *The Fertility of Working Women. A Synthesis of International Research*, New York, Praeger Publishers.

———— (1980), "A Class and Sex Stratification Theoretical Model and Its Relevance for Fertility Trends in the Developing World," in C. John and R. Rachensen (eds.), *Determinants of Fertility Trends: Theories Re-Examined*, Liège, Ordina Editors, pp. 189-202.

———— (1982), "Female Power, Autonomy and Demographic Change in the Third World," Richard Anker *et al.* (eds.), *Women's Role and Population Trends in the Third World*, London, International Labour Organisation (ILO), pp. 117-132.

———— (1988), "Women's Income Profile as a Key Indicator of the Status of Women for the Understanding of Changing Fertility Behaviour," paper delivered at the Conference on Women's Position and Demographic Change in the Course of Development, Asker (Oslo), June 15-18.

Schuler, Sidney Ruth, and Syed M. Hashemi (1994), "Credit Programs, Women's Empowerment and Contraceptive Use in Rural Bangladesh," *Studies in Family Planning*, Vol. 25, No. 2, pp. 65-76.

Standing, Guy (1983), "Women's Work Activity and Fertility," in Rodolfo Bulatao and Ronald D. Lee (eds.), *Determinants of Fertility in Developing Countries: A Summary of Knowledge*, Washington, D.C., National Academy Press, pp. 416-438.

———— (1978), *Labour Force Participation and Development*, Geneva, International Labour Office.

United Nations (1987), "Women's Employment and Fertility," *Fertility Behavior in the Context of Development. Evidence from the World Fertility Survey*, New York, pp. 255-280.

Urbina Fuentes, Manuel, Yolanda Palma Cabrera, Juan Guillermo Figueroa Perea and Patricia Castro Morales (1984), "Fecundidad,

anticoncepción y planificación familiar en México," *Comercio Exterior*, Vol. 34, No. 7, pp. 647-666.

Welti, Carlos (1989), "Participación económica femenina y fecundidad en el área metropolitana de la Ciudad de México," in Jennifer Cooper *et al.*, *Fuerza de trabajo femenina urbana en México*, Vol. I: *Características y tendencias*, Mexico, Coordinación de Humanidades, Universidad Nacional Autónoma de México (UNAM) and Grupo Editorial Miguel Ángel Porrúa, pp. 187-217.

——— and Beatriz Rodríguez (1999), "Trabajo extradoméstico femenino y comportamiento reproductivo," in Brígida García (coord.), *Mujer, género y población en México*, Mexico, El Colegio de México, pp. 317-362.

——— and Héctor Macías (1986), "Ideales de fecundidad y uso de anticonceptivos en México: evidencias empíricas," talk given at the *III Reunión Nacional sobre la Investigación Demográfica en México*, Mexico, Sociedad Mexicana de Demografía (SOMEDE), and El Colegio de México, November 3-6.

Youssef, Nadia H. (1982), "The Interrelationship between the Division of Labour in the Household, Women's Roles and their Impact on Fertility," in Richard Anker *et al.* (eds.), *Women's Role and Population Trends in the Third World*, London, International Labour Organisation (ILO), pp. 173-201.

VIII. SCHOOL DROPOUT RATES, ADOLESCENT LABOR AND FAMILY STRUCTURES IN MEXICO

Silvia E. Giorguli Saucedo

1. INTRODUCTION

Mexico experienced important gains in its social indicators during the second half of the last century. Among the principal attainments in education were the rapid increase of the literate population and the increase in children's attendance of elementary school. However, during the 1990s, just after attaining almost universal attendance at the elementary level and an average of six years of education, there was a slowdown in educational advancements. At present, there are new concerns regarding the topic of education within the Mexican context. Half the children are leaving school early during adolescence (before they turn 17) while dropping out from school coincides for many, particularly boys, with entry into the labor force. In a way, this process of leaving school and working during adolescence points to the fact that Mexican children are experiencing an early transition into adulthood, from the point of view of the normative standards of at least nine years of compulsory education for all children, as established in Mexican law, and because this sometimes occurs at an age when working is illegal (before age 14). This also implies that both transitions (leaving school and entering the labor force) cannot be separated and, on the contrary, should be studied together. The main goal of this paper is to contribute to the understanding of these transitions during adolescence.

Earlier studies have focused on the effect on people's lives of the repeated economic crises of the last two decades. Studies on survival strategies and family adaptation to the decline in real income have observed the use of adolescent labor as a means of compensating for the need for additional income and have implied that adolescent children, mainly boys, may be taken out of school in order to work (González de la Rocha, 1991 and 1997; Benería, 1992). For girls, the story is slightly different. Girls' participation in the labor market is not mentioned as a household strategy as frequently as it is for boys. Within this research line, the explanation for girls' leaving school early has focused on their greater participation in domestic tasks as a result of adult women's more frequent engagement in non-domestic jobs.

Families become the intermediary between young adolescents and the socioeconomic context. In the first place, family characteristics define their socioeconomic status, their access to educational opportunities and the possibility of delaying their entry into the labor force. However, the family also influences other aspects involving transitions out of school and into the labor force. The family context defines educational expectations (of parents and adolescents), learning environments, the social and human capital available to adolescents, expectations regarding gender roles and access to labor networks. Aside from the socioeconomic resources within households, family characteristics determine the use and distribution of such resources among all family members. This research incorporates this other perspective of family studies that has sometimes been overlooked in Mexican social studies based on economic determinism. Recent studies prove the need for new explanations, where the analysis of family characteristics beyond socioeconomic factors may be promising. In fact, recent data suggest that motivational factors, educational expectations and the learning environment may play an important role in adolescents' school attendance. For example, recently released national statistics show that adolescents do not mention their engagement in domestic or non-domestic work as the main reason for leaving school (INEGI, 2000a). "Do not want to study anymore" was the most frequent response among Mexican adolescents regarding the reasons for dropping out of school.

Based on these concerns, the specific research question in this paper can be summarized as follows: how is the enrollment and labor status of adolescent children linked to the organization and characteristics of their families? To explore the link between adolescents' activities and their families, the study recovers two dimensions of family organization. It considers the potential effect of the absence of one or both parents and of the working status of mothers.[1] Different case studies have suggested that the absence of one or both parents may be related to poverty, the loss of social capital and a downward trend in educational expectations as a result of the disruptions caused in intact households. This research looks at the effect of co-residence status relative to the parents, distinguishing whether the father, the mother or both do not live in the same household as the adolescent.

In the 1980s, Mexico experienced a rapid increase in female labor participation rates. Although mothers still tend to work less often than women with no children, the rate of increase of mothers' participation has been greater than for other groups. The novelty of mothers' entry into the labor force has raised concern over the potential impact on children, especially regarding the health status of young children (Stern, 1996). This study explores the impact of mothers' work on adolescents' lives and, specifically, on the probabilities of enrollment and working of adolescent children.

One more element to consider is the gendered aspect of the transition out of school and into the labor force. While there are few gender differences in school attendance among the younger Mexican generations, the incorporation into non-domestic jobs is highly segregated. Boys tend to work more often than girls while at the same time girls that have left school tend to be concentrated in domestic jobs. For that reason, this research explores the experiences of adolescent boys and girls separately.

---

[1] This paper is based on the results of a broader research about the influence of family variables on adolescents' enrollment and labor status (Giorguli, 2004). For simplicity, I chose to focus only on these two aspects (co-residence and mother's working status). However, other aspects such as the presence of younger and older children in the household and the presence of extended kin also have a strong influence on adolescents' activities.

The analysis for this paper relies mainly on representative data at the national level from the *Encuesta Nacional de Dinámica Demográfica* conducted in 1997. From this nationwide survey, I selected children who were 12 to 16 years old, the age at which they are supposed to finish elementary school and start (and finish) secondary school. It is also the period when half of all Mexican children will leave school and includes the legal age of entry into the labor market. Using this national information, I examined the general trends regarding the educational and labor status of adolescents. I also analyzed the variations in school enrollment and labor status by selected family characteristics. The use of multivariate analysis techniques and the addition of control variables in the multivariate models separate the effects of family characteristics from other influences such as socioeconomic factors.

2. The Intersections between Family, Education and Work in the Early Transition Out of School

> ... people of the same age do not march in concert across major events of the life course: rather, they vary in pace and sequencing, and this variation has real consequences for people and society... kinship and family emerged as a primary source of variation and regulation in life trajectories [Elder, 1992: 1124].

How do family characteristics favor or discourage the early transition out of school and into the labor force? The strongest effect of family on children's educational/labor status seems to be related to the access to socioeconomic resources. The family becomes the first mediator between the child and the context. It defines his/her socioeconomic status and, thus, the resources available to the child. Specifically regarding school and labor, household resources will determine the kind of education a child receives, the potential years in school and the need for child labor (domestic and non-domestic labor).

Besides the main source of economic resources, families are the first source of social capital and the locus that defines children's

primary learning environment. Thus, family structure is also linked to aspects such as children's educational expectations, access to social capital and social networks, and the type of adult supervision over children's educational progress and social behavior. Family organization also influences the allocation of resources and the distribution of responsibilities among the various household members.

a) Co-residence Status as Regards Mothers and Fathers

In most studies of Western societies, including Latin America, children living in nuclear two-parent households generally have higher educational achievement and attainment, even after controlling for socioeconomic factors. Children seem to be at a disadvantage when they live in non-intact nuclear families, i.e. when one of their parents or both are missing due to separation, divorce, single parenthood, the death of one or both parents or abandonment. Evidence from various studies suggests that the negative effect of the absence of one or both parents is reflected in lower academic achievement, lower educational attainment, and particularly in more problems at school related to children's behavior (McLanahan and Sandefur, 1994; Cherlin, 1999; Coleman, 1988; Astone and McLanahan, 1991; Zill, 1996; Shonkoff and Phillips, 2000).[2] What are the mechanisms that lead to this negative effect of the absence of one parent on children's educational progress?

Economic deprivation in one-parent households: The main effect of the father's absence, in this case, would be a lower household income or uncertainty regarding the financial situation of the household. In most developing countries where there is no enforcement of legal norms (or simply an absence of norms) regarding the provision of pensions when one of the parents, usually the

---

[2] Cherlin (1999) and Zill (1996) point out that living in non-intact nuclear families *increases the risk* of having problems at school, but this does not mean that the majority of children in this kind of family experience such educational disadvantages.

father, leaves the household and where there is little institutional support for single parents, the financial uncertainty may be greater.[3] Besides affecting the educational resources available to adolescent children, this economic deprivation increases the need for extra income and might precipitate the entrance of adolescent children into the labor force.

Decrease in parental supervision and social capital: The absence of one parent from the household may result in less parental supervision. In non-intact nuclear families, the parent in the household generally needs to work outside the home, meaning that he or she has severe time constraints regarding children's supervision. This means a reduction in parental surveillance over children's educational progress and behavior and less involvement in their development. The decrease in adult supervision is related to both educational achievement (such as test scores, Zill, 1996) and school-related problems that increase the risk of pupils' dropping out of school (Astone and McLanahan, 1991).

Educational expectations and motivation at school: The absence of one parent from the household may also imply a loss in terms of social networks and extra-familial resources for children, so that children are involved in fewer social relationships and organizations (Coleman, 1988; Entwisle, Alexander and Olson, 1997). Although household characteristics outweigh outside resources in explaining school attainment, access to extra-familial social capital (from extended family members and friends) may still have a positive effect on children's educational outcomes (Hofferth, Boisjoly and Duncan, 1998).

The transition from an intact to a non-intact nuclear household is usually preceded by a context of emotional upheaval and turbulent social relations, which might cause stress, depression and/or behavioral problems in children (Astone and McLanahan, 1991; Jonsson and Gähler, 1997; Zill, 1996). Once their educational

---

[3] There is little information on this topic for the situation in Mexico. However, there is some evidence that in most cases single mothers are the sole financial providers for their children following separation or divorce (Brachet-Márquez, 1996; Stern, 1996).

progress has been affected, children may lower their educational aspirations, which have proved to be one of the main determinants of educational outcomes (Entwisle and Alexander, 1993; Entwisle, Alexander and Olson, 1997). Children with neither parent in the household are in the most detrimental position in terms of educational outcomes (Zill, 1996). Usually, living with neither parent reflects a previous situation of neglect, abuse or turmoil.

Changes in household responsibilities: The father's absence may be related to greater labor participation rates for the mother. If this is the case, it may increase the participation of children, especially daughters, in housework and childcare as substitutes for the working mother. A similar argument can be applied when the mother is absent from the household. Given the traditional gender division of labor, when the mother is absent, elder daughters may take over the responsibilities of housework and childcare, especially when there are no other adults around to help out with such duties.

There are two elements that might mitigate the possible negative impact of children's increased participation in housework and childcare when the father is absent and the mother is working. First, single mother households tend to be smaller and household chores and childcare might be less demanding than in other types of households. Therefore, studying and working at home might be compatible for those children responsible for house chores. Second, single mothers tend to distribute resources among the different household members more equally. For example, the responsibilities of housework and taking care of younger children when the female head is working outside the home seem to be more evenly distributed among sons and daughters. If responsibilities are shared, again, studying and participating in housework and childcare might be compatible.

Social networks (regarding opportunities): The absence of either parent means a decrease in the extra-familial resources and social networks available to children. In the case of their insertion into the labor force, this might mean less access to job opportunities, since these networks might be critical during adolescence. The

loss of social networks related to job opportunities probably has a larger impact on boys, since they tend to work in non-domestic jobs more often than girls, especially when the father is absent.

Women's access to resources and single motherhood:[4] The distribution of resources and responsibilities between family members varies when the mother has a greater say in the decisions regarding this distribution. When the father is absent, women do not have to negotiate with or submit to their husbands' decisions regarding the use of resources. This situation might even partly offset the economic deprivation resulting from the absence of the father. In fact, Chant (1997) suggests that although household income might be lower in single-mother households, the income used for household needs might be higher.

From what has been said so far, there is a strong incentive to keep children in school for longer periods in single-mother households. To what extent can children fulfill their mothers' educational expectations? Participation rates of adolescent children may be greater in single-mother households. It seems, however, that single mothers try to reconcile studying and working (Chant 1999; González de la Rocha 1999). Thus, one could expect to find more adolescent children in this type of households working and studying simultaneously.

b) Mothers' Work and Children's Well-being

One of the first direct impacts of mothers' entry into the labor force may be an increase in household socioeconomic resources. Nonetheless, this potential impact depends on other household characteristics, especially the co-residential status of fathers. In dual-parent households where both parents work, the income from the mother's work may in fact represent an improvement in the house-

---

[4] When adolescent children live in female-headed households, the head of the household is usually the mother while the father is absent. In fact, from the data set used for this paper, nearly 90% of female heads were the children's mother, and in almost 70% of the cases where only the mother was at home they were the heads of the household.

hold economic situation. When mothers are the sole economic pro-
viders for their children (for example, when the father is not in the
household), they are more vulnerable and dependent on their jobs
than in dual-earner households. In such cases, the mother's income
may be hardly enough to compensate for the economic depriva-
tion resulting from the father's absence. Nonetheless, one could
expect children living in mother-only arrangements where the
mother does not work to be in the most disadvantaged situation
regarding access to socioeconomic resources.

   Another possible effect of the increase in household resources
due to mothers' entry into the labor force on adolescents' educa-
tional/job status is that the additional income might reduce the
need for child labor — for example, in dual-parent households —
thereby delaying children's entry into the labor force.
.

   *The use of daughters or sons as substitute caretakers of younger
siblings:* As mentioned earlier, some of the most likely caretakers
of children when mothers work outside the households are elder
siblings. If this is the case, does having younger siblings and a
working mother affect children's educational status? To what ex-
tent is it possible to take care of younger siblings and stay at school?
Elder siblings taking care of younger siblings may have lower
educational attainment and find it more difficult to stay at school.

   *The influence of mothers' job status on the shaping of children's
roles and expectations:* Mothers may be playing an important role
of socioeconomic achievement for their children, especially for
their daughters (Kalmijn, 1994). Prior studies cited by Kalmijn
(1994) pointed out that daughters of employed mothers in the U.S.
tended to name their mothers as role-models more often. How-
ever, this effect varies according to the mothers' occupational sta-
tus and is particularly true for women in managerial or profes-
sional positions. When mothers work, their children — especially
daughters — may be encouraged to keep on studying in order to
find a good job in the future. There is an interaction between so-
cioeconomic status (reflected in occupational status) and the pos-
sible effect of mothers' employment on children's educational
outcomes, since those mothers in higher status occupations might

be more attractive role-models for their daughters than those with lower status.

The reduction of the mother's time with children:[5] In most Western societies, including Mexico, the mother is still the main socializing actor in children's lives, particularly during early childhood. This has led to the popular belief concerning the negative effect of the mother's absence from the household on children. In fact, several studies have found a negative effect of mothers' employment on children's intellectual development (Kalmijn, 1994; Desai, Chase-Landsdale and Michael, 1989; Blau and Grossberg, 1992), especially during the first years of life. Nevertheless, the evidence is not conclusive and some studies point out that the negative effect of the mother's absence tends to disappear or is reversed in later years (Leslie, 1987; Haveman, Wolfe and Spaulding, 1991; Kalmijn, 1994).

The increase of women's management of household resources: When women work they tend to spend a higher proportion of their income on the family and the well-being of its members compared to men. Women also tend to use an important share of their income on their children's education. If mothers' earnings or resources are more directly invested in children, one would expect that even after controlling for household income, children would be better off when mothers work.

c) Specifying the Research Question

How can we study the link between the enrollment and job status of adolescents, on one hand, and the family variables of interest on the other? The answer to this question leads us to consider how to specify the main independent variables in this research

[5] There are several empirical studies regarding the effect of the reduction of mother's time with and supervision over children during the first years of life (Blau and Grossberg, 1992; Desai *et al.*, 1989; Desai and Jain, 1994; Short *et al.*, 2000). There are few studies, however, studying the effect through educational transitions later in life, which is the object of interest for this research.

(co-residential status of parents and the effect of the mother's job status). We know, for example, that the effect of parents' co-residence is different depending on who the absent parent is and whether both parents are absent. Therefore, the father and the mother's co-residential status should be considered separately. On the subject of the mother's job status, we also know that the effect on children's lives will depend on whether the father is present (dual-earner arrangements) or the mother is the sole or main provider for the children (which is usually the case in mother-only households). Based on these ideas, the analysis in this paper will group the categories of parental co-residential status and the mother's job status into a single variable that will include the following categories: 1) both parents at home, non-working mother; 2) both parents at home, working mother; 3) only father at home; 4) only mother at home, not working; 5) only mother at home, working; 6) neither parent at home. Table 1 shows the distribution of the sample cases across the different categories of parental co-residential status and mother's employment status. The table also includes some selective characteristics by type of household.

The dependent variable is divided into four categories, which depict four possible scenarios regarding the transition out of school and into the labor force: 1) only studying (no transition into adulthood), 2) working and studying, 3) only working, 4) not working or studying. The last category has a different significance for boys and girls. Boys in this category may have left school for non-job-related reasons. For girls, falling into this category will suggest greater household responsibilities incompatible with attending school.[6]

d) Main Hypotheses

Table 2 summarizes the expected direction in the relationship between family variables and adolescents' enrollment and working

[6] One limitation of the data source used is that it does not provide separate information on the participation in domestic labor. For this reason, the category "not working and not studying" is used as a proxy, specially in the case of adolescent girls.

Table 1
Distribution, Average Years of Parental Education and Household
Income by Type of Family and Mothers' Job Status. Mexico, 1997

Type of family and mothers' job status	Percentage	Education (years)	Household monthly income (pesos)	Household per capita income (pesos)
Both parents at home:				
non-working mother	45.9	5.6	2,498	414
working mother	29.6	6.7	3,602	655
Only father at home	2.5	6.5	2,845	605
Only mother at home:				
non-working mother	4.7	5.1	2,174	388
working mother	10.7	6.6	2,629	562
Neither parent in household	6.6	6.0	2,828	517
Total means	100.0 (37,227)	6.0	2,946	512

Note: Parental education is the average years of education of both parents in dual-parent households, of the parent present in single-parent households and of the household head when no parent is present.

Source: Author's calculations based on data from *Encuesta Nacional de Dinámica Demográfica, 1997* (INEGI, 1997).

status. Because many of the comparisons in the literature refer to traditional arrangements (dual parent households, non-working mother) and how children's context and opportunities change in non-intact families compared with traditional households, the effects reflected in the table refer to how one can expect a positive or negative impact on studying or working in non-traditional arrangements compared with a traditional arrangement.[7] One of the difficulties of constructing Table 2 was the methodological problem of capturing the contradictory effects of family variables on what adolescents do as regards school and work. Building the table sometimes meant making a decision bearing in mind the fact that one or more mechanisms may have a greater influence on the

[7] The results of the multivariate analysis later in this paper follow the same logic.

Table 2
Expected Directions of the Relationship between Family Variables
and Adolescents' Enrollment and Labor Status

Variable	Enrolled and not working	Enrolled and working	Not enrolled and working	Not enrolled not working
Both parents at home:				
Non-working mother		(comparison group)		
Working mother	+	+	−	?
Father only at home	−	−	+	+
Mother only at home:				
Non-working mother	−	?	?	+
Working mother	−	+	?	?
Neither parent in the household	−	−	+	+

Note: The signs reflect expected changes (positive or negative) in the probabilities of falling into either category of enrollment and labor status. For the case of the family type categories, the changes are in relation to the comparable probabilities in traditional arrangements (dual-parent household, non-working mother).

final result. In other cases, the final influence was not so straightforward. In such cases, I decided to keep a question mark to represent the operation of contradictory mechanisms that make the final effect uncertain.

Both parents at home, working mother: Children living in this type of household may have access to more resources than children in traditional arrangements. The participation of mothers in income-generating activities may result in more resources devoted to children's education (as suggested by prior studies) and may result in greater educational expectations for children, especially for the daughters. Given the positive effect on children's education and the greater access to resources, the fact that mothers work in dual-parent households may translate into a longer stay in school during adolescence. It may also increase the probabilities of working and studying and imply broader job networks for the

children, especially in dual-parent households where mothers' participation in unpaid jobs is greater. In short, although adolescent children of working mothers may be delaying their exit from school, they may also be combining work and school due to the increase in job networks.

Table 2 shows an uncertain effect regarding the category "not enrolled, not working." If mothers' work increases enrollment in the dual-parent household, one would expect to find fewer adolescents "not working, not studying" in this type of household. However, in this case, there are two ways through which the mother's work may be having the opposite effect. For both boys and girls, there may be a reduction in adult supervision when mothers work. This may result in less surveillance over the child's educational progress or behavior at school, increasing the risk of leaving school for non job-related reasons. For girls, the absence of the mother may mean an increase in household responsibilities, which may be incompatible with school.

Only father at home: According to what has been said in this chapter, children in this type of arrangement will have fewer educational opportunities and may be leaving school earlier as a result of the less access to resources and less supervision. We may expect more adolescent boys and girls in this type of arrangement to be not working nor studying or only working, although they may be leaving school for non job-related reasons. For the specific case of girls, we may also find greater participation in household chores and care of younger siblings than in households where the mother is present.

Only mother at home, not working: Adolescents in this kind of arrangement may also be in a less favorable position regarding their educational progress and therefore their enrollment. Children may be leaving school because of the restricted access to resources, loss of social capital and lower educational motivations that may result from the absence of the father or from the upheaval of parental separation. We may therefore find lower enrollment and greater "idleness" among adolescent children in households where the father is absent and the mother does not work.

Results may be less clear where participation in the labor force is concerned. This type of household is in greater need of adolescents' income. Nonetheless, adolescents' participation in the labor market may be constrained due to lower access to job networks and social capital. This would explain the question marks in Table 2 regarding the categories related to working status (enrolled and working; not enrolled and working).

The father's absence increases the mother's say in the distribution of resources, which may result in adolescents' leaving school at a later age. In this case, mothers forced to cope with a reduction of resources may have a greater incentive to keep their children at school beyond elementary education. Although the combination of work and school may be a solution, less access to job networks and opportunities may still reduce the chances of combining both activities.

Only mother at home, working: The difference between the above type of household and this one is that the mother has access to more resources and social networks than households where the father is absent and the mother is not working. Although children in this type of arrangement may be in a better situation regarding their opportunities of staying in school as a result of the mother's work, the question of the extent to which this may compensate for the consequences of the father's absence remains. We would expect adolescent children in this type of household to have fewer chances of staying at school and not working than children in traditional arrangements. It may be that as a result of greater access to labor networks, adolescents in this type of household combine work and school more often than those in traditional households. Thus, the need to find a job may not necessarily affect adolescents' enrollment. Nevertheless, it is still uncertain whether children in this type of household will have to leave school more often to work (and fall in the category of "not enrolled and working").

Children in this type of arrangement may also be leaving school for non job-related reasons such as behavioral problems at school. In the specific case of girls, an additional effect may be the greater participation in household chores and supervision of

younger siblings when mothers are working. Still, access to re-
sources through the mothers' work and mothers' greater say in
their use may mitigate these potentially negative effects. This is
why I placed a question mark over the expected final direction of
living in this type of arrangement compared with traditional
households for the category "not enrolled and not working."

Neither parent in the household: Children in this type of family ar-
rangement are in the most disadvantaged position as regards op-
portunities to stay at school. They may have to start working at
earlier ages and they may be obliged to participate more in house-
hold chores and responsibilities, especially in the case of adoles-
cent girls.

3. FAMILY, EDUCATION AND WORK AMONG MEXICAN ADOLESCENTS

Let us now look at the data for the specific case of Mexico. Table 3
shows the distribution of boys and girls in 1997 by enrollment
and labor status. Approximately one third of all Mexican adoles-
cents (between 12 and 16 years of age) had left school and/or were
working in the survey year. Although there is practically no gen-
der difference as regards enrollment, there is a difference regard-
ing job status. As prior studies have suggested, boys tend to work
more often than girls. In fact, the percentage of boys working
(30.8%) — either in school or not in school — is twice as high as
for girls. In contrast, nearly one out of every five girls reported
neither working nor studying. Incorporation into the labor market
is gender segregated in Mexico even at this early age. Boys' greater
participation in income-generating activities agrees with prior
evidence that boys' labor has been used in Mexico more often than
girls' as a strategy for increasing household income.

As regards family arrangements, living in traditional dual-
parent households (with non-working mothers) constitutes an
advantage for adolescent boys and girls as shown by the larger
percentage not working yet still enrolled in this type of house-
hold (Table 4). Nonetheless, we found that mothers' work has a
very positive effect in terms of delaying the school-leaving age.
Even in households where the father is absent, the potential nega-

Table 3
School Enrollment and Labor Status of Children Ages 12 to 16,
Mexico, 1997
(percent)

Variable	Enrolled and not working	Enrolled and working	Not enrolled and working	Not enrolled and not working	Total
Boys	62.7	12.7	18.1	6.4	100.0 (18,952)
Girls	66.3	5.6	10.0	18.1	100.0 (18,275)
Total	64.5	9.2	14.2	12.1	100.0 (37,227)

Source: Author's calculations based on data from *Encuesta Nacional de Dinámica Demográfica*, 1997 (INEGI, 1997).

tive effect on school enrollment is mitigated when the mother is working.

The study found that when the mother works, adolescents tend to work more often. Nonetheless, in many cases they combine work and study, a fact reflected in the high enrollment rates among children of working mothers. Although in some contexts there may be a need to increase household income through adolescent labor, specially for boys, there is still a strong incentive to keep them at school, which coincides with the fact that the mother is working.

Boys are at the greatest disadvantage in educational terms in "mother only, not working" arrangements. Reasons include lower access to economic resources and fewer social networks as well as motivational aspects. In fact, it is in this type of household that boys are the most idle. Conversely, adolescent girls were in the most vulnerable situation when the mother was not at home. The lowest enrollment rates corresponded to girls who lived in "father only" and in "neither parent at home" arrangements. Moreover, they tended to concentrate on domestic work as shown by the fact that nearly a third of these girls were neither working nor studying.

Mothers' employment status also had an impact on girls' working status. If the mother was working, there were higher pro-

Table 4
Educational and Labor Status of Boys Ages 12 to 16 by Type of Family and Mothers' Labor Status. Mexico, 1997
(percent)

Type of family	Enrolled and not working	Enrolled and working	Not enrolled and working	Not enrolled and not working	Total
Boys					
Both parents at home:					
Non-working mother	65.0	9.1	18.8	7.1	100.0 (8,970)
Working mother	60.3	19.1	15.8	4.8	100.0 (5,490)
Only father at home	58.7	12.6	20.8	7.9	100.0 (499)
Only mother at home:					
Non-working mother	59.9	9.7	21.2	9.2	100.0 (895)
Working mother	65.4	12.6	14.9	7.1	100.0 (2,004)
Neither parent in household	55.3	13.4	23.7	7.6	100.0 (1,094) (18,952)

Girls

Both parents at home:					
Non-working mother	69.4	2.1	7.6	20.9	100.0
					(8,105)
Working mother	65.9	10.5	12.0	11.6	100.0
					(5,549)
Only father at home	57.7	3.1	12.0	27.2	100.0
					(418)
Only mother at home:					
Non-working mother	63.0	2.8	9.9	24.3	100.0
					(851)
Working mother	67.9	8.5	10.6	13.0	100.0
					(1,986)
Neither parent in household	51.9	4.3	14.6	29.2	100.0
					(1,366)
					(18,275)

Source: Author's calculations based on data from *Encuesta Nacional de Dinámica Demográfica*, 1997 (INEGI, 1997).

portions of working daughters. When the mother was not work-
ing, in dual — parent or mother — only households there were
higher proportions of daughters devoted to housework. This can
be explained, on one hand, by access to networks in the female
labor market when the mother works and, on the other, by the
role models provided by working and non-working mothers.
When the mother follows a traditional role and stays at home to
look after the house and the family, girls may either be expected
or expect to play a similar role.

The data in Table 4 suggest that the transition from school to
the labor force is different for adolescent boys and girls. Nonethe-
less, there are some common aspects regarding family arrange-
ments. Children are at an advantage in dual-parent households
and we hypothesized that mothers' working status may have nega-
tive effects. The data suggest that mothers' work increases house-
hold resources and has an especially positive effect on sons' and
daughters' enrollment. There is also an effect due to socioeconomic
status (SES). The descriptive statistics in Table 1 showed that
households where mothers work have greater per capita income
and higher parental educational achievement. The multivariate
analysis in the next section will help determine the extent to which
this positive effect of mothers' work on children's enrollment
persists even after controlling for SES and other variables.

We found that networks are important in terms of the transi-
tion into the labor force and related to the sex of the child. For
boys, the father's presence seems to be more important in terms
of finding a job. For adolescent girls, the mother's working status
is an important determinant of their participation in non-domes-
tic jobs. In fact, working or non-working mothers may serve as
role models for their daughters.

We hypothesized in the preceding section that having only
the mother at home may have a different impact on adolescent
children depending on the mother's employment. The descrip-
tive statistics offer plenty of evidence to support this hypothesis.
In fact, the most vulnerable households seem to be the "mother-
only, non-working" arrangements. Conversely, children of single,
working mothers are not at a disadvantage compared with those
in dual-parent households. As we saw earlier in the chapter, this

type of household enjoys a higher SES in general, which indicates that the mothers might have had greater access to resources even before the disruption of the union.

A key issue that should be clarified in the next section is the extent to which the relationship between family arrangement and adolescents' educational/employment status reflects the effect of other variables such as the size of the location and SES. The following multivariate analysis should help clarify the mechanisms operating behind these initial results.

4. RESULTS OF MULTIVARIATE ANALYSIS

Given that the dependent variable (enrollment and employment status of adolescents) is categorical, the multivariate analysis is based on the estimation of multinomial logistic models. The multinomial logistic model fits the analysis proposed for this paper given the categorical nature of the dependent variable. The multinomial logistic model pairs each response category (j_i) with a baseline category (J). The model estimates the log odds that the response is j compared to the baseline category J. The form of the model is (Agresti, 1996: 206-207):

$$\log\left(\frac{\pi_j}{\pi_J}\right) = \alpha_j + \beta_j x, \quad \text{where} \quad J = 1... J - 1$$

The baseline category is chosen arbitrarily. For this paper, I used the category "not working and enrolled" as the baseline category. Since the main hypotheses point out that the expected relationship between the dependent variable and the type of family arrangement varies by sex, the models are estimated separately for boys and girls. I also estimated pooled models to test whether there were significant differences in the effects by sex (results not shown).

The independent variables to be included in the model can be grouped into four categories: individual characteristics, family

arrangement and other characteristics, SES (also based on house-
hold indicators) and community (or municipal) level variables.
Table A.1 in the Appendix presents the complete models. Finally,
to facilitate the interpretation of the results from the multinomial
logistic models, I estimated the probabilities for the main inde-
pendent variable of interest: co-residential status of parents and
mothers' labor status (see Table 5). All the probabilities were esti-
mated using the mean value of the other co-variates.

The first conclusion from the tables is that living in a tradi-
tional household (with both parents and a non-working mother)
delays leaving school and entry into the labor market for children
between the ages of 12 and 16, even after controlling for several
other factors. However, we also found that an early transition into
work is not necessarily detrimental to school enrollment. Follow-
ing the structure of the arguments presented in an earlier section,
the main results from the multivariate analysis can be summa-
rized as follows:

Both parents at home, mother working: The positive effect of moth-
ers' work in dual-parent households is largely explained by so-
cioeconomic factors. Once we added controls, we found no sig-
nificant difference between this type of household and traditional
arrangements in terms of the probabilities of studying and not
working.

We found, however, that when the mother works, children
tend to start working at earlier ages, without affecting the general
probabilities of enrollment. Although children in this type of
household work more often, the change can largely be explained
by the combination of school and work. The influence of mothers'
work in hastening the entry of children in dual-parent households
into the labor force is stronger for girls. In addition, we found that
when mothers work, girls tend to fall into the category of "not
enrolled and not working" less often than in traditional arrange-
ments.

The fact that the differences between children in dual-parent
households with working and non-working mothers prevail even
after controlling for socioeconomic variables suggests that there
are other mechanisms operating in these relationships. Labor net-

Table 5
Simulated Probabilities of Studying and/or Working
by Type of Family and Mother's Employment Status.
Boys Ages 12 to 16. Mexico, 1997

Variable	Enrolled and not working	Enrolled and working	Not enrolled and working	Not enrolled and not working
Boys				
Both parents:				
Non-working mother	74.7	8.4	11.1	5.8
Working mother	**73.0**	**10.3**	10.2	6.5
Only father	**59.0**	**14.0**	**19.0**	**8.0**
Only mother:				
Non-working mother	**68.6**	10.7	13.8	6.8
Working mother	**69.1**	**12.1**	11.6	7.2
Neither parent	**62.6**	**11.9**	**17.6**	**7.9**
Girls				
Both parents:				
Non-working mother	76.6	2.3	5.5	15.6
Working mother	76.7	**5.1**	**6.8**	**11.4**
Only father	64.0	**3.2**	**8.1**	**24.7**
Only mother:				
Non-working mother	67.8	*3.5*	**10.3**	*18.4*
Working mother	**66.6**	**7.7**	**8.7**	**17.0**
Neither parent	**52.4**	**3.5**	**11.5**	**32.5**

Note: Simulated probabilities based on the multivariate models estimated (see Table A.1). Probabilities were estimated using the mean value of the other independent variables. Table 5 shows in bold type those cases where the differences in the effect of a type of family compared to the reference category (both parents at home, mother not working) on the dependent variable were significant.

Source: Author's calculations based on data from *Encuesta Nacional de Dinámica Demográfica*, 1997 (INEGI, 1997).

works of working mothers seem to be reflected in greater employment opportunities for adolescent children, especially daughters. However, the fact that the effect for daughters is stronger than for boys may also suggest the influence of a role model on the educational and job expectations of adolescent girls.

In the theoretical section, I hypothesized that mothers' work may also result in a higher number of adolescent children who are not enrolled or working because of the reduction in child supervision when the mother works and possibly greater participation in domestic jobs. The multivariate analysis does not support any of these hypotheses.

Only father at home: The results in this case follow the expected direction presented in Table 2. Children in this kind of arrangement are less likely to attend school or to work. Again, we find that this effect is stronger for girls. The results support the idea of greater household responsibilities for girls when the mother is absent, to the detriment of their school enrollment. However, it is also possible that girls may be leaving school for other reasons besides their participation in domestic labor. The absence of the mother may result in lower educational expectations, which in turn affects their educational opportunities. It is interesting to note that this negative effect of the mother's absence on enrollment occurs only in girls.

Only mother at home, not working: In the descriptive statistics we have found that children in this kind of household were at a great disadvantage in terms of postponing their transitions from school into the labor force. This negative impact is mainly due to the restricted access to socioeconomic resources in this type of household. In fact, there were no significant differences in the probabilities of enrollment with traditional arrangements once controls were added, nor was there a greater likelihood of being "not enrolled and not working" for either boys or girls.

On the basis of these results, no evidence was found to support the idea of lower educational expectations or less adult supervision, which may affect adolescents' enrollment when the father is absent and the mother is not working. In fact, these results

support what Chant (1991) had noted earlier in her interviews with Mexican single mothers. In other words, the greater autonomy of single mothers regarding the distribution of resources may be benefiting children in terms of their time at school, thereby slightly offsetting the effect of the father's absence. The main disadvantage for children in this type of arrangement is related to the lack of socioeconomic resources.

Only mother at home, working: There is little difference in the probabilities of enrollment between adolescents in traditional households and adolescents whose mothers work and whose fathers are not at home. As expected, both boys and girls are more likely to combine school and work when they have working mothers and again this effect is more pronounced in girls.

As with single mothers who do not work, there is no evidence to support the idea that the father's absence may accelerate children's transition out of school, although they are more likely to join the labor force when the father is absent and the mother works. Again, the difference may lie in the greater access to labor networks for children of working mothers.

Neither parent in the household: The multivariate analysis confirmed that children in this type of household tend to leave school and start working during adolescence more often than children in other arrangements. We found that the effect is stronger for girls and that it may reflect girls' greater participation in domestic jobs (to the detriment of their school enrollment) when they do not live with their parents.

5. SUMMARY AND FINAL REFLECTIONS

The main goals of this paper can be grouped into two sections. First, it explores two main aspects of adolescents' lives in Mexico: school attendance and employment status. Second, it links these aspects to their parents' co-residential status and mothers' employment status. Why focus on teenagers? From the point of view of the Mexican context, most children will be leaving school and/

or starting work in early adolescence (before they turn 17). Fur-
thermore, recent evidence from previous research in Mexico un-
derlines the importance of studying adolescence to understand
these transitions (i.e. leaving school and starting work).

   *Family characteristics are among the main determinants of children's
educational progress.* First of all, family characteristics determine ac-
cess to socioeconomic resources. In addition to its influence through
access to and availability of resources for the adolescent, the family
also defines other aspects related to children's progress in school
and their entry into the labor force. It defines the learning environ-
ment, parental and children's expectations regarding school, su-
pervision of the adolescent's educational progress and behavior
outside school, and the social capital available to the child. From
the point of view of adolescents' participation in the labor market,
in addition to the need for extra income within the household, its
composition also influences the labor networks available to adoles-
cents. The analysis of the link between family type — in this case re-
garding parents' co-residential status — and adolescents' enrollment
will provide a more detailed explanation of how the transition from
school during adolescence takes place in the Mexican context.

   The literature on survival strategies has also stressed changes
in family organization, which are of interest for this research,
particularly *mothers' entry into the labor force.* In Mexico, this pro-
cess has advanced swiftly over the past two decades. There have
been studies of the impact of mothers' work on the family (for
example, studies on domestic violence and the effect on children's
health, among others). This paper shares the goal of previous
research in terms of understanding possible changes or new
forms of organization as a result of mothers' entry into the labor
force and its impact on other members of the household. Among
the possible changes due to mothers' participation in the labor
force and directly related to adolescents' activities, is the reorga-
nization (and redistribution) of household duties. If mothers are
away from home, who undertakes the responsibilities of house-
hold chores and childcare? There is little evidence of changes in
husbands' participation in domestic work. Again, the literature
on family survival strategies suggests that adolescent children,
especially daughters, may assume more responsibilities regard-

ing housework and childcare. In this respect, the greater time and energy devoted to domestic work may lead to their dropping out of school earlier, even before the completion of middle school. The results of this study indicate that mothers' work may be having the opposite effect on daughters' enrollment. Partially due to the increase of household resources through women's participation in non-domestic employment, we observed that when the mother is working there is a greater likelihood of enrollment beyond age 16. This result is not restricted to girls; the positive impact of mothers' work on enrollment applies to both sexes.

Apart from the direct effect explained by greater access to socioeconomic resources, this research found that the influence of mothers' work may be explained by other factors such as mothers' having a greater say in the allocation of household resources. Although there is a variety of experiences in this respect, the general perception is that mothers tend to be more child-oriented and that their greater access to resources may increase family investment in children's health and education.

One interesting result is that mothers' participation in non-domestic jobs also increases adolescents' likelihood of enrollment and working. Little is known about the significance of combining work and school during adolescence. Nonetheless, the possibility of combining both activities may have a positive effect on children's eventual educational attainment. Furthermore, the greater access to labor networks and to flexible jobs compatible with school may be of special importance for the combination of both activities in contexts of restricted resources.

Although the influence of mother's work operates in the same direction for boys and girls, the effect is more pronounced in girls. A straightforward explanation is that the access to job opportunities for women (in this case, adolescent girls) may be strongly related to access to networks through other women involved in or related to the labor market. In contexts such as the Mexican one, where female participation in non-domestic jobs is still low, women may rely more often on other women to enter the labor market. However, another explanation is the importance of mothers as role models for their adolescent children.

In spite of the common conception of adolescent labor as a household strategy for augmenting resources, this research supports previous evidence regarding the prevalence of boys' participation in non-domestic work over girls'. Cultural issues related to role models and the traditional division of labor permeate girls' and their parents' expectations regarding what they do during adolescence and beyond. In this respect, working mothers may expect their daughters to work (now or later in the course of their lives) and, when the mother works, there may be less opposition to girls' engagement in non-domestic employment.

This work does not directly explore the issue of female headship; however, from the data we know that in most cases where adolescents live with their mothers only, the latter reported being heads of the household. Female headship and the absence of the father from the household are related to greater vulnerability as a result of the economic deprivation and possible social distress associated with the dissolution of a union. For the Mexican case, we found that the impact of the father's absence may differ depending on the mother's labor status. First of all, mother-only arrangements where the mother works are positively selected by socioeconomic status. Both the household head's per capita income and educational attainment are higher than in those of traditional arrangements (both parents at home, non-working mother). Conversely, single-parent arrangements where the mother does not work are negatively selected in both aspects. The different access to socioeconomic resources depending on the mother's employment status when the father is absent results in different enrollment and labor rates between adolescents. In fact, descriptive statistics show that boys are in the least favorable situation regarding school attendance in mother-only arrangements where the mother does not work, whereas there is only a slightly detrimental effect when single mothers work, compared with traditional arrangements.

To a certain extent, one can even say that the fact that the mother works may partly offset the negative impact of the father's absence on enrollment. In fact, mothers' participation in non-domestic jobs does makes an enormous difference for adolescent children. In a context of little institutional support for single mothers and erratic economic contributions from absent fathers, it

would be possible to imagine a scenario where children leave school in order to work. However, this research points out that the main explanation for this effect of single-motherhood on enrollment lies in the different access to socioeconomic resources. Furthermore, once controls were added, we saw that there was practically no or very little difference in the enrollment and labor status of adolescents in "mother-only, not working" arrangements.

This work also analyzed two other family situations: *the absence of the mother from the household (father-only arrangement)* and *the absence of both parents.* Children in this last type of arrangement were in the most detrimental situation regarding their education. Although a small percentage, they still represent approximately 7% of the sample. Further research is required to know the factors involved in the parent's absence (orphanhood, internal or international migration, abandonment) to understand the reasons underlying such a disadvantaged position. Father-only arrangements were uncommon. Nevertheless, children, especially girls, tend to leave school more often in this type of households. In addition, the effect remains for girls even after controls are added. In fact, the mother's absence seems to be related to an increase in girls' participation in domestic tasks.

6. REFERENCES

Agresti, Alan (1996), *An Introduction to Categorical Data Analysis*, Wiley Series in Probability and Statistics, New York, John Wiley & Sons, Inc.

Astone, Nan Marie, and Sara S. McLanahan (1991), "Family Structure, Parental Practices and High School Completion," *American Sociological Review*, 58 (3): 309-320.

Benería, Lourdes (1992), "The Mexican Debt Crisis: Restructuring the Economy and the Household," in Lourdes Benería and Shelley Feldman (eds.), *Unequal Burden: Economic Crises, Persistent Poverty, and Women's Work*, Colorado, Westview Press.

———— and Martha Roldán (1987), *The Crossroads of Class and Gender: Industrial Homework, Subcontracting and Household Dynamics in Mexico City*, Chicago, University of Chicago Press.

Bianchi, Suzanne M. (2000), "Maternal Employment and Time With Children: Dramatic Change or Surprising Continuity?," *Demography*, 37 (4): 401-414.

Binder, Melissa and David Scrogin (1999), "Labor Force Participation and Household Work of Urban Schoolchildren in Mexico: Characteristics and Consequences," *Economic Development and Cultural Change*, 48 (1): 122-154.

Blau, Francine D., and Adam J. Grossberg (1992), "Maternal Labor Supply and Children's Cognitive Development," *Review of Economics and Statistics*, 64: 474-481.

Blumberg, Rae Lesser (1997a), "Income Under Female Versus Male Control: Hypotheses from a Theory of Gender Stratification and Data from the Third World," in Rae Lesser Blumberg (ed.), *Gender, Family and the Economy: The Triple Overlap*, California, Sage Publications Inc.

Brachet-Márquez,Vivian (1996), "Trabajo materno y salud infantil: hacia una guía teórica para las políticas públicas," in Claudio Stern (ed.), *El papel del trabajo materno en la salud infantil*, Mexico, The Population Council/El Colegio de México.

Chant, Sylvia (1991), *Women and Survival in Mexican Cities. Perspectives on Gender, Labour Markets and Low-Income Households*, Manchester, Manchester University Press.

———— (1997), *Women-Headed Households. Diversity and Dynamics in the Developing World*, Great Britain, MacMillan Press LTD.

———— (1999), "Las unidades domésticas encabezadas por mujeres en México y Costa Rica: perspectivas populares y globales sobre el tema de las madres solteras," in Mercedes González de la Rocha (ed.), *Divergencias del modelo tradicional: Hogares de jefatura femenina en América Latina*, Mexico, CIESAS/SEP-Conacyt/Plaza y Valdés.

Cherlin, Andrew (1999), "Going to Extremes: Family Structure, Children's Well-Being, and Social Science," *Demography*, 36 (4): 421-428.

Coleman, James S. (1988), "Social Capital in the Creation of Human Capital," *American Journal of Sociology*, 94 (Supplement): S95-S120.

Congreso de la Unión (2000), *Constitución Política de los Estados Unidos Mexicanos*, Mexico, Congreso de la Unión.

Damián, Araceli (2002), *Cargando el ajuste: los pobres y el mercado de trabajo en México*, Mexico, El Colegio de México.

Desai, Sonalde, P. Lindsay Chase-Lansdale and Robert T. Michael (1989), "Mother or Market? Effects of Maternal Employment on the Intellectual Ability of 4-Year-Old Children," *Demography*, 26 (4): 545-561.

———— (1992), "Children at Risk: The Role of Family Structure in Latin America and West Africa," *Population and Development Review*, 18: 689-717.

———— and Devaki Jain (1994), "Maternal Employment and Changes in Family Dynamics: The Social Context of Women's Work in Rural South India," *Population and Development Review*, 20 (1): 115-136.

————— (1995), "When Are Children from Large Families Disadvantaged? Evidence from Cross-National Analyses," *Population Studies*, 49 (2): 195-210.

Echarri Canovas, Carlos (1995), "Hogares y familias en México: una aproximación a su análisis mediante encuestas por muestreo," *Estudios Demográficos y Urbanos*, 10 (2): 245-293.

Elder Jr., Glen H. (1965), "Family Structure and Educational Attainment: A Cross-National Analyses," *American Sociological Review*, 30 (1): 81-96.

————— (1974), *Children of the Great Depression. Social Change in Life Experience*, Chicago, University of Chicago Press.

————— (1985), "Perspectives on the Life Course," in Glen H. Elder Jr. (ed.), *Life Course Dynamics. Trajectories and Transitions, 1968-1980*, Ithaca, Cornell University Press.

————— (1992), "Essay on the Life Course," in Edgar and Marie Borgatta (eds.), *The Encyclopedia of Sociology*, New York, MacMillan Publishing Co.: 1120-1130.

Entwisle, Doris R. and Karl L. Alexander (1993), "Entry into School: The Beginning School Transition and Educational Stratification in the United States," *Annual Review of Sociology*, 19: 401-423.

—————, Karl L. Alexander and Linda Steffel Olson (1997), *Children, Schools and Inequality*, Colorado, WestviewPress.

—————, Karl L. Alexander and Linda Steffel Olson (2000), "Early Work Histories of Urban Youth," *American Sociological Review*, 65 (April): 279-297

García, Brígida, Mercedes Blanco and Edith Pacheco (1999), "Género y trabajo extradoméstico," in Brígida García (coord.), *Mujer, género y población en México*, Mexico, El Colegio de México/Sociedad Mexicana de Demografía.

————— and Edith Pacheco (2000), "Esposas, hijos e hijas en el mercado de trabajo de la Ciudad de México en 1995," *Estudios Demográficos y Urbanos*, 15 (1): 35-63.

————— and Orlandina de Oliveira (1993), "Trabajo y familia en la investigación sociodemográfica de México," in Francisco Alba and Gustavo Cabrera (eds.), *La población en el desarrollo contemporáneo de México*, Mexico, El Colegio de México.

————— and Orlandina de Oliveira (1994), *Trabajo femenino y vida familiar en México*, Mexico, El Colegio de México.

Giorguli, Silvia E. (2004), "Transitions from School to Work: Educational Outcomes, Adolescent Labor and Families in Mexico," Dissertation, Brown University.

Gomes, Cristina (2001), *Procesos sociales, población y familia*, Mexico, Flacso/Miguel Ángel Porrúa.

González de la Rocha, Mercedes (1991), "Family Well-Being, Food Consumption and Survival Strategies during Mexico's Economic Crisis," in Mercedes González de la Rocha and Agustín Escobar Latapí (eds.), *Social Responses to Mexico's Economic Crisis of the 1980s*, San Diego, University of California.

—— (1994), "Household Headship and Occupational Position in México," in Helen Kennedy and Mercedes González de la Rocha, *Poverty and Well-Being in the Household: Case Studies of the Developing World*, San Diego, Center for Iberian and Latin American Studies, University of California, Working Paper No. 5.

—— (1997), "Erosion of a Survival Model: Urban Household Responses to Persistent Poverty," paper presented in the workshop Gender, Poverty and Well-Being: Indicators and Strategies, UNRISD-UNDP and Center for Development Studies, Trvandrum, Kerala.

—— (1999), *Divergencias del modelo tradicional: Hogares de jefatura femenina en América Latina*, Mexico, CIESAS/SEP/Conacyt/Plaza y Valdés.

Haveman, Robert, Barbara Wolfe and James Spaulding (1991), "Childhood Events and Circumstances Influencing High School Completion," *Demography*, 28 (1): 133-157.

Hofferth, Sandra L. (1985), "Children's Life Course: Family Structure and Living Arrangements in Cohort Perspective," in Glen H. Elder Jr. (ed.), *Life Course Dynamics. Trajectories and Transitions, 1968-1980*, Ithaca, Cornell University Press.

——, Johanne Boisjoly and Greg J. Duncan (1998), "Parents' Extrafamiliar Resources and Children's School Attainment," *Sociology of Education*, 71 (July): 246-268.

INEGI (1997), *Encuesta Nacional de Dinámica Demográfica, 1997*, Mexico, Instituto Nacional de Estadística, Geografía e Informática.

—— (2000a), *XII Censo general de población y vivienda, 2000*, Mexico, Instituto Nacional de Estadística, Geografía e Informática.

—— (2000b), *Los jóvenes en México*, Mexico, Instituto Nacional de Estadística, Geografía e Informática.

Jonsson, Jan, and Michael Gähler (1997), "Family Dissolution, Family Reconstitution, and Children's Educational Careers: Recent Evidence for Sweden," *Demography*, 34 (2): 277-293.

Kalmijn, Matthijs (1994), "Mother's Occupational Status and Children's Schooling," *American Sociological Review*, 59 (2): 257-275.

Knaul, Felicia Marie (2001), "The Impact of Child Labor and School Dropout on Human Capital: Gender Differences in Mexico," in Elizabeth Katz and Maria Correia (eds.), *The Economics of Gender in Mexico. Work, Family, State and Market*, Washington, D.C., The World Bank.

———— and Susan Parker (1998), "Patterns over Time and Determinants of Early Labor Participation and School Dropout: Evidence from Longitudinal and Retrospective Data on Mexican Children and Youth," paper presented at the 1998 Meeting of the Population Association of America, Chicago.

Leslie, Joanne (1987), "Women's Work and Child Nutrition in the Third World," Working Paper, Washington, D.C., International Center for Research on Women.

Levison, Deborah, Karine S. Moe and Felicia Marie Knaul (2000), "Youth Education and Work in Mexico," *World Development*, 29 (1): 167-188.

Lloyd, Cynthia, and Ann K. Blanc (1996), "Children's Schooling in sub-Saharan Africa: the Role of Fathers, Mothers and Others," *Population and Development Review*, 22 (3): 265-298.

———— and Sonalde Desai (1992), "Chidren's Living Arrangements in Developing Countries," *Population and Policy Review*, 11: 193-216.

McLanahan, Sara, and Gary Sandefur (1994), *Growing up with a Single Parent: What Hurts, What Helps*, Cambridge, Harvard University Press.

Mier y Terán, Marta, and Cecilia Rabell (2001), "Condiciones de vida de los niños en México, 1960-1995. El entorno familiar, la escolaridad y el trabajo," in *La población de México. Tendencias y perspectivas sociodemográficas hacia el siglo XXI*, Mexico, Consejo Nacional de Población/Fondo de Cultura Económica.

———— and Cecilia Rabell (2002), "Desigualdades en la escolaridad de los niños mexicanos," Mexico (mimeo).

Modell, John (1979), "Changing Risks, Changing Adaptations: American Families in the Nineteenth and Twentieth Centuries," in Allan J. Lichtman and Joan R. Challinor (eds.), *Kin and Communities. Families in America*, Washington, D.C., Smithsonian Institution Press.

———— (2000), "How may Children's Development Be Seen Historically?," *Childhood*, 7 (1): 81-106.

Morrison, Donna R., and Amy Ritulo (2000), "Routes to Children's Economic Recovery after Divorce: Are Cohabitation and Remarriage Equivalent?," *American Sociological Review*, 65 (4): 560-580.

Oliveira, Orlandina de, and Marina Ariza (2001), "Transiciones familiares y trayectorias laborales femeninas en el México urbano," in Cristina Gomes (ed.), *Procesos sociales, población y familia*, Mexico, Flacso/ Miguel Ángel Porrúa.

————, Marcela Eternod and María de la Paz López (1999), "Familia y género en el análisis sociodemográfico," in Brígida García (ed.), *Mujer, género y población en México*, Mexico, El Colegio de México/ Sociedad Mexicana de Demografía.

Oppenheim Mason, Karen (1986), "The Status of Women: Conceptual and Methodological Issues in Demographic Studies,"*Social Forces,* 1(2): 284-300.

Pacheco, Edith (1997), "Cambios en la población económicamente activa: 1900-1995," *Demos,* 10: 30-31.

Parker, Susan, and Carla Pederzini (2001), "Gender Differences in Education in Mexico," in Elizabeth Katz and Maria Correia (eds.),*The Economics of Gender in Mexico. Work, Family, State and Market*, Washington, D.C., The World Bank.

Rakowski, Cathy A. (1997), "Gender, Family and Economy in a Planned, Industrial City: the Working – and Lower – Class Households of Ciudad Guayana," in Rae Lesser Blumberg (ed.), *Gender, Family and the Economy: The Triple Overlap*, California, Sage Publications Inc.

Riquer, Florinda, and Ana María Tepichín (2001), "Mujeres jóvenes en México. De la casa a la escuela, del trabajo a los quehaceres del hogar," in Enrique Pieck (ed.), *Los jóvenes y el trabajo. La educación frente a la exclusión social*, México, UIA/IMJ/Unicef/Cinterfor-ILO and Conalep.

Shonkoff, Jack P., and Deborah A. Phillips (eds.) (2000), *From Neurons to Neighborhoods: The Science of Early Childhood Development*, National Academy of Science, Committee on Integrating the Science of Early Childhood Development, Board on Children, Youth and Family.

Short, Susan, Feinian Chen, Barbara Entwisle and Zhai Fengying (2000), "Maternal Work and Time Spent in Child Care: A Multi-Method Approach" (mimeo).

Stern, Claudio (coord.) (1996), *El papel del trabajo materno en la salud infantil*, Mexico, The Population Council/El Colegio de México.

Tuirán, Rodolfo (2001), "Estructura familiar y trayectorias de vida en México," in Cristina Gomes (ed.), *Procesos sociales, población y familia*, Mexico, Flacso/Miguel Ángel Porrúa.

Wong, Rebeca, and Ruth E. Levine (1992), "Estructura del hogar como respuesta a los ajustes económicos: evidencia del México urbano de los ochenta," *Estudios Demográficos y Urbanos*, 7 (2-3): 493-509.

Zill, Nicolas (1996), "Family Change and Student Achievement: What We Have Learned, What It Means for Schools," in Alan Booth and Judith F. Duncan (eds.), *Family-School Links. How Do They Affect Educational Outcomes?*, New Jersey, Lawrence Erbaum Associates, Publishers.

Table A.1
Multinomial Logistic Regression Predicting Educational and Labor Status.
Boys ages 12 to 16. Mexico, 1997

Variable	Enrolled and working		Not enrolled and working		Not enrolled and not working	
	Boys	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
Age: 12–13	−0.824**	−0.790**	−2.793**	−2.495**	−1.320**	−1.756**
14–15	−0.374**	−0.292	−1.010**	−1.046**	−0.441**	−0.589**
16	—	—	—	—	—	—
Migrant	−0.139	0.245	0.170	0.498**	0.276**	0.357*
Younger children	0.115**	0.140**	0.200**	0.257**	0.155	0.207**
Older boys	−0.238**	−0.289**	−0.132**	−0.102	0.056	0.131**
Older girls	−0.171**	−0.063	−0.130**	−0.050	0.121	0.021
Both parents:						
Non working mother	—	—	—	—	—	—
Working mother	0.231*	0.782**	−0.058	0.219*	0.142	−0.318**
Only father	0.746**	0.501	0.778**	0.568*	0.567	0.639**
Only mother:						
Not working mother	0.327	0.543	0.308	0.752**	0.252	0.291
Working mother	0.444**	1.334**	0.121	0.602**	0.296	0.229
Neither parent in the household	0.527**	0.794**	0.639**	1.124**	0.492**	1.115**
Other income earners	0.292**	0.229**	0.255**	0.235**	0.079	0.056
Other non-working adults in the household	−0.376**	−0.590**	−0.277**	−0.649**	−0.070	−0.243**

Table A.1
(end)

Variable	Enrolled and working		Not enrolled and working		Not enrolled and not working	
	Boys	Girls	Boys	Girls	Boys	Girls
Family-owned business	2.718**	2.533**	1.659**	1.257**	-0.298	0.482**
HH migration to the US	0.194	0.279	0.256*	0.137	0.376**	0.218*
Parental education	-0.109**	-0.098**	-0.236**	-0.217**	-0.218**	-0.227**
Ln (income)	0.006	0.066	-0.046	-0.025	-0.047	-0.065**
Size of community:						
Fewer than 2,500 hab.	0.321**	-0.071	0.915**	0.780**	0.013	0.603**
2,500/99,999	0.003	0.084	0.359**	0.633**	-0.004	0.226*
100,000 or more	—	—	—	—	—	—
% of EAP in manufacturers	-0.004	0.006	0.015**	0.020**	0.020**	0.020**
% of women working	0.017**	0.022**	0.001	0.022**	-0.010	-0.013**
Constant	-2.540**	-4.496**	-0.171	-2.184**	-0.631	0.442

Wald Chi2(63) = 3742**
Pseudo R2 = 0.2330
  * $p < 0.01$
  ** $p < 0.001$

Source: Author's calculations based on data from *Encuesta Nacional de Dinámica Demográfica, 1997* (INEGI, 1997).

IX. CHANGE AND CONTINUITY IN GOVERNMENT RESPONSES TO MEXICAN MIGRATION

Francisco Alba

Migrations from Mexico to the United States have undergone significant changes since the 1980s both because of the context in which the two governments have coped with them and because of the causes that led to the migratory phenomenon in the first place. The passage of the Immigration Reform and Control Act (IRCA) in 1986 marked the start of a prolonged attempt to influence the migratory phenomenon, with the aim of controlling the components and characteristics of the flow of "undocumented workers." The North American Free Trade Agreement (NAFTA), which came into force in 1994, was also envisaged as a response for containing migration from Mexico. More recently, as a result of the discussions and bilateral negotiations begun in 2001, attempts were made to normalize the migratory flows from Mexico to the United States. However, none of these attempts at migratory management have achieved their aims and migration has continued its course.

Government responses, however, have had a major effect on migratory trends. As a result of policies that have sent mixed signals, the flows have adapted to the emerging context, adopting the nature of more permanent form of migration, as opposed to the markedly circular nature that this phenomenon displayed until the 1970s. For a period of approximately twenty years, after the *bracero* programs ended in 1965, Mexican migration had developed relatively freely, under the protection of a sort of tacit understanding between the two countries, characterized by a low degree of intervention, to permit the satisfaction of the economic

interests of the main actors involved, namely employers and migrant workers. As a result, the migratory phenomenon continued to entail the circular movement of workers. This understanding, however, provided few guarantees for the rights of migratory workers.

The three main attempts to modify the phenomenon of migration from Mexico to the United States have involved significant changes in the government's response to this situation. However, certain continuities in the responses and migratory trends have persisted over time. Consequently, the interests of neither country have been satisfied, while migrants' rights have not only been neglected but frequently violated. The number of accidents and deaths of migrants attempting to cross the border into the United States has increased significantly since the 1990s.[1]

In order to put the changes and continuities of the various attempts to control the Mexican migratory flows into perspective, the next section reviews both the inconsistencies in the implementation of IRCA and the Mexican reaction to this unilateral measure, while summarizing the changes in migratory patterns that have occurred in response to an increasingly restrictive context.

Below is an examination of NAFTA as an instrument for migratory management together with its insufficiencies, which drove governments to return to their previous migratory responses. It then provides a brief summary of the bilateral negotiations undertaken by the governments of Fox and Bush at the start of their respective administrations in 2001 to organize the migratory flows. This is the third largest attempt, in the past twenty years, to craft government responses to these flows, by acknowledging the economic and social realities underlying the origin and continuity of the latter. This attempt at negotiation came nearly forty years after the end of the agreements governing the migratory phenomenon during the *bracero* programs. Although negotiations were cancelled after the attacks on September 11, 2001, the significance and legacy of the latter persist in the ways in which both governments, particularly Mexico's, deal with the issue of migration.

[1] Numbers registered along the border have reached approximately 400 annually since border control operations came into effect in late 1993.

The attacks on September 11, 2001, in the United States have led to a major reformulation of security issues and facilitated the links between migration, the fight against terrorism and border control. The article ends with an outline of the challenges and opportunities within which the bilateral handling of Mexican migratory flows will be framed in the immediate future.

1. IRCA: A LEGISLATIVE RESPONSE TO UNDOCUMENTED WORKERS

Through the passage of IRCA in 1986, the US Congress sought to place major limits on undocumented Mexican migration,[2] widely perceived to have flooded the country as a result of the loss of border control, so it was argued, along the entire southern border. IRCA contained two major strategies for the purpose of interrupting migratory flows. In order to reduce the demand for undocumented labor, it required that all employers demand the appropriate documentation from all potential employees and imposed fines on firms that knowingly hired undocumented workers. In order to reduce the supply of undocumented workers, border surveillance was significantly increased, thanks to major budgetary increases for the Immigration and Naturalization Service and the Border Patrol. At the same time, in order to avoid destabilizing the firms and economic sectors traditionally dependent on cheap, reliable labor, it established channels of regularization for a large number of undocumented residents in the United States together with farm workers who met certain requirements.[3]

The law, however, was not consistently enforced. Despite the increase in expense and forces to prevent undocumented workers from crossing the border, little was done to check demand, since sanctions were not usually imposed. The United States sent mixed signals to potential migrants. On the one hand, it tried to make

---

[2] US signals and policies toward the flows of undocumented workers have not usually been exclusively designed to modify Mexican flows, but since Mexicans are the majority, they are the most directly affected.

[3] As a result of IRCA, approximately 2.8 million people regularized their situation in the US, about 2.1 million of whom were Mexican.

the border less porous, while on the other, the magnet of available jobs for migrants remained unchanged. Eventually, Mexican migration resumed its upward trend.

Moreover, the pattern of circular migration, which had hitherto prevailed, began to be replaced by a pattern of settlement in the United States and to acquire the form of permanent migration. Thus, from a US perspective, migrants were transformed *from sojourners to settlers*.[4] From the Mexican perspective, the migratory phenomenon turned into a growing population loss. Thus, in the 1980s, the net migratory balance was negative, estimated, as an annual average, at between 210,000 and 260,000 Mexicans, representing a substantial increase over the 120,000 to 155,000 Mexicans estimated as the negative net migratory balance for the 1970s and above all, in relation to the 30,000 to 50,000 estimated for the 1960s. During the early 1990s, the Mexican population loss oscillated between 277,000 and 315,000 per year.[5]

At the same time, the territorial extension of the migratory phenomenon began to become noticeable. It did not involve the replacement of traditional emigration zones by new zones of migrants, since emerging zones were added to those that had already been consolidated. Thus, in the early 1990s, the ten main states of origin for migrants included Oaxaca, a state that had not previously figured as an important zone of origin of migrants. During the 1990s, the "other" states (outside the first ten) accounted for 28.4% of all migrants. Conversely, in 1970, the ten main states of origin of migrants were the "traditional" states, while

[4] Wayne A. Cornelius (1992), "From Sojourners to Settlers; The Changing Profile of Mexican Immigration to the United States," in Jorge Bustamante, Clark Reynolds and Raúl Hinojosa-Ojeda, *U.S.-Mexico Relations: Labor Market Independence,* Stanford, CA, Stanford University Press, pp. 155-195. This change began to occur before 1986. IRCA was the legislation adopted after years of discussion and several failed attempts — in 1981, 1982, 1983 and 1985 — during which similar legislation was almost adopted. It is not illogical to suppose that, since before 1986, immigrants began to "discount" the effect of border closure or greater control of the latter, which would prevent the circularity of their traditional behavior.

[5] *Binational Study on Migration between Mexico and the United States* (1997), Secretaría de Relaciones Exteriores and US Commission on Immigration Reform, Mexico. The regularization of migrants under IRCA contributed to the increase in the number of permanent Mexican migrants. Regularized migrants in the US acquired rights that enabled them to "sponsor" certain members of their families and dependants.

the proportion of migrants originating from "other states" (which at the time included Oaxaca) was just 17.2% of the total.

Changes in the migratory pattern were also due to the unfavorable economic circumstances and conditions in Mexico, particularly from the early 1980s onwards. As a result of the difficulties in the 1970s and the first major economic crisis in 1982, the economic system experienced a radical change in the 1980s: the economy was liberalized, the sphere of action for markets was expanded and there was an enormous reliance on private investment — both domestic and foreign — to activate the economy.

Coinciding with the passage of IRCA, the year 1986 was also an emblematic year, with Mexico's incorporation into GATT, as regards changes in the country's economic orientation. The economic imbalance caused by the crisis and restructuring associated with economic liberalization led to fluctuations in the employment rate and to the reduction in the rate of job creation, which was accompanied by an increase in open unemployment and, above all, unprotected, informal employment. This period also saw a significant decrease in real salaries, together with a widening of the salary gap between Mexico and the United States. The 1980s, in short, constituted a "lost decade." Economic growth barely equaled demographic growth.[6] This led, for perhaps the first time in decades, to widespread pessimism among the population regarding the country's potential for development.

Following the passage of IRCA, the Mexican government did not send very different signals from those it had been sending since the 1970s, when it institutionalized the "policy of not having a policy,"[7] a policy that potential migrants could only perceive as abandonment or neglect. The change in economic policy ignored the migratory phenomenon. Coping with emigration was not part of the new national project, nor had it been during the project of industrialization with a closed economy. Public policies were not adopted to deal with the possible effects of the restruc-

[6] The Gross Domestic Product fell in absolute terms in 1982, 1983 and 1986.

[7] Manuel García y Griego, "Hacia una nueva visión del problema de los indocumentados en Estados Unidos," in Manuel García y Griego and Mónica Verea Campos (1988), *México y Estados Unidos frente a la migración de los indocumentados*, Mexico, UNAM-Coordinación de Humanidades and Miguel Ángel Porrúa, pp. 123-152.

turing caused by the liberalization of the economy on Mexican labor markets and therefore, on the conditions traditionally associated with emigration.

Nevertheless, the Mexican government was forced to adjust its positions and attitudes as a result of the new US policy. The previous Mexican attitude of "distancing," although functional, was no longer tenable. Nevertheless, Mexican responses continued to be based on the assumption that emigration was inevitable.[8] Indeed, Mexico was not prepared to actively respond to the challenges of the unilateral, restrictive attitude of the United States. With the exception of the attempts to initiate a bilateral approach to migratory issues, the response was to reinforce the policy to defend migrants' rights.[9] But no significant attempts were made to design public policies that would seek to offset the widespread economic and social conditions that encouraged emigration.

2. NAFTA: AN INSUFFICIENT STRATEGY FOR SUBSTITUTING TRADE FOR MIGRATION

NAFTA marked a watershed in economic policy and foreign relations between the three countries in North America and was also regarded as a major attempt to modify Mexican migratory flows. On that occasion, the attempt was not unilateral; it was a conception shared by the United States and Mexico.[10] On the basis of the expectation that the free movement of goods and capital would lead to sizable investments in Mexico, it was hoped that NAFTA would lead to more jobs and higher wages in Mexico, which would reduce migratory pressure, in other words, migration would be replaced by trade.

Within the context of the paradigm that had begun to emerge in the late 1980s, economists recommended liberalizing trade be-

---

[8] Francisco Alba (1999), "La política migratoria mexicana después de IRCA," *Estudios Demográficos y Urbanos*, Vol. 14, No. 1, January-April, pp. 11-37.

[9] Remedios Gómez Arnau (1990), *México y la protección de sus nacionales en Estados Unidos*, Mexico, CISEUA, UNAM.

[10] The NAFTA proposal was directly inserted in the "international consensus" regarding the inter-relations between economic development, free trade and international migration. See Trilateral Commission (1993), *International Migration Challenges in a New Era*, New York.

tween the United States and Mexico as a strategy for promoting the economic development of the latter and eventually reducing Mexican emigration.[11] Migration would be reduced as the two economies converged.[12] NAFTA offered Mexico solid conceptual scaffolding for lending credibility to a position that opposed Mexican emigration, a position expressed in López Portillo's government as, "We want to export goods, not people."

Nevertheless, insufficient attention was paid to the aim of economic convergence. On the one hand, given that the supposed effects of NAFTA on economic convergence would not be immediate,[13] it would have been necessary either to adopt active policies to hasten convergence or to accommodate large number of migrants during the transition period. On the other hand, free trade and the resulting economic integration do not lead either automatically or inevitably to convergence, and thence to the reduction of migratory flows. Consequently, it would have been necessary to accompany trade liberalization with specific public policies designed to achieve the goal of convergence and to reduce the

[11] Commission for the Study of International Migration and Cooperative Economic Development (1990), *Unauthorized Migration: An Economic Development Response*, Washington.

[12] Expectations of less migratory pressure, as a result of trade liberalization, played a key role in the acceptance of the NAFTA, particularly among the US political class. Francisco Alba (1993),"La migración mexicana a Estados Unidos y la iniciativa del Tratado de Libre Comercio: el juego de las expectativas," in Gustavo Vega (coord.), *Liberación económica y comercio libre en América del Norte: consideraciones políticas, sociales y culturales*, Mexico, El Colegio de México, 1993, pp. 273-289.

[13] Various econometric exercises showed the difficulty that would be caused, within a close time horizon, by significant changes in established migratory trends, given the considerable economic asymmetries between the two countries and the numerous social and enterpreneurial-labor networks that had been shaped over more than half a century of migration. Most of the experts on migration were also sceptical about such a possibility. Among the former, see Raúl Hinojosa-Ojeda and Sherman Robinson (1992), "Labor Issues in a North American Free Trade Area," in Nora Lustig, Barry P. Bosworth and Robert Z. Lawrence (eds.), *North American Free Trade: Assessing the Impact*, The Brookings Institution, Washington, D.C., pp. 69-108; among the latter, see Francisco Alba (1993), "El Tratado de Libre Comercio y la emigración de mexicanos a Estados Unidos," *Comercio Exterior*, Vol. 43, No. 8, August, pp. 743-749, and Manuel García y Griego (1993), "La emigración mexicana y el Tratado de Libre Comercio en América del Norte: dos argumentos," in Gustavo Vega (coord.), *Liberación económica y libre comercio en América del Norte*, Mexico, El Colegio de México, pp. 291-304.

dynamics that would prevent the latter. None of this happened, the authorities did not even design specific policies to provide either compensation or training for Mexicans affected by the cost of economic liberalization and restructuring.

When it was decided to negotiate a free trade agreement with the United States and Canada, the authorities neglected to antici- pate, just as they had failed to do when the economy was opened to outside competition, the effects of the profound restructuring and economic changes on society, nor did they attempt to reduce its negative effects. The consequences of the latter included the neglect of those who had lost out because of integration and eco- nomic and social polarization. Consequently, for growing num- bers of the population, the role of migration as a means of gaining access to economic advancement, accumulating capital and ful- filling their ambitions and dreams, was reinforced.

The strategy of economic convergence to reduce migratory pressure was not translated into specific action (beyond trade lib- eralization). On the contrary, both countries did not really believe that trade liberalization would not have the desired effect on mi- gration and resorted to their earlier positions. The United States began to erect barriers along the border with Mexico to reduce undocumented migration, while Mexico promoted the organiza- tions that would provide migrants with protection.

The United States energetically returned to its policy of physi- cally controlling the entrance of undocumented workers. The pe- riod between 1993 and 1994 saw the implementation of the policy known as "prevention through dissuasion" (which followed IRCA's policy), doubling the funds assigned to the Border Patrol and launching a series of "operations" that used all the techno- logical advances available to block the busiest crossing points for undocumented workers between the Pacific Ocean and the Gulf of Mexico. Utility vehicles, electronic sensors, night visors, powerful lights and "uncrossable fences" comprised the new border scenery. This showed that emphasis was obviously being placed on controlling the supply of undocumented workers at the border. At the same time, as in the past, the government failed to send signs of having a similar interest in seriously controlling the demand for these same workers. Instead, attention was fo-

cussed on the supposed migratory magnet of US infrastructure and social conditions.[14]

Mexico also witnessed a return to previous conditions: efforts focussed on dealing humanely with migrants and the migratory phenomenon was regarded as inevitable once again, since achieving a significant reduction in the volume of Mexican emigration was not on the agenda.[15] This translated into the reinforcement of the traditional public policies of consular protection in the United States. Thus, the strategy of Zedillo's government, designed to establish a migratory dialog with the United States, was primarily[16] designed to minimize the damage caused by the hardening of actions that meant that border crossing took place under increasingly adverse circumstances.[17] This dialog sought to establish conditions whereby migrants would be ensured a safe departure, be spared discrimination and have their rights respected once they joined the US work force and society.[18]

These responses were paralleled by the reinforcement of liaison programs with communities abroad, as well as legal reforms to ensure "the non-renounceability of Mexican nationality" which had a similar purpose: to make it easier for Mexicans already living in the United States to enjoy a legal status that would enable them to defend their rights more effectively in that country. The counterpart to this approach was also designed to make it easier

[14] In the United States, the year 1996 saw the passage of the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA), which was the main piece in the legislative strategy designed to create more difficult conditions for immigration in general and for unauthorized immigration in particular. Other legislative pieces that came into effect that same year and were permeated by the same restrictive attitude regarding immigration were the Anti-terrorism and Death Penalty Act and the Personal Responsibility and Employment Opportunity Act (a law that reformed social welfare).

[15] Other internal events in Mexico in 1994 and 1995 — the emergence of the EZLN in Chiapas, the devaluation of the peso, economic recession and the financial crisis — were factors that moved the reduction of emigration away from the horizon.

[16] The dialog strategy also extended to the regional sphere — including North and Central America, with the Puebla Process or the Regional Conference on Migration.

[17] Francisco Alba (1999), "La política migratoria mexicana después de IRCA," *Estudios Demográficos y Urbanos,* Vol. 14, No. 1, January-April, pp. 11-37.

[18] Gustavo Mohar and María Elena Alcaraz (2000), "U.S. Border Controls: A Mexican Perspective," in Peter Andreas and Timothy Snyder (eds.), *The Wall Around the West,* Lanham, MD, Rowman and Littlefield Publishers Inc., pp. 139-150.

for Mexican residents abroad (particularly in the United States) to exercise their rights, as Mexicans, in Mexico: namely the right to be represented, vote and be elected.

The combination of favorable circumstances in the United States — high economic growth and a continued demand for workers — and unfavorable circumstances in Mexico — recurrent crises, insufficient economic growth, low demand for workers coupled with an abundant supply of the latter — reinforced the migratory phenomenon. Thus NAFTA has not only failed to discourage migration but has also probably created more migration. However, NAFTA has translated into significant changes in trading trends in Mexico: international trade has expanded to rates of nearly 15% annually since 1994, exceeding even the most optimistic expectations. Conversely, the development of migratory trends has reflected those observed prior to the passage of NAFTA.

The increase in migration, observed after the passage of NAFTA, has been described as a migratory hump,[19] since migratory trends initially rise above previous levels (in view of closer economic integration that implies significant processes of economic adjustment, together with the availability of more funds, which means that people can afford to emigrate), and subsequently, during the medium and long term, declines, once a certain threshold of economic development has been crossed.

The migratory trends of the first ten years after the passage of NAFTA fit the migratory hump hypothesis during the transition stage. However, since no point of migratory inflection was observed during these ten years, one could argue that trade liberalization, with the increase and intensification of trade, has been insufficient or unable to significantly modify the factors shaping the migratory trend of Mexicans to the United States. This perspective would appear to discredit the hypothesis of the migratory hump, since the hypothesis becomes irrelevant if the processes of economic adjustment — associated with trade liberalization and economic integration — continue to extend into

[19] Philip Martin (1993), *Trade and Migration: NAFTA and Agriculture*, Washington, D.C., Institute for International Economics.

the long term with no sign of leading to a structural change in the parameters that characterize the current Mexican economy.[20]

Thus the population loss (of Mexicans of any age or sex, not only workers) continued to increase significantly during the second half of the 1990s. In comparison with a net negative emigration of between 277,000 and 315,000 Mexicans during the early 1990s, estimates for the last five-year period fluctuate between 325,000 and 360,000.[21] More recent estimates set the net migratory balance at approximately 390,000 people for the period from 2000 to 2002,[22] reflecting a migratory intensity that has continued to rise from 3.4 international migrants per hundred inhabitants during the first half of the1990s to 3.6 during the second.[23]

Consequently, migration to the United States has become a national phenomenon that is increasingly widespread both geographically and socially. The indices of migratory intensity at the municipal level for the year 2000 clearly show the enormous territorial spread of the migratory phenomenon. Thus, municipalities with extremely high indices of migratory intensity not only belong to states that traditionally expel migrants but also to certain emerging states, such as Guerrero, Oaxaca and Puebla. Municipalities with high indices are also located in states such as Hidalgo, Querétaro, Mexico State and Nuevo León, which are outside traditional regions. Between 1995 and 2000, only a few dozen municipalities in the country failed to register some type of migratory activity. In other words, municipalities that did not report households from which a circular migrant either left or returned to; municipalities to which no migrant returned; municipalities that did not have any members in the United States and/or municipalities that did not report any households that had received remittances.[24]

[20] Francisco Alba (2004), "El Tratado de Libre Comercio, la migración y las políticas migratorias," in Enrique R. Casares and Horacio Sobarzo (comp.), *Diez años de* TLCAN *en México. Una perspectiva analítica,* Mexico, Fondo de Cultura Económica, pp. 215-242.

[21] Rodolfo Corona Vázquez (2002), "Magnitud de la migración mexicana en años recientes," National Congress on Migration, Guadalajara, Jal., November 21-23.

[22] Consejo Nacional de Población (2002), *Proyecciones de la población de México 2000-2050,* Mexico, Conapo.

[23] Francisco Alba (2000), "Migración internacional. Consolidación de los patrones emergentes," *Demos. Carta Demográfica sobre México,* No. 13, pp. 10-11.

[24] Consejo Nacional de Población (2002), *Índices de intensidad migratoria México-*

It has also been consistently proved that migrants increasingly originate from urban areas, not just rural areas (although temporary migrant workers from these last areas continue to constitute a slight majority). At the same time, migrants' working experience in the United States is extremely diverse and has taken place in industry and services (with approximately two fifths of temporary migrants taking part in each sector), and not just in agriculture (which absorbs a fifth of temporary workers). Before they leave, migrant workers have been engaged in semi-skilled occupations or even relatively skilled occupations (the number of professionals residing in the United States in 2002 was estimated at approximately 380,000), not just unskilled jobs. In short, migration affects, albeit in different ways, an extremely broad spectrum of the country's social and occupational groups.[25]

In fact, one could even say that NAFTA has made Mexican emigration more complex and heterogeneous. NAFTA has changed the expectations of citizens in its member countries in ways that were probably not anticipated by the promoters of the Trade Agreement. As far as Mexican citizens are concerned, NAFTA has helped sever their bonds with their mother country, which were previously very strong, and encourage various forms of transnationalism. Due to the closer links between the countries, the social aspirations of broad sectors of the Mexican population tend to be projected onto the United States, now more easily than in the past, in view of what they see as limited opportunities for personal, familial and societal fulfillment in Mexico. Given the previous experience of social networks that operate across transborder divisions, the spirit of NAFTA — the dilution of borders — has probably permeated the mental horizons of large groups of Mexicans who have hardly benefited from it. Due to the transnationalism from the top downwards — the ideology of commercial, productive and financial integration — which facilitates

Estados Unidos, 2000, Mexico. We do not have an equivalent indicator to this index for earlier data for examining long-term changes in the migratory phenomenon. However, these indices show that the migratory phenomenon has undoubtedly spread, with varying intensity, throughout the country.

[25] Abundant empirical evidence on the new migratory patterns is available in Paula Leite, Luis Felipe Ramos and Selene Gaspar (2003), "Tendencias recientes de la migración México-Estados Unidos," in *La situación demográfica de México 2003,* Mexico, Conapo, pp. 97-115.

selective mobility,[26] transnationalism from the bottom upwards, i.e. mass migration, has also acquired its naturalization papers.

The emergence of the "spirit of the NAFTA" has also influenced Mexican positions — both societal and governmental — regarding the migratory phenomenon, by opening up spaces to "rationalize" the exodus of Mexican workers by seeking guarantees and conditions to ensure their safe passage. The defense of commercial and productive integration and the country's involvement in world markets, particularly those of the United States, has given encouragement and "legitimacy" to the demands and hopes of formalizing freer movement for Mexican workers.[27]

Nevertheless, given this situation, what has emerged from the current migratory relationship is a wave of deaths along the border: the dismal result of a US policy of impenetrable border control and a migratory reality that exceeds it. The situation is also contradictory since the integration of certain markets is promoted while that of others is checked, such as the labor market through migration, which the policies for economic and trade integration promote.[28] Responses to the reality of migration have not only been partial but out of sync with the economic needs of the United States and Mexico. This means that certain arrangements and changes will have to be carried out regarding the positions and policies of the two countries to create a new approach to the migratory phenomenon that will be both realistic and acceptable to the main parties involved.

---

[26] Within a selective, limited sphere, chapter XVI of the NAFTA reflects a view of the correspondence between the freedom sought for goods, capital and technology markets and the freedom for determined labor markets (particularly those of skilled human resources, such as technical and administrative personnel). The point is to accompany the productive factors of capital and technology by the work that possesses the appropriate knowledge for its exploitation.

[27] This demand has been one of the keynotes of the Mexican press in the years following the passage of NAFTA.

[28] Douglas Massey, Jorge Durand and Nolan J. Malone (2002), *Beyond Smoke and Mirrors. Mexican Immigration in an Era of Economic Integration*, New York, Russell Sage Foundation. Francisco Alba (1999), "La migración mexicana a Estados Unidos. Un rompecabezas difícil de armar: relaciones entre políticas de desarrollo, libre comercio, integración económica y migración," *Este País*, No. 105, December, pp. 32-37.

3. Significance and Legacy of the Migratory
Negotiations of 2001

Once Vicente Fox was elected president of Mexico in the year 2000, he declared himself in favor of an "open border" policy between the three signatory countries of NAFTA. One of the aims behind this statement was to reach an agreement that would liberalize the flows of Mexican workers, particularly towards the United States.[29] The reactions of the Canadian and US governments were unenthusiastic, if not overtly antagonistic. However, the proposal opened up avenues for a reconsideration of the migratory issue between Mexico and the United States. In February 2001, in Guanajuato, Presidents Fox and Bush agreed to initiate a negotiating process designed to establish a new migratory relationship that would conclude with an "orderly system of migratory flows."[30]

This political decision filled a major gap in bilateral relations. It involved the "normalization" of one of the bonds that had profoundly linked the two countries for a long time. The search for rules to ensure the orderly, predictable management of the migratory phenomenon placed it on a par with trade, investment and financial links, culminating in NAFTA. In the Guanajuato Proposal, the two governments sought to "achieve short- and long-term agreements that would enable them to handle migration constructively..."

The joint attempt to channel migratory flows into a legal framework was extremely ambitious. The bilateral negotiations represented a significant desire to achieve congruence between policies and realities, by providing legitimate spheres for the mobility of the labor factor within a region that was increasingly integrated at several levels. For the first time since the conclusion of the *bracero* programs, Mexico and the United States were prepared to seek agreements through negotiations on the management of the migratory issue.[31] There

---

[29] Fox's government directly and openly embraced the aim, buried by nearly all previous administrations, including Zedillo's, of ensuring Mexicans' entry into US labor markets, into which they have gradually been inserted, since Fox's government did not feel responsible for the fact that Mexican emigration was linked to the particularities of national development, whose limitations and failures were attributed to the previous regime and governments.

[30] *Partnership for Prosperity. The Guanajuato Proposal*, February 16, 2001.

[31] The US ambassador to Mexico at the time, Jeffrey Davidow (2003), held

are unmistakable signs that political will existed on both sides to achieve specific results within a reasonable period of time.

However, negotiations failed to translate into an agreement due to circumstances beyond them. The events of September 11, 2001, aborted any progress that had been achieved.[32] Although everything would seem to suggest that the negotiators had made significant progress before September 11, 2001, it would be point-less to mention any specific advances or disagreements, since ne-gotiations collapsed together with the Twin Towers.

It is, however, at least worth mentioning the five points on the Mexican negotiating agenda: the regularization or legalization by the United States of Mexicans living there without the appropriate permits and documents; the establishment of a program of tempo-rary workers that would incorporate a significant number of Mexicans; obtaining a higher number of immigration visas for Mexican citizens; creating safe, orderly conditions along the com-mon border; and cooperation for the development of the main regions of origin of the migrants.[33] Most of the discussions and negotiations, however, focussed on the four previous points.

Although migratory negotiations have been shelved, their sig-nificance and legacy continue to mark discussions on migratory issues. The political agreement between Mexico and the United States, reached in Guanajuato, to begin migratory discussions and negotiations, entailed an enormous change of orientation in the management of one of the most intractable bilateral issues and opened up the possibility of modifying previous US policy which has fruitlessly sought to separate solidly integrated labor markets that cannot be ignored by either of the two countries. The fact that top-level discussions and negotiations were carried out repre-

---

that it was a "negotiation that was not a negotiation as such," Jeffrey Davidow, *El oso y el puercoespín*, Mexico, Grijalbo, particularly pp. 329-351.

[32] Arriving at any agreement was still a long way ahead. The US Congress was barely involved in the various points of the agenda discussed by the execu-tive branches.

[33] The issues in the negotiations reflected the main components of the pro-posal by a non-governmental binational group. The us,- Mexico Migration Panel (2001), *Mexico-U.S. Migration: A Shared Responsibility*, Washington, D.C., Carnegie Endowment for International Peace/Instituto Tecnológico Autónomo de México. This panel was specifically designed to offer the two new administrations — i.e. Fox and Bush's — a series of guidelines for a bilateral policy on the matter.

sented an institutional change with enormous implications for both bilateral migratory relations and Mexico's migratory agenda.

As for bilateral relations, there was a shared agreement to raise their level. Not only did Fox's administration prioritize the relationship with the United States; Bush's government also acted on the premise that its relationship with Mexico was a top priority. From this perspective, engaging in migratory negotiations involved the will to do away with major divergences that act as irritants to the relationship. The new approach appeared to seek to establish more congruent relations between the various spheres of the complex bilateral interaction.

The first point that should be emphasized concerns the fact that when the United States sat down, very visibly, at the negotiating table, it elicited widespread recognition, by that country, that the US economy experienced a major demand for Mexican migrant workers, whose economic and social contribution was both accepted and appreciated.[34] Creating a suitable climate for the negotiations indirectly contributed to the recognition, by US society, of the contribution of Mexican migrants to their economy.[35]

The enormous political will behind the negotiations can also be deduced from the high level of those responsible and the composition of the secretariats involved. The negotiating teams comprised the top levels of the respective governments: the Foreign Affairs and Interior secretaries on the Mexican side, the Secretary of the State Department and the attorney general on the US side.[36] This composition of those ultimately responsible for the discussions and negotiations reflects the importance that geopolitical considerations had acquired, complementing and coun-

[34] "Rethinking Mexican Immigration," editorial, *The New York Times*, July 23, 2001.

[35] For more on Mexico's complaints about the lack of US recognition of Mexican migrants' contribution to the US economy, see *Binational Study on Migration between Mexico and the United States*, Mexico, Secretaría de Relaciones Exteriores and US Commission on Immigration Reform, 1997.

[36] The scant attention paid by those responsible for US foreign policy to the search for a strategic response to the migratory issue has been pointed out and criticized by Carlos Rico (1992), "Migration and U.S.-Mexican Relations 1966-1986," in Christopher Mitchell (ed.), *Western Hemisphere Immigration and United States Foreign Policy*, The Pennsylvania State University Press, University Park, pp. 221-283.

terbalancing the legal and police considerations linked to US internal interests.

As for Mexico's agenda, managing to seat the United States at the negotiating table constituted a major triumph for the country. From a human rights perspective, the very fact of engaging in top-level discussions and negotiations constituted a major step in the defense of Mexican migrants, since unsafe, vulnerable conditions of the latter are usually associated with the absence of agreements — however limited — that force the parties involved to observe certain rules of behavior. Moreover, the agenda of migratory negotiations closely reflected the interests of the Mexican party.

The formalization of Mexican interests, within the context of serious discussions and negotiations, implied that Mexico's positions should be expressed in an open, specific and precise manner. In the past, Mexico had clung to the universal, abstract principle of the defense of Mexican migrants, an irrefutable obligation and the traditional object of the consular functions of any country regarding its citizens. These discussions and negotiations forced the Mexican party to translate its traditional principles and objectives — respect for migrants' rights and ensuring the safe departure of certain workers — into specific proposals that constituted the points that Mexico placed on the negotiating table.[37]

The legacies of these discussions or negotiations are proving to be crucial, although negotiations were interrupted by the events of September 11, as a result of which they were cancelled by the US party. The fact that the two countries had agreed to discuss and negotiate the migratory issue with the aim of achieving an agreement has changed the terms in which it is raised in both countries, even after this round of discussions and negotiations ended. What remains is the recognition, not only of the governments but also of several political actors in the two countries, of the importance of the migratory phenomenon. Conducting negotiations has catalyzed the search for answers in both Mexico and the United States in view of the economic, demographic, social and migratory realities that bind the two countries.

[37] Francisco Alba (2003), "Del diálogo de Zedillo y Clinton al entendimiento de Fox y Bush," in Bernardo Mabire (ed.), *Mexico-United States-Canada 1999-2000*, Mexico, El Colegio de México, pp. 109-164.

One of the main implications of the negotiations on migration in the United States has been the strengthening of a collective awareness of the need to accommodate the flows of Mexican migrants. Several of the legislative initiatives, submitted after the cancellation of the discussions between the executive branches, that seek to accommodate migratory pressure, are in some way part of this legacy. Similar proposals have been expressed and supported by influential media[38] and various social organizations (including the AFL-CIO and the Catholic Church, through its bishops, in conjunction with Mexican bishops).[39] The voices in favor of some form of accommodation are also responding to the demands to meet the labor needs of major economic interests, particularly business.

President Bush's proposal, announced on January 7, 2004, can also be regarded as being linked to the discussions and negotiations with Mexico in 2001. As in that year, in 2004 President Bush placed the migratory issue back on the US national agenda, a few days before he met with President Fox at the Extraordinary Summit of the Americas held in Monterrey. However, although the rationale of previous discussions is present, the framework of Bush's proposal is still very different from that of 2001; the proposal concerning US immigration policy is unilateral and general. There is no mention of a special relationship with Mexico or of consolidating a project for economic integration.[40]

Instead of a regional vision, the proposal is dominated by other components that emerge as central elements of a future US immigration policy. First of all is the key role played by security considerations in immigration policy design. On the basis of these considerations, the proposal includes a series of measures to reduce the volume and eliminate the illegal situation of the population of undocumented workers,[41] estimated at several million,

[38] "Death on the Border," editorial, *The New York Times,* May 19, 2003, p. A22.
[39] Bishops of the United States and Mexico [The], "Strangers No Longer: Together on the Journey of Hope," letter published on January 23 in Mexico City and on January 24, 2003, in Washington.
[40] The proposal has also been interpreted as an attempt to attract the Mexican-American and Latino vote to the Republican camp.
[41] President Bush made it quite clear that he did not consider any form of amnesty acceptable.

approximately 4 million of whom might be Mexican. Secondly, the proposal states that satisfying the labor demands of the US economy includes wide-ranging programs of temporary workers (which are also open to undocumented workers living in the United States as a temporary solution to their illegal status). One has the impression that this proposal outlines the new priorities of US policy; security considerations come first, and economic considerations come next.

In Mexico, calls for negotiation and the demand for a migratory agreement have become a demand by all political parties, the media and virtually all opinion leaders.[42] Another legacy is the importance that the migratory phenomenon has acquired in the political sphere, both domestic and international,[43] together with the reappraisal of migrants themselves, and the value and importance of Mexican and Mexican-American communities in the United States. Within the economic sphere, there has been a rediscovery and re-appraisal of remittances and their contribution to the Mexican economy in general, particularly to regional and local economies,[44] and specifically to the survival and improvement of the living standards of several million Mexican families.

In short, after the events of 2001, the Mexican government must continue to convince the US government of the need to modify the current status quo, which is extremely costly. The legacy of having begun to engage in discussions and negotiations, which created high expectations of wide-ranging agreements on migration in the two countries, has become a political and social claim

[42] The notes in Mexican newspapers on the migratory issue have been a "regular column" ever since negotiations raised expectations about the possibility of reaching a relatively broad agreement. In the post-September 11 circumstances, the gap between the pressure exerted by various media and political groups in favor of an "integral" migratory agreement and the lack of contents in this demand is extremely risky. There seems to have been a return to the traditional attitude of the past, through the return to a position of principles, the demand for a migratory agreement being a sort of additional principle.

[43] The search for a migratory agreement has been reaffirmed, despite the change by the Foreign Affairs Secretariat, as a key objective of foreign policy. Luis Ernesto Derbez, "Estrategias de la nueva política exterior de México," *Reforma*, September 19, 2003, p. 18A.

[44] The amount of remittances increased nearly fivefold from the early 1990s (between 2 and 3 billion dollars) to the early 2000s (when it quickly and easily exceeded 10 billion).

that must be dealt with in a bilateral context that has proved re-
luctant to accommodate both traditional and more recent Mexi-
can objectives as a country of origin and transit of migrants.

4. The Emerging Context:
Security Priorities and Border Control

The international context, particularly that of the United States,
that marked the beginning of the 21st century, as a result of the
September 11 attacks, is one in which national security consi-
derations have become crucial. Within this context, any other con-
sideration is secondary and there is an acute sensitivity to any
commitment that appears to impinge on national sovereignty.
Various forces are seeking to redefine the role of borders in the
direction of greater control, which will undoubtedly make it more
difficult to support the accommodation of migratory flows.[45] The
new priorities for the United States revolves around national
security; the anti-terrorist struggle and border control pose new
challenges to the search for acceptable solutions for the main actors
that are involved and aware of the reality of the integration of the
two countries and its implications for dealing with the migratory
phenomenon. Anti-immigrant (and anti-Mexican) actors and
voices have raised their heads again, and in some cases overtly
xenophobic attitudes have begun to emerge.[46]

    With the new context, security considerations and us internal
political interests prevail over economic and geopolitical interests
linked to the proximity of Mexico. From now onwards the agenda
for managing migratory flows is unlikely to be contemplated or
discussed without including security issues, border control and
the fight against terrorism. The migratory issue, already highly
complex, will become even more so.

    The new us priorities, partly interiorized by Mexico, are al-
ready reflected in the orientation of bilateral relations. The secu-

[45] The anti-terrorist struggle feeds unfavorable perceptions of migrants.
[46] The anti-immigrant (anti-Mexican and anti-Latino) offensive will undoubt-
edly find support in the unhelpful points of view of Samuel Huntington (2004),
"The Hispanic Challenge," *Foreign Policy,* March/April, pp. 30-45.

rity of their common border has become a priority issue; the border is already more heavily protected. On March 22, 2002, the two countries signed a cooperation agreement on the Mexico-US border to turn it into an "intelligent" border. Follow-up of the agreement is under the jurisdiction of the Department of Homeland Security, which, since its creation, has been responsible for migratory issues. The Mexican counterpart responsible for this agreement is the Interior Secretariat. This has made the "contamination of issues" in this case, migration and security, a fact, something Mexico has sought to avoid in its relations with the United States.

A 2001-style migratory package, although still valid, is no longer a viable option. An alternative option, given the current bilateral context, would be to seek specific results in aspects of Mexico's general objectives that would benefit from the perspective of a relationship of trust between the two countries. Thus, the regularization of undocumented Mexican workers would benefit from US attempts to put its house in order, by registering all the residents of that country more carefully. This type of initiatives has been submitted, since 2001, in the US Congress. Temporary worker programs could also benefit for similar reasons, in the logic of replacing illegality by reliable documentation.[47]

From this perspective and in response to the circumstances since September 11, the Mexican government has worked successfully on other "active policies" to deal with the problem of undocumented Mexican workers in the United States.[48] These policies include promoting a "matrícula consular" as an ID card for migrants, which would contribute to the security of all parties. Nearly a million consular registers were issued in the year 2003.

In addition to taking advantage of conditions that might arise as a result of the emerging circumstances focussed on security, and in view of a highly feasible scenario that rules out agreements to increase regional integration through the liberalization of the labor factor in the immediate future, Mexico should look seriously

[47] Joining temporary worker programs such as those proposed by President Bush in January 2004 entails serious dilemmas for certain migrants who are more likely to be detected in the event that they fail to observe the clauses governing the duration of work and the time of their return.

[48] A strategy of "small steps" would also permit significant advances in the conditions under which many migrants cross the border and the United States.

into the issue of reducing migratory pressure. However, without agreements designed to encourage shared prosperity, it is impossible to envisage scenarios with reduced migratory pressure.[49] Hence the argument for the need for Mexico's economic development and regional economic convergence to be reinforced by the additional advantages of this development and a similar degree of convergence in matters of security. In the long run, balanced, shared regional development is the most effective guarantee of security between neighbors.

In the meantime, Mexico must develop and combine policies for managing migratory flows with other policies to influence the dynamic of the migratory phenomenon. Future migratory discussions must include both issues. Since economic and social development, like internal and international processes of convergence, require long periods for their maturation and achievement, and given that the momentum and inertia of migratory flows are enormous in the short term, it is essential to deal with both issues in a congruent fashion.

Considerations of collective security provide an opportunity for the two governments to seriously explore the "development approach" in order to be able to offer workers and citizens safe, controlled, orderly conditions of mobility. Only a well-founded effort, financed by the two governments, to modify structural factors on either side of the border underlying current migratory pressures, and to create economically attractive alternatives in Mexico for the population would significantly reduce Mexican emigration. National and regional security needs provide a window of opportunity for governments and societies to overcome the limitations and grievances of the past and view each other as strategic partners and jointly responsible agents of a "cohesive" social construction within the area of North America.

The overlapping of security issues and border control with the migratory agenda, however, poses several challenges and

[49] The construction of an egalitarian space in the national spheres is a principle that is widely accepted by countries. In the context of NAFTA, this principle of binational cooperation is partially applied to the border region between Mexico and the United States, the area of influence of the North American Development Bank (NAD Bank).

places the country at a crossroads. A strategic association within the context of deepening security relations places heavy demands on the participating states. In North America, Canada and the United States are advancing towards the institutionalization of a "North American Perimeter" (even though the term has yet to be fully accepted) to prevent the interruption of bilateral trade flows and strengthen security relations. The creation of this space contemplates major coordination and cooperation initiatives regarding migration and mobility. Mexico cannot at present join this effort to secure North American borders, nor does it appear to be prepared to do so. Nevertheless, nor can it remain on the edges (nor has it) as shown by the border cooperation agreement with the United States. Thus, in the immediate future, given the current political conditions in the three countries, a feasible consolidation scenario would be the emergence of an America protected, and differentiated, by two "buffer states," each in its own way.

In any case, the incorporation of security conditions into the management of migration would place Mexico in a policy dilemma because of the growing problem of transit migration and the predictable demands and requirements to secure the border with Guatemala.[50] Within the framework of these difficult conditions, the country must promote the development of an "integral migratory policy" which contemplates the reality of massive Mexican emigration, the objectives of specific immigration and the design of congruent yet respectful responses to the growing problem of transit migration.[51]

The complex links between migration, trade integration, border control and security will undoubtedly give rise to broad discussions in order to arrive at congruent national policies. The changes and continuities in government responses from 2001 onwards in establishing specific proposals and for a shared agenda vis-à-vis the phenomenon of Mexican migration to the United

[50] The increase in resources, personnel and the use of advanced technologies since 2001 should, however, be seen as an acceleration and intensification of a process, initiated several years earlier, that seeks greater surveillance of the southern border (on the basis of highly unregulated conditions).

[51] Fox's government's acceptance of international scrutiny — regarding the respect of human rights — is a deliberate strategy to advance the rule of law and the human rights of national and non-national citizens in Mexico.

States is merely the start of a long process in which Mexico will have to immerse itself in the search for national definitions and consensus in order to respond consistently, on the threshold of the 21st century, to the problems of economic integration, limited labor mobility and the pre-eminence of security considerations. Within this context, the views and perspectives on migration, from, by and towards Mexico, will be closely linked to the views on Mexico's insertion into the North — United States and Canada — and the South — Central and South America.

SECOND PART

I. THE SERVICE REVOLUTION

Gustavo Garza

The year 1950 marked the beginning of a major economic change in the United States when, for the first time in history, the tertiary labor force rose to over 50% of total employment. Other countries in the developed world experienced a similar transformation during the following decades, driven by the new technological paradigms that accelerated the manufacture of industrial goods by combining flexible, numerically controlled production schemes with inventions in semiconductors, microelectronics, computers, industrial robotics, telecommunications and biotechnology. Several countries' rapid servicialization[1] was also fuelled by the increase in the consumption of services due to citizens' higher income, the high income-elasticity of their demand, demographic modifications coupled with changing lifestyles that required more health, education and entertainment services, the need for better public services, equipment and infrastructure in cities and regions for both the productive apparatus and the population.

The microeconomic sphere saw an enormous increase in the number of large multinational firms that transferred assembly line manufacturing processes to the Third World, with its cheap labor and other locational advantages, concentrating research and development, financial and banking institutions, corporate control, as well as entrepreneurial services of a high technical level (in-

---

[1] Since the process derived from the industrial revolution has been called industrialization (from industry→industrial→industrialization), for the sake of linguistic simplicity the revolution in the service sector has been called servicialization.

volving legal consultancy, engineering, computing, market re-
search and advertising) in the central countries.

The emerging service revolution is as yet far from complete,
yet its spatial impact on developed countries has been material-
ized through the consolidation of its principal mega-cities located
on the cusp of the global urban hierarchy: New York, London,
Tokyo and Paris. In underdeveloped nations, the number of large
metropolitan areas has multiplied, with 38 of the 50 most popu-
lated cities being located in this area. Demographically speaking,
Mexico City is the world's largest city after Tokyo, but it is far
from being a world city (Garza, 2000: 317).

The progress of post-industrial society in the United States
would seem to be irreversible. In 2002, it became the world's lead-
ing service industry, with this sector accounting for an astonishing
82% of the labor force, most of whom are engaged in activities
requiring a high knowledge component. The service revolution
will gradually continue to dominate manufacturing activities
which, as the 21st century advances, will constitute a minute pro-
portion of the post-industrial economy, like the US farming sector,
which accounted for just 1.8% of all workers in 2002.

This chapter seeks to develop three crucial areas for under-
standing the economy's conversion into a service industry, by
1) characterizing the service revolution in developed countries;
2) analyzing the nature of tertiary activities according to their vari-
ous meanings, in order to propose a positive general definition, in
other words, one that will incorporate its essential characteristics,
and 3) detecting trends in the territorial location of services. These
elements will be used to establish the analytical bases for
contextualizing research into the dynamics and levels of territo-
rial concentration of service activities in Mexican cities.

1. POST-INDUSTRIAL SOCIETY

In the 1930s, Fisher and Clark devised a means of classifying the
economic structure which groups economic activities into three
sectors: 1) primary (agriculture, forestry, fishing and mining),
2) secondary (manufacturing industry, construction, water and

electricity), *3)* tertiary (trade, transport and communications, finance and services) (Noyelle and Stanback, 1983: 8). Since then there have been proposals to sub-divide the tertiary sector (which would include transport and public services) to constitute a quaternary sector with banks and insurance companies, trade and real estate activities and a quintuple sector with education, health, government, research and recreation (Daniels, 1982: 7; Prince and Blair, 1989: 3). This last section has recently been expanded to include information science and modern telecommunications, although it is still classified as the quaternary sector by certain authors.

Regardless of the different classifications, however, the total tertiary hegemony in economically advanced countries has created an authentic service revolution from which post-industrial society has emerged (Bell, 1976: 525). The "ideal type" of this kind of society is characterized by three main components: *1)* a shift towards services in industry, in economic issues; *2)* central economic activities based on sciences, in technological issues; and *3)* the consolidation of technical elites and new principles of stratification, in social issues (Bell, 1976: 561). The determinants of post-industrial society are primarily, as mentioned earlier, the increase in manufacturing productivity due to automation, robotics and numerically controlled machines as well as the rapid development of computers and information science.

The increase in income levels due to industrialization, together with the saturation of the demand of agricultural and industrial goods, according to the laws of Christian Engel on the income-elasticity of consumption, explain why the demand for health, education, luxury and entertainment has grown and why the service sector has expanded, becoming hegemonic in the employment and production sector (Bell, 1976: 153).

One might add that the advance of an economy on the world scale implies a new social and territorial division of labor. Large transnational firms relocate their factories to certain Third World countries, keeping financial, research and development activities, central offices, highly specialized professional services, and global forms of dissemination and communication, i.e. what could be called the post-modern service sector, in their countries of origin. Within this new configuration of the world's economic geog-

raphy, underdeveloped countries obviously play the role of spaces where international corporations carry out the manufacturing process, extracting raw materials and fuel, making it highly unlikely that they will evolve towards post-industrial states unless a specific development strategy is implemented.[2]

In 1950, the service sector in the United States accounted for over 50% of the total labor force, making it a pioneer in the service revolution, like England in the industrial revolution during the second half of the 18th century. The main characteristic of this economic metamorphosis, in which an ever-increasing proportion of the labor force is employed by the service sector, is the dynamism of services provided for producers. These expand more rapidly than those in the rest of the sector, since they provide the technical and scientific knowledge and the information science requirements that are becoming an increasingly crucial factor in firms' development. It is vital to have the information and technology required for productive processes and vanguard products, a broad knowledge of markets and the differences between products, as well as the ability to implement the most efficient systems of corporate management (Bailly and Maillat, 1989: 16).

In 1960, tertiary workers in Canada accounted for 54.1% of the total labor force, followed by those in England who accounted for 51.9% in 1970, constituting, together with the United States, the three leading post-industrial nations (Singelmann, 1978: 68). In 1974, the labor force engaged in the service industry in France absorbed 51.9% of all workers, 25.1% of which were involved in producer services, up from 19.2% in 1954 (Bailly and Maillat, 1990: 47). Finally, in 1982, Italy and the former German Federal Republic reached the threshold of an absolute majority in services, when this sector represented 50.6 and 51.8% of total employment respectively (Petit, 1986: 5). Generally speaking, during the second half of the 20th century, most developed nations began a service

---

[2] This statement is drawn from the increase in inequalities observed between countries' levels of development. During the last three decades of the 20th century, differences were exacerbated between countries in the most highly developed third and those with intermediate and low development (World Bank, 2000: 14).

revolution that would gradually transform their economic and social structures, that has yet to be consolidated in the post-industrial world.

In terms of the dynamics of the labor market, the hegemony of tertiary activities in the US economic structure is reflected in the fact that over 90% of the 19 million new jobs created between 1970 and 1980 were in the service sector, while manufacturing jobs remained virtually stagnant (Noyele and Stanback, 1983: 1).

The service revolution in the United States also implied the transformation of the structure of the sector, observed during the last quarter of the 20th century and the beginning of the 21st century. In 1975, knowledge-based services accounted for 36.6% of the total, easily exceeding the 25.1% of all manufacturing activities (Table 1). By 2002, these services had increased to 49.6%, while manufacturing activities accounted for a mere 17.8%. In 2002, services as a whole absorbed 82.2% of all jobs in the United States, making it the country with the most advanced service revolution.

It has been estimated that during the first two decades of the 21st century, the US tertiary sector will rise to approximately 90% (Royssen, 1987: 100), making primary and secondary activities mere appendices to the servicialization experienced by developed economies. Although services constitute the leading economic activities, paradoxically, they are surrounded by misunderstandings that have prevented the creation of a widely accepted definition.

2. Towards a General Definition of Services

There is still no universal definition of service activities, despite the fact that they originated and evolved decades ago. They tend to be explained in terms of certain attributes, with two main conceptual characterizations: 1) according to their physical and trading peculiarities; 2) according to certain aspects of their production process.

Examples of this are given below:

1. "Goods" results in a material product that is typically storable and transportable. Production of services results in an out-

Table 1
United States: Jobs by Activity Sector and Branch, 1975-2002

	Thousands					Vertical percentages				
	1975	1980	1985	1996	2002	1975	1980	1985	1996	2002
Total	*82,515*	*97,244*	*107,622*	*122,795*	*129,366*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Sector I. Agriculture and mining	4,319	4,472	4,262	4,216	2,899	5.2	4.6	4.0	3.4	2.2
Agriculture	3,567	3,445	3,335	3,642	2,342	4.3	3.5	3.1	3.0	1.8
Mining	752	1,027	927	574	557	0.9	1.1	0.9	0.5	0.4
Sector II. Traditional industries	18,500	21,121	19,541	21,215	20,557	22.4	21.7	18.2	17.3	15.9
Construction	3,457	4,469	4,662	5,400	6,544	4.2	4.6	4.3	4.4	5.1
Manufacturing, excluding manufacturing information and printing and editing equipment	15,043	16,652	14,879	15,815	14,013	18.2	17.1	13.8	12.9	10.8
Sector III. Specialized manufacturing	2,225	2,927	3,126	2,755	2,441	2.7	3.0	2.9	2.2	1.9
Electric, electronic and communications equipment, excluding electrodomestic appliances and electricity	1,426	1,744	1,865	1,538	1,360	1.7	1.8	1.7	1.3	1.1
Instruments and related equipment	489	711	724	854	790	0.6	0.7	0.7	0.7	0.6
Office and computer machinery	284	431	506	363	291	0.3	0.4	0.5	0.3	0.2
Printing and publishing equipment	26	41	31	n.a.	n.a.	0.0	0.0	0.0	n.a.	n.a.
Sector IV. Knowledge-based services	30,214	36,317	44,651	54,443	64,203	36.6	37.3	41.5	44.3	49.6
Education	7,448	7,650	8,371	10,691	12,561	9.0	7.9	7.8	8.7	9.7
Health	5,393	6,287	7,583	9,469	10,787	6.5	6.5	7.0	7.7	8.3
Media	1,434	1,687	1,877	2,008	1,976	1.7	1.7	1.7	1.6	1.5
Telecommunication	1,710	1,739	1,833	1,337	2,413	2.1	1.8	1.7	1.1	1.9
Business services	1,629	2,523	3,732	4,023	7,124	2.0	2.6	3.5	3.3	5.5
Computing and data processing services	143	293	1,819	1,208	2,187	0.2	0.3	1.7	1.0	1.7
Other business services	1,489	2,230	3,275	4,208	n.a.	1.8	2.3	3.0	3.4	n.a.

Professional services	743	1,353	3,275	3,824	7,959	0.9	1.4	3.0	3.1	6.2
Financial services	4,223	5,162	5,924	6,899	7,816	5.1	5.3	5.5	5.6	6.0
Government jobs	6,002	7,393	6,962	10,776	11,380	7.3	7.6	6.5	8.8	8.8
Sector V. Tertiary services	27,257	32,407	36,042	40,166	39,266	33.0	33.3	33.5	32.7	32.6
Transport and public services	3,888	4,397	4,477	4,923	5,110	4.7	4.5	4.2	4.0	4.0
Wholesale trade	4,177	5,275	5,769	6,483	6,637	5.1	5.4	5.4	5.3	5.1
Retail trade	12,771	15,292	17,425	21,625	23,152	15.5	15.7	16.2	17.6	17.9
Accommodation	979	1,071	1,368	1,716	1,807	1.2	1.1	1.3	1.4	1.4
Personal services	835	931	1,125	1,184	1,292	1.0	1.0	1.0	1.0	1.0
Automobile and other repair services	656	889	1,066	1,084	1,268	0.8	0.9	1.0	0.9	1.0
Tertiary business services	477	615	836	661	n.a.	0.6	0.6	0.8	0.5	n.a.
Other services	3,474	3,937	3,976	2,490	2,909	4.2	4.0	3.7	2.0	2.2

n.a.: not available.

put that is not storable and usually requires direct interaction with the customer (Stanback, 1979: 5).[3]

2. The most that can be said at a general level is that services encompass an extremely heterogeneous group of economic activities often having little in common other than their main outputs are for the most part intangible products (Shelp *et al.*, 1981: 11).

3. It is probably most easily expressed as the exchange of a commodity, which may either be marketable or provided by public agencies, which often does not have a tangible form (Daniels, 1985: 1).

Definitions that comprise features of the production process include:

4. Including in it everything that is not part of agriculture or manufacturing product (Petit, 1986: 10).[4]

5. A change in the condition of a person or of a good belonging to the same economic unit, which is brought about as the result of the activity of some other economic unit (Hills, quoted by Nicolaides, 1989: 8).[5]

6. "Services are economic activities that provide time, place and form utility while bringing about a change in or for the recipient of the service. Services are produced by: *a)* the producer acting for the recipient; *b)* the recipient providing part of the labor; *c)* the recipient and the producer creating the service in interaction (D. Riddle, quoted in Nicolaides, 1989: 9).[6]

---

[3] This conception is extremely widespread. For example, people often say, "...by definition, personal services involve a one-to-one relationship between the service provider and the service receiver" (Shelp *et al.*, 1984: 2).

[4] This widely used statement defines them by what they are not, contrasting them with primary and secondary activities.

[5] This definition assumes that service production necessarily implies the simultaneous participation of two economic units (producer and consumer). Although this is valid for a group of services such as restaurants, beauty parlors, health and education, it does not apply to trade or the main financial services such as credit cards, banking deposits or life insurance. Neither the person who acquires life insurance nor the company that sells it to him wishes the reason why the service is contracted to happen (i.e. the customer's death). In any case, as long as this does not happen, there is no change in the condition of the purchaser, as Hill's definition points out. By focussing on the concept of "change of condition," the definition fails to distinguish clearly between goods and services (Nicolaides, 1989: 9). Consuming food bought at a supermarket alters the buyer's condition.

[6] Nicolaides regards this condition as more comprehensive than all the others, since it includes the buyer's time and participation, as well as focussing on

7. A service can then be defined as an agreement or undertaking by the service-provider to perform now or in the future a series of tasks over a specific period of time towards a specific objective (Nicolaides, 1989: 9-10).[7]

All these attempts at definition and the difficulty of arriving at a general definition of services that incorporates the essential feature of their heterogeneous nature which distinguishes them from goods, explain the tendency to use the residual conception that identifies them as those economic activities that are not classified in the primary (agriculture, livestock, forestry and fishing) or the secondary sector (manufacturing, construction and electricity).[8] By a process of elimination, services are grouped together within the tertiary sector that includes communications and transport, trade and services per se, in other words, banking and insurance, hotels and restaurants, amenities, health care and education as well as the government sector, which are usually collectively known as services. It has been said, however, that this is not a true

the production of the service that does not constitute a form of economic transaction. However, the author of this paper thinks that it fails to distinguish clearly between goods and services, since, for example, the acquisition of an automobile or musical instrument adapts completely to the definition of a service in that, "They provide, for a certain time and in a certain place, a useful change for the recipient," in addition to the fact that, by driving the car or playing an instrument, the recipient "interacts" with the provider.

[7] In this definition, Nicolaides emphasizes the fact that services are a *process or transaction*, unlike goods, which are objects, but he believes that they may not produce a change in the buyer, eliminate the condition of simultaneity and transitoriness of their production and consumption and avoid the logical difficulties of definitions that identify services with attempts to make changes in the recipient (Nicolaides, 1989: 10). This definition may orient future definitions towards the mercantile aspects of service production, but it fails to distinguish them from goods transactions. The purchase of any good involves a monetary transaction and if one considers the guarantee that many of these have, there is an agreement for many years (some automobiles have three years' "bumper to bumper" guarantee). Can there really be a special process or input for service production that distinguishes it from manufacturing and agricultural goods?

[8] This is still relative, since some authors such as Colin Clark include construction in the tertiary sector although most regard it as being in the secondary sector. "We can give a precise definition of industry as the continuous, large-scale transformation of raw materials into transportable products... the word transportable, excludes the processes of building and installation, which is best included in the service industry" (Clark, 1980: 351).

definition, since it fails to describe services as what they are (Shelp *et al.*, 1984: 11).

Although political economy has attempted to provide a positive definition of services, it also focuses on the fact that their production and consumption coincide in time and in space, as in the first set of definitions provided earlier. Using some of Marx's statements, which may have been correct at the time but are no longer so, "services are consumed the moment they are produced. The useful effect can be consumed only during this process of production" (Marx, quoted in Burger, 1970: 24). This author defines them as:

> Thus, all regular social activities can be considered as services of which it is characteristic — apart from other features — that the process of the activity, its result and utilization (inclusive of its distribution) coincide in time and space [Burger, 1970: 25].[9]

By emphasizing, like simpler definitions, the simultaneity in space and time of services, the definition basically considers those that were characteristic of the first stage of capitalism. From the late 20th century to the early 21st century, the technological development of electronic and computers has permitted a revolutionary separation between the place where services are produced and consumed, which in turn has permitted their widespread export (Baumol, 1986: 196; Nicolaides, 1989: Chap. 3).

The old temporal and spatial link between production and consumption has disappeared in a growing number of services. There is a range of new services, resulting from recent technological advances, such as the Internet, compact discs and video, cable TV, TV or Internet classes and wireless telephony, which do not fit traditional definitions, since, in addition to possessing a material component (compact discs, software, cell phones, etc.), they are fully storable, transportable and long-lasting. Moreover, they do not require interaction between the producer and the consumer. The same can be said of computer program services, legal, engi-

---

[9] She adds that it would be a mistake to think that the activities defined with this general characteristic have the same functions, which is why the various services should be grouped together according to their salient economic features, given the enormous heterogeneity of the general aggregate of this activity (Burger, 1970: 25).

neering and financial consultancy, which can be carried out thousands of miles away from the consumer and at different times.

Another factor complicating the distinction between goods and services is the fact that the latter are usually materialized in the form of physical objects, although what is acquired is the service they represent, rather than the paper or disc itself.[10] This is exemplified by architecture or engineering services printed in the form of plans (goods) or standard software or special programming, recorded on compact discs. Another equally imprecise case is patent medicines, since their high prices reflect the investment in research to discover them rather than the inputs required to produce them, which are usually a fraction of the cost.

In terms of time of consumption, it is possible to have traditional, long-lasting services, such as house leases or mortgages (if the house has been bought), life insurance and dental and medical services, which are used for longer than many goods. Generally speaking, both goods and services can be classified as being intended for immediate, intermediate and lasting consumption.[11]

Taken to an extreme, one can say, on the service side, that since they possess a material aspect in one way or another, this is what is actually bought, while the rest is a sort of illusion. On the goods side (from a Marxist perspective), what is acquired is its value of use, while its exchange value only reflects past work, in other words, a service (Nicolaides, 1989: 10-11).

In order to resolve this dilemma, one has to consider the fact that any merchandise can be classified as a good or service depending on the social relations existing in its production, distribution and consumption. When one buys a fully assembled car, as is usually the case, one acquires a physical good, but if one buys all the pieces individually and contracts a body shop to assemble it, one obtains a service: "The crucial difference is the

[10] It has even been suggested that the software in basic CDs sold in a series (such as Microsoft's Windows, for example) are goods, whereas if the CD contains a program that has been specially requested, then it constitutes a service (Nicolaides, 1989: 10).

[11] Services have also been classified as perishable (haircuts, laundries, restaurants, etc.), semi-durable (dental treatment, maintenance of domestic appliances) and lasting (such as university education, financial services and mortgages, club membership, etc.) (Daniels, 1985: 6).

method and nature of the transaction through which the consumer acquires the car" (Nicolaides, 1989: 11). Buying a car means that one acquires a good, while hiring it means that one obtains a service, even if its function as a means of transport is the same. Moreover, if one buys a car to use it as a taxi, one purchases a good to provide a service, just as with the cooking equipment in a restaurant. Nicolaides concludes:

> Hence, what is a service depends neither on some immutable natural law nor on the characteristics of the output or performance of a service. It depends on how economic agents transact and on which aspect of economic activity is examined [Nicolaides, 1989: 11].[12]

There is, therefore, a continuum of possibilities between the characteristics of goods and services. Their classification in either case will depend on their use, the form and cycle of production and the nature of the transaction, in other words, the set of social mediations characterizing the economic system. In any case, one has to consider the purpose of the distinction between goods and services. If the sole aim is to produce a taxonomy enabling one to measure changes in the composition of the production structure in a set period for the purpose of analyzing the economic development and evolution of nations, it would be best to devise a classification of merchandise by certain homogeneous characteristics and preserve them in a consistent, comparable way over time. Any exercise of this nature has a certain degree of arbitrariness, which is why attempting to arrive at a rigorous, exclusive definition of goods and services constitutes a false problem.[13]

In an attempt to incorporate the entire range of new services into a positive definition, which include their intrinsic relativity, due to the way in which they are acquired, the following definition is proposed in this chapter:

---

[12] Nicolaides ads that the perception of services as a form of economic transaction has the advantage that it can be analyzed using the traditional instruments of economic theory.

[13] The difficulty of establishing a universally accepted definition of services is compounded by the problem of defining the international trade of services, since this is sometimes defined by the producer's place of residence and at other times, by the firm's nationality (see Feketekuty, 1990: Chap. 5).

Services are all labor — firms and individuals — characterized by: 1) producing useful effects demanded by consumers and producers; 2) having the knowledge or skill of those who provide it as one of their essential components; 3) being undertaken using this basic, intangible element, even though agricultural and industrial goods are essential for service production, which gives a material aspect which may or may not be expressed or by the buyer; 4) a socially determined form of appropriation, according to which they may be free if provided by the state or non-profit organizations, or acquired from firms or persons for a set price; 5) they may be intended for immediate or lasting consumption yet, unlike goods, in the case of services, the relationship between seller and buyer tends to be maintained for the duration of its validity or use.

The skill or knowledge component in the definition of services (section 2) has been described as one of the features common to all types of services, since their production "...involves a professional activity that entails a certain degree of personal qualification ... and a lesser degree of manual skill" (Gershuny and Miles, 1988: 33). Indeed, the knowledge component has expanded as post-industrial nations have advanced, since the main economic activities are increasingly based on science and technological development, which in turn has led to the emergence of new technical elites.[14] In the United States, the main employer sector comprises knowledge-based services (education, health, the media, business services, computing, etc.) whose share of the total labor force rose from 36.6% in 1975 to 41.5% in 1985, while conventional tertiary services rose from 33.0% to 33.5%, reaching a combined total of 73.2% in 1985. Specialized manufacturing only rose from 2.7 to 3.1% during this period (calculations based on Feketekuty, 1990: 64). By 1967, it was estimated that jobs linked to the production, processing and distribution of information alone generated 53% of US national income (Porat, quoted in Feketekuty, 1990: 84-85). In 2002, knowledge-based services reached 49.6% of the total US labor force and together with the remaining tertiary activities, accounted for 82.2% of the total (see Table 1). Knowledge and skill

[14] Even the level of high or low status of service activities implies certain properties of location, with less qualified ones being more decentralized than more highly qualified ones (Prince and Blair, 1989: 60, quoting Doreen Massey).

are to services as soil is to farming and inputs are to manufacturing, in other words, their main defining factor.

Just as agriculture and manufacturing require services, production of the latter requires agricultural and industrial goods (section 3). A restaurant, for example, will have to possess a significant amount of manufacturing articles such as tables, crockery and cutlery, tablecloths, coffee makers, stoves and refrigerators, as well as buying agricultural products for making food. The ingredient that turns it into a service is the knowledge of those who prepare the meals, as well as that associated with running a business. Training levels may range from that of a simple cook with practical knowledge to a chef with formal Cordon Bleu studies in Europe. A compact disc requires all the industrial equipment of recording studies, together with an appropriate locale, as well as the disc with its case and graphic elements, although its defining element is the singer and/or musicians. According to the definition, both restaurant food and the disc include material supplies, but knowledge and skill, their basic component, are intangible. However, as a disc or a meal, they acquire a physical shape. Although the cinema and theater require complex industrial equipment, the essential art behind their production does not assume a physical shape when it comes into contact with the consumer.

Section 4 of the definition includes free public services, such as the army, police, parks, administration, schools and hospitals. It also includes services which are paid for, such as professional and banking services, which may be intermediate, or durable, whose undertaking does not necessarily coincide in time and space, meaning that they do not fit the usual definitions. These services require more training, usually undergraduate or graduate studies, in addition to office locales, computers, desks and communication systems, but their main element is the knowledge of their providers. Likewise, there are high-tech services such as the Internet and software production which have been enhanced by scientific and technological development.

Section 5 describes a unique feature of services, in other words, the fact that the relationship between producer and consumer lasts the entire time that the service is provided. In life insurance, credit cards, car rental over several years with a purchase option,

or the rental of dwellings and offices, this link is maintained and regular payments usually have to be made as long as a contract exists.[15] Thus, several services involving durable consumption assume the form of a procedural transaction, in other words, the producer-consumer relationship lasts as long as the object in question is being used.

Finally, amenity services, one of the most widely used of which is television, require manufacturers to produce TV sets, cassette and DVD players, which are simply an extension of services and the physical element required to use them. Thus, services and goods are inextricably linked in an intricate, circular cause-effect-cause relationship, which makes it extremely difficult to create a definition in which they are clearly distinguished. Be that as it may, in order to find out about their causal links and establish the differences between them, it was necessary to propose a positive general definition that would identify their main characteristics and facilitate their sectoral and spatial analysis.

3. THE SOCIALLY DETERMINED LOCATION OF SERVICES

Since they require soil as a productive factor, farming activities are distributed throughout arable land, permitting the establishment of a large number of rural localities with a relatively small population. At the opposite extreme, manufacturing and services are primarily concentrated in cities, since they require the urban infrastructure, equipment and services that constitute a productive social force, which is outside firms and indispensable for their running, which is why their location is socially determined.

The best-known theories in so-called "regional science" (the neo-classical technical approaches to urban analysis) which seek to explain the distribution, size and dynamics of cities and, by implication, the location of economic activities, are the central place and economic base theories. Christaller's central place theory is untenable since the assumptions on which it is based do not exist

[15] In the case of long-term purchases, such as buying a home through credit, the financial service enables one to use the dwelling, since the property is not acquired until payment is complete.

in actual territorial space (uniform population distribution, equal productivity of soil, consumers moving equally in all directions) yet it can be regarded as a useful normative scheme that provides the criteria for interpreting the distribution of economic activities, even though it fails to incorporate the factors that historically determine this distribution.[16]

The industrial location theory has a greater explanatory capacity and a broader historical perspective. Alfred Weber, the first author to systematically develop this theory, began with the principle that there is always a place to produce, distribute and consume commodities. Although his theory focussed on the distribution of manufacturing firms, he stated that this did not limit the generalization of his proposals, given the close relationship between production and consumption and distribution (services). This leads to the concentration of the population, since the latter moves to where capital is accumulated and jobs are created: "The locations of the industries form the substance (I do not say the cause) of large agglomerations of people today" (Weber, 1929: 6).

Weber focuses his argument on the role played by transport costs and salaries in firms' decisions to locate. Realizing, however, that every economic system has its own logic for constructing urban space, he points to the need to incorporate certain characteristic elements of the social nature of production. He incorporates the factors of agglomeration, defined as an "…'advantage' or a cheapening of production or marketing which results from the fact that production is carried on to some considerable extent at one place…" (Weber, 1929: 126). In other words, the interrelations between firms constitute the economics of agglomeration. As for services, it has been said that, "There are, then, service linkages, marketing linkages and in some cases, but less frequently than for manufacturing, production linkages" (Daniels, 1985: 73). Thus, the differences in transport and labor costs may be offset by the advantages of agglomeration, meaning that "Weber has identified a factor which is

---

[16] A devastating criticism of the assumptions underlying these theories, which totally invalidates them, is available in Richardson (1975: Chap. IV) and Murphy (1966: Chap. VII). In a somewhat disorganized fashion, Lipietz (1979: 137-153) disqualifies them as "bourgeois theories," while Stope questions the use of logical abstractions to explain complex specific phenomena (quoted by Prince and Blair, 1989: 91).

much nearer the top of the list of locational priorities for many service industries" (Daniels, 1985: 72).

Considering the close links between goods and service production, one might think that this theory is general, in other words, that it can equally be applied to the location of firms that produce either goods or services. Both activities have significant interrelations, but "...this does not mean that they are geographically linked, so that by concentrating on the geography of manufacturing we cannot adequately explain the geography of services" (Daniels, 1985: 2). Moreover, both manufacturing and services are extremely heterogeneous, so their branches may follow different patterns of location within the urban hierarchy.

Since this issue will be explored in more depth in future research, this chapter will merely describe the main location patterns observed for producer and consumer services from an interurban perspective. Tentatively, tertiary location patterns between cities can be drawn from the experience of countries with an advanced service revolution.

Firms that provide services for immediate consumption, due to their intangible nature, the impossibility of the storage or export of their services (except for trade) tend to be located near their consumers, there being a degree of proportionality between their concentration and the economic and demographic importance of the city.[17] Conversely, commerce and durable (consumer) services may be exported and stored, which is why they tend to be concentrated in large metropolises, where the existence of more technically sophisticated activities facilitates economies of urbanization and scale: "There will be relatively few urban centers in which the very highest level of services are located, and they will typically be large" (Stanback, 1979: 76).

The concentration of durable services is accentuated through technological changes in transport, particularly the widespread use of cars; the specialization of commerce in large department stores and malls; the existence of specialized educational insti-

---

[17] "The spatial distribution of 'residential' services, such as retailing, basic consumer and local government services, but also many education, health and personel care services, depends on the level and density of the population and the level of residents' purchasing power" (Ochel and Wegner, 1987: 38).

tutes and hospitals and growing external economies (Daniels, 1985: 123; Ochel and Wegner, 1987: 38)

Thus it is possible to think of the existence of a hierarchy of consumer services because of their different types, according to which the main metropolitan centers will contain the most sophisticated services required in the national spheres, in addition to all those of a lower level existing in the remaining cities. Intermediate cities will offer a small variety of services, primarily those required by the local population and smaller cities in the hinterland. Finally, smaller cities will offer a more restricted range of services to satisfy the requirements of the local market (Stanback, 1979: 95). The latter's needs for more sophisticated services will be met by intermediate or large cities or the main metropolis, as appropriate.

In contrast to consumer services, those oriented towards producers tend to be located in a few metropolises, equipped with the most sophisticated and varied urban infrastructures thanks to enormous public investments (economies of urbanization). This also enables them to have substantial advantages of agglomerations, since they concentrate a highly diversified range of economic activities and qualified labor (Daniels, 1985: 183). These cities tend to contain modern firms offering the services for producers in the field of information science, complex professional services, finances and insurance, demanded by large firms: "...the headquarters or regional offices of service and manufacturing corporations tend to seek similar locations as closely together as possible..." (Daniels, 1985: 184).

This process occurs in the US urban system, where new high-tech manufacturing activities tend to shift towards medium-sized cities in the Sunbelt, whereas

> many of the older and larger centers of the Snowbelt that played important roles as manufacturing centers during the industrial era have been relatively successful in restructuring their economies away from the excessive dependence on traditional industrial activities through growth in the complex of corporate activities and in many instances in the government sector and nonprofit sectors and are thus retaining, as diversified or specialized service centers, a great deal of their economic importance or "dominance" over the urban system [Noyelle and Stanback, 1983: 7].

A similar territorial pattern can be observed in Europe, where the most dynamic services, mainly corporations, computers and telecommunications, "tend to strengthen the old patterns in the regional distribution of services..." by consolidating the traditional metropolitan and regional concentrations, such as Île-de-France, the Greater London area, southeast England and Lombardy, Italy, with its center in Milan (Ochel and Wegner, 1987: 37-38). The attraction of the main metropolitan areas for advertising and computer firms, market research, all kinds of professional consultancy (legal, accounting, engineering, etc.), banks and insurance, among others, is due to the advantages of major cities in economies of agglomeration, rapid access to information and clients and the availability of a better communications and transport infrastructure, a flexible supply of office buildings, a diversified labor market and a concentration of universities and research centers. This is all possible thanks to monumental public investment in infrastructure works, roads and equipment, without which an agglomeration of firms is not possible. The service revolution will therefore tend to accentuate regional inequalities (Ochel and Wegner, 1987: 39).

Third World countries have not experienced the structural changes that characterize the service revolution, and instead have had to face the challenges of an incomplete, dependent industrial development, meaning that studies on the capitalist tertiary sector are extremely scarce, particularly those concerning their spatial patterns. It is therefore important for Mexico to promote systematic research into the structure and evolution of services as well as their locational characteristics within the country's system of cities, since knowledge of these aspects is crucial for designing a realistic strategy for economic development and ensuring Mexico's successful insertion into the international economy.

4. Importance of the Analysis of the Service Sector in Mexico

In 1950, the tertiary and secondary sectors of Mexico involved just 25.7% and 15.9% of the economically active population (EAP),

whereas the primary sector absorbed 58.4%, reflecting the country's essentially rural profile. Over the next twenty years, a period of rapid economic growth within the Mexican "economic miracle," the service and industrial sector proved extremely dynamic, increasing their share of the EAP to 37.6% and 23.0% respectively in 1970. As a corollary, the primary sector was reduced to 39.4% (Table 2). During the 1970s, even within the period of rapid economic development, services and industry continued to expand in a parallel fashion, reaching 43.6% and 27.5% of the national EAP. During the "lost decade" of the 1980s, there was a point of inflection in the national macroeconomic dynamics and, as a result of the lack of economic growth, the secondary sector experienced a dramatic loss of dynamism and in 1991 its participation dropped to 23.1% of the country's EAP, while the tertiary sector continued to expand until it reached 50.1% (Table 2).

Considering that in 1950 the tertiary labor force in the United States exceeded 50% of the total, one could say that Mexico lags 50 years behind as regards the evolution of the structure of US employment, ignoring the characteristics of the industries in the sector, since in Mexico the figure rose largely because of the expansion of the informal tertiary sector.[18]

In 2000, Mexico advanced towards the tertiarization of its economy, with the tertiary EAP rising to 55.2% of the total, more than doubling the 26.7% for industry. However, the latter was higher than the figure for 1991, yet lower than the rate for 1979. The increase in manufacturing is due primarily to the dynamics of the maquiladora firms, which increased their number of workers from 446,000 in 1990 to 1.3 million in 2000.[19]

Since Mexico is a country of intermediate development with a growing financial and technological dependence on hegemonic

[18] The information used is taken from employment surveys, which cover more than population censuses, through "the recording of precarious, unpaid work..." (García, 1994: 39). The analysis by industry and gender shows a sharp increase in female commercial activity and in personal services in men, as a result of which the main increase in the tertiary sector in the 1980s took place in "services with the most precarious occupations..." (García, 1994: 43).

[19] Given the deceleration of the US economy in 2001 and 2002 as well as the loss of Mexican maquiladoras' competitiveness in relation to China, employment in this sector fell from a maximum of 1,348 million in October to 1,069 million in October 2003, i.e. 20.7% (INEGI, "Estadísticas económicas," www.inegi.gob.mx).

Table 2
Mexico: Economically Active Population by Main Sectors
of Activity, 1950-2000
(percentages)

Sector and branch of activity	1950	1970	1979	1991	2000
Total	100.0	100.0	100.0	100.0	100.0
Primary sector	58.4	39.4	28.9	26.8	18.1
Agricultural	58.4	39.4	28.9	26.8	18.1
Secondary sector	15.9	23.0	27.5	23.1	26.7
Mining, energy and manufacturing	13.2	18.6	21.1	17.0	20.2
Construction	2.7	4.4	6.4	6.1	6.5
Tertiary sector	25.7	37.6	43.6	50.1	55.2
Commerce	8.2	9.3	13.8	15.9	17.6
Services[a]	13.2	22.6	29.3	33.6	37.2
Other, unspecified	4.3	5.7	0.5	0.6	0.4

[a] Includes communications and transport.
Sources: 1950 to 1991, Brígida García, *Determinantes de la oferta de mano de obra en México*, Cuadernos de Trabajo 6, Secretaría del Trabajo, 1994: 37; 2000, *Encuesta Nacional de Empleo* (www.stps.gob.mx).

countries, the fact that in 2000 its economically active population was largely employed by the tertiary sector does not necessarily imply that it has begun its post-industrial stage. In order to determine whether it is on the threshold of a service revolution, it would be useful to promote research on the structure of the labor force and production by sub-group or type of activity, so as to identify the peculiarities of modern, traditional and informal services (productivity, capital intensity, interrelations, training, etc.). It would also be useful to incorporate the stages and trends in the regime of capital accumulation in order to design development scenarios that would enable one to envisage the feasibility of the advent of a post-industrial Mexico and the policies required to achieve this.

On the basis of the concepts summarized in this study, one should also study the phenomenon of the territorial distribution of services in Mexico's urban system. It would be useful to determine, first, whether there is a spatial pattern characteristic of the servicialization of the Mexican economy and, second, to determine its implications for the country's economic and social

development. It would be particularly interesting to analyze the Mexico City Metropolitan Area in order to determine the levels of concentration and other characteristics of formal service activities in Mexico as well as the perspectives for the service revolution in the country's largest metropolis.

In anticipation of this and by way of a general conclusion, one can say that, in their own terms, neoclassical economic theory and political economy are conceptual and methodological scaffolding that serves to explain the functioning of the production, distribution, circulation and consumption of goods and services, indistinctly. On the basis of this premise, and considering the advent of post-industrial society, an analysis of the tertiary sector in Mexico is crucial to an understanding of macroeconomic development during the late 20th century and visualizing the future perspectives of a possible service revolution during the early 21st century, since this transformation will determine the nation's social and economic progress.

5. REFERENCES

Bailly, Antoine, and Denis Maillat (1989), "Servicios a las empresas y desarrollo regional," *Ekonomiaz, Revista de Economía Vasca*, Nos. 13 and 14.

——— (1990), "Actividades de servicios y sistema de producción," *Papeles de Economía Española*, No. 42, pp. 40-51.

Baumol, William J. (1986), "Conclusion," in Gerald Faulhaber, Eli Noam, Roberta Tasley, *Services in Transition. The Impact of Information Technology on the Service Sector*, Cambridge, Massachusetts, Ballinger Publishing Company.

Bell, Daniel (1976), *El advenimiento de la sociedad post-industrial*, Madrid, Alianza Editorial.

Burger, Anna (1970), *Economic Problems of Consumers' Services*, Budapest, Akademiai Kiadó.

Clark, Colin (1980), *Las condiciones del progreso económico, II*, Madrid, Alianza Editorial (second edition).

Daniels, Peter W. (1982), *Services Industries. Growth and Location*, Cambridge, UK, Cambridge University Press.

——— (1985), *Services Industries. A Geographical Appraisal*, London, Methuen.

Department of Labor (2003), "News: The Employment Situation" (www.bls.gov).

Feketekuty, Gesa (1990), *Comercio internacional de servicios*, Mexico, Gernika.

García, Brígida (1988), *Desarrollo económico y absorción de fuerza de trabajo en México, 1950-1980*, Mexico, El Colegio de México.

—————— (1994), *Los determinantes de la oferta de mano de obra en México*, Mexico, Secretaría del Trabajo y Previsión Social, Cuadernos de Trabajo 6.

Garza, Gustavo (2000), "La megaciudad de México," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, Gobierno del Distrito Federal/El Colegio de México.

Gershuny, Jonathan I., and Ian D. Miles (1988), *La nueva economía de servicios*, Madrid, Ministerio de Trabajo y Seguridad Social.

Lipietz, Alain (1979), *El capital y su espacio*, Mexico, Siglo XXI Editores.

Murphy, Raymond (1966), *The American City. An Urban Geography*, New York, McGraw-Hill Book Company.

Nicolaides, Phedon (1989), *Liberalizing Service Trade: Strategies for Success*, London, Routledge.

Noyele, Thierry J., and Thomas M. Stanback (1983), *The Economic Transformation of American Cities*, United States, Rowman & Allanheld, Publishers.

Ochel, Wolfgang, and Manfred Wegner (1987), *Services Economies in Europe. Opportunities for Growth*, Boulder, Colorado, Westview Press.

Petit, Pascal (1986), *Slow Growth and the Service Economy*, New York, St. Martin Press.

Prince, David, and Alasdair Blair (1989), *The Changing Geography of the Service Sector*, London, Belhaven Press.

Richardson, Harry W. (1975), *Elementos de economía regional*, Madrid, Alianza Editorial.

Royssen, Oliver (1987), "The New Deal in Services. A Challenge for Europe," in G. Akehurst, J. Gadrey (eds.), *The Economics of Services*, Great Britain, Franc Cass.

Shelp, Ronald Kent, et al. (1984), *Service Industries and Economic Development*, New York, Praeger.

Singelmann, Joachim (1978), *From Agriculture to Services*, Vol. 69, Beverly Hills, California, Sage Library of Social Research.

Stanback, Thomas M. (1979), *Understanding the Service Economy. Employment, Productivity, Location*, Baltimore, The Johns Hopkins University Press.

Weber, Alfred (1929), *Theory of Location of Industries*, Chicago, The University of Chicago Press (originally published in 1909).

World Bank (2000), *Entering the 21st Century. World Development Report 1999/2000*, New York, Oxford University Press.

II. COMPETITIVENESS AND EMPLOYMENT IN THE LARGEST METROPOLITAN AREAS OF MEXICO

Jaime Sobrino

Specialized literature acknowledges the fact that territorial competitiveness is determined by a series of factors called competitive advantages, while its effects or results are linked to changes in the levels of local productivity and transformations in the urban labor market. The purpose of this document is to explore the impact of a city's competitive position on its labor market, taking the ten largest metropolitan areas in Mexico as case studies. The period spans from 1980 to 2000, years marked by economic crisis and change in the national economic model, covering the time from that period based on trade protection and import substitution to the current period of trade liberalization and economic deregulation.

The first part presents a literature review of the most important notes on the concept of territorial competitiveness. The second part analyzes the behavior of the labor market in the national context during the period of study. The third section discusses the results of an auto-regression statistical model, specially constructed to analyze the association between competitive position and employment demand in the ten largest metropolitan areas of Mexico. The last section talks about the conclusions of the empirical results of the study, findings that agree with the theoretical positions which hold that a city's competitive position is positively related to the increase in productivity and the dynamics of the labor market.

1. TERRITORIAL COMPETITIVENESS LINKS

From the 1970s onwards, the globalization of economic activity has been consolidated as another phase in the stages of capitalist development. It is characterized by the following: *1)* the countries involved carry out international transactions that may be more important in relation to the internal behavior of demand; *2)* there is a new international division of labor; *3)* economic activities are arranged hierarchically, with the main ones concentrated in the major cities of central countries, which are called world cities or global cities; *4)* the decentralization of production towards new points occurs as a result of the adoption of technological innovations, development of telecommunications, mobility of financial flows and flexibility in the productive process, and *5)* state functions are transformed from a welfare state to one that regulates and guarantees the accumulation and profits of large corporations (Arrighi, 1994; Budd, 1998).

The degree of integration of countries into the globalization process depends on their level of development, adoption of explicit policies for trade integration, changing patterns in the location of economic activities and the existence of a consolidated national system of cities (Gereffi, 1990; Kleinknecht and Poot, 1992; Taylor, 1997). The indicators commonly used to measure a country's degree of commercial integration include its participation in international trade, use of the Internet, level of personal contacts and capital flows (Notimex, 2001).

One concept closely linked to globalization is competitiveness. The competitiveness of a country is the degree to which, under free and clear market conditions, it can produce goods and services that pass the test of international markets while at the same time increasing the real income of its inhabitants in the long term (Fajnzylber, 1988: 13). In other words, a country's competitiveness consists of sustaining and expanding its participation in the international market, while raising its population's living standards.

Competitiveness is a relative measure that compares the economic performance of a particular unit of analysis to the rest of the units comprising the universe of study. The evolution of ex-

ports and the current account balance constitute two of the key indicators for the analysis of the country's competitiveness (Malecki, 1997: 15). These indicators represent quantitative measurements of the competitive success of a unit of analysis, but do not constitute explanatory variables of their performance; explanatory variables are called factors or determinants of competitiveness, or *competitive advantages*.

The concept of competitive advantage refers to an active instrument or dynamic process of accumulation of internal and external factors for production. It is neither absolute nor permanent, which is why it gains or loses in relation to the actions and strategies adopted by competitors. Competitive advantages cannot be achieved in closed, highly protected and oligopolistic economies; each unit of analysis has to compete within the domestic and outside market and, in many cases, the learning gained on the domestic front has encouraged the development of its international competitiveness (Beristain, 1991: 97-99).

Generally speaking, the competitive advantage of a country is the result of the microeconomic efficiency of its firms, the formulation and implementation of public policies to promote economic growth, and the ability of its principal cities to attract private investment that generates employment and contributes to local economic growth. Competitiveness is evaluated through quantitative indicators of national macroeconomic performance, but these indicators must be contrasted with changes in the population living conditions.

Globalization has implied a transformation of the economic base of several cities throughout the world and the growing role of regional development policies in promoting territorial competitiveness. It has also promoted the generation of a series of studies that analyze the performance of local economies, the explanatory factors of competitiveness between cities and the social costs associated with this stage, which are reflected in labor demand changes and the polarization of income distribution.

City competitiveness is defined as the degree to which an urban area can produce goods and services for the regional, national and international markets, thereby increasing the population's real income, living standards, and sustainable development (Lever and

Turak, 1999: 792). This means that urban competitiveness has to do with the change in the local economic base and structure, the degree of sustainability of the economic transformation, the beneficiaries of economic growth and the impact on the social fabric, meaning the inclusion of capital and social cohesion (Body, 2002; Potts, 2002) (see Figure 1).

Cities compete with each other to attract productive investments; investments that generate employment contribute to local economic growth, encourage changes in the income-elasticity of demand and, ideally, do not affect environmental conditions (Gordon, 1999: 1001; Lever, 1999: 1029). In each case, this competition may take place between many or few cities and on a regional, national, continental or global scale. In the last instance, cities compete to improve their position in the national urban system or in the network of global cities.

Figure 1
Competitiveness of Cities
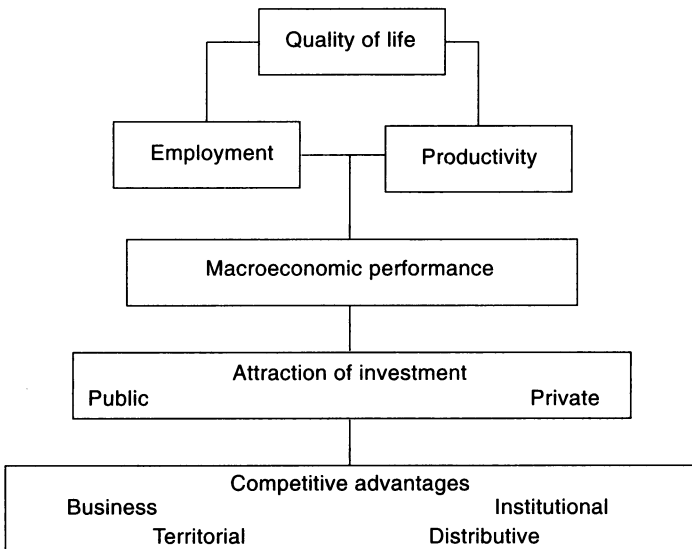
Source: Adapted from Iain Begg (1999: 802).

The success or failure to attract productive investment in an urban area can be explained by a set of factors known as competitive advantages, which can be classified into four groups: *1)* entrepreneurial; *2)* institutional; *3)* territorial, and *4)* distributive.

It is worth mentioning that cities and regions compete with each other, within the framework of the national system of cities and the multinational network of cities, on the basis of the principle of absolute competitive advantages, rather than the principle of comparative advantages. For this reason, there is no automatic mechanism for guaranteeing that each territory acquires a role in the division of labor, nor is there any certainty that economic specialization is a good strategy (Camagni, 2002: 2409).

Entrepreneurial competitive advantages correspond to the strategies implemented within productive units, leading to a change in firms' organization, a function of production and microeconomic efficiency. These advantages are expressed both through the incorporation of technological innovations and the use of human capital in the productive process (Malecki, 1997: 33), and through the interactions or interdependencies generated by synergies and cooperation between firms, promoting a process of collective learning and better use of information systems.

Institutional competitive advantages refer to the role of local government in the formulation and implementation of policies to promote cities' economic growth. The increase in the participation of local governments as agents of development is one of the major emerging phenomena in the 1990s. It involves a different sort of management since it has attempted to combine land use planning and organization with deliberate actions to encourage economic growth. Territories where local governments have been able to create and reorganize the conditions for the development of local agents are those that have achieved the highest rates of economic growth (Ruiz, 1999: 15).

When public and private agents implement joint coordinated actions, with the participation of the resident population, then associative economies are obtained, which are not easy to create, but when they are achieved they create a favorable fiscal and regulatory climate for investment (Malecki, 2002: 932-933). This coordinated action may either lead to the planning of local economic

development for the quantitative expansion of its current economic base or the qualitative restructuring of its productive sector (Kresl, 1998), or to the creation of public-private partnerships to define and implement common objectives (Van Etten, 2002).

The association between public and private sectors has led to the creation of certain theoretical paradigms, one of them being regime theory, which establishes that the promotion of local economic development is led by the private sector. There are five conditions for the formation and maintenance of a regime: 1) a business community; 2) a local integrated group of businesses; 3) a large urban area; 4) a tradition of cooperation between the local public and private sectors in urban policy, and 5) the economic advantages that make public and private sectors have the incentives and will to act together in order to increase and consolidate the prevailing conditions of local competitiveness (John and Cole, 1998).

Territorial competitive advantages correspond to the old concept of external economies of agglomeration, which are divided into economies of urbanization and economies of localization. Economies of urbanization are used by all spheres of economic activity, promoting the diversification of the local economic base, and are associated with the increase in the size of the market, the nature of the labor market and the development of transport, infrastructure and public services. On the other hand, economies of location refer to the advantages offered for a certain activity or set of activities, which translates into a specialization of the local economic base.

Finally, *distributive competitive advantages* are related to the costs incurred by economic units as a result of being located in one area rather than another. From an interurban perspective or one involving the creation of networks of cities, these costs include: 1) mercantile transactions associated with distance, for input acquisition or product distribution; 2) costs of specific factors, related to land and local labor market access; 3) costs of inter-firm coordination, linked to information flows, and 4) opportunity costs due to coincidence, as a function of market size and consumer location (McCann, 1995). In other words, distributive competitive advantages are associated with spatial differential costs for access to production factors, interpersonal contacts, systems that support the interrelations between social agents (soft networks) and

systems that depend on infrastructure and telecommunications (hard networks) (Malecki, 2002).

When actions are deliberately undertaken to improve and increase the four competitive advantages in a joint and integral way, with a strategic vision, then what is involved is the concept of *systemic competitiveness* (Villarreal and Villarreal, 2002: 99-188).

City microeconomic performance is expressed as a function of the annual increase in its aggregates as sales, income or aggregate value. The growth of sales in the industrial sector is based, from the point of view of supply, on the investments made in physical and human capital, whereas on the demand side it is determined by the characteristics of the good and the elasticity of consumption associated with consumer income. The increase in retail trade sales is a function of demographic growth, income growth and the sales potential to consumers that do not reside in the city. On the other hand, income for producer services is associated with the local productive restructuring stage.

It is important to mention that local macroeconomic performance is one of the key indicators for measuring the competitiveness of a particular city: its competitive position will improve over time if its participation in the national aggregate or the international context increases. In last instance, cities compete to improve their economic position within the national systems of cities or in the multinational network of metropolitan areas.

The effects of competitiveness between cities are expressed through two major variables: the increase in local productivity and the change in the urban labor market. Productivity is defined as the degree of efficiency achieved in the productive process. The partial productivity of labor measures the product generated by the worker employed in the productive process, while the total productivity of factors describes the quotient of the product in relation to the combination of all the factors used (Tinbergen, 1942: 5). A fundamental element that determines the growth of productivity is the technological change or progress, which leads to increased efficiency in the use of productive factors (Link, 1987: 1). Conversely, the total productivity of the factors explains the change in the product associated with technological innovation, rather than the change in the use of production factors.

Productivity is one of the principal indicators of economic growth in that its increase reflects a more efficient use of productive factors, which translates into the growth of the product and counteracts the effects of inflation through the reduction of costs (Guzmán, 1997: 180). The importance of technical progress and its effect on productivity has been widely acknowledged by economics scholars. Adam Smith was the first to establish this link but it was not until the economic research of the 1950s that scholars concluded that technological change was the most important individual factor associated with aggregate economic growth (Link, 1987: 2). This conclusion originated the theoretical debate on the endogenous or exogenous participation of technological change in economic development.

Within the sphere of globalization, productivity constitutes one of the most important factors in country competitiveness. Within the latter, the comparison of productivity levels by groups of activity or cities contributes to the study of structural change, technological progress and the evolution of convergence in territorial economic growth (Pilat and Van Ark, 1994: 36).

The change in local productivity means that competitiveness between cities is not a zero sum game, but a scenario in which the national macroeconomic aggregate increases as a result of more efficient use of production factors. Given their nature as entities in which activities, public goods and externalities are concentrated, and as places that favor territorial interaction and synergies, coupled with government performance, cities can be considered key players in territorial competitiveness, with an impact on national economic growth.

A second effect of competitiveness between cities occurs in the change of their labor markets. The labor market is the most important of all urban markets, since it determines whether or not people will have access to a job as well as the salary they will earn. In the study of the urban labor market, people are not only seen as production factors but also as residents that consume, vote, pollute and experience problems with their neighbors and the law. In the labor market, demographic and economic variables are interrelated.

The labor supply in general and at a certain point in time is produced by the aggregation of people's decision to work and

the number of hours spent working. In a city, the short-term labor supply depends first on the size, age composition and rate of participation of its population, and second, on the relative salaries, educational distribution and technical level of the population. In the long term, supply is determined by: 1) general participation of the labor force, within the limits imposed by the growth of the working-age population; 2) the effect of productivity-demand, where, if the former exceeds the latter, then there will be a tendency to reduce the participation rate; 3) education and training in and for work; 4) collective negotiations, and 5) vulnerability to small groups of workers that hold strategic positions, such as the police, garbage collectors or transport workers (Hirsch, 1977: 200-211).

At the same time, the short-term demand for labor depends on the demand for goods and services, meaning that it is a kind of demand derived from consumption behavior. The behavior of sales and income is expressed as a function of production of the following kind:

Production of goods and services = f (land, work, capital, technology)

Labor demand is also affected by aspects regarding economic policy; the number of workers and their salaries are determined, among other factors, by the minimum salary imposed, employment subsidies and the laws regulating labor relations. In the long term, labor demand is influenced by changes in the relative price of the work factor, the adoption of technological innovations in the general process of production, and changes in the demand for the final product. This final product may either form part of the goods and services that comprise the local economic base or be primarily consumed by residents of the city itself (Hirsch, 1977: 211-216).

The aggregate urban labor market consists of a series of specific and specialized markets, the number of which depends on the size of the city and the composition of its economic structure. These markets are spatially separated according to the pattern of distribution of land use, which leads to displacement costs and their interrelation with the transport market.

The balance in the labor market equals the opposing desires of workers and firms and determines the salaries and level of employment observed. In a perfectly competitive labor market, workers and firms are free to enter and leave, while they achieve efficient distribution. Under this scheme, the aggregate supply curve shows the total number of hours worked that the agents in the economy distribute to the market at a given salary level, bearing in mind the fact that the higher the salary the greater the supply. On the other hand, the demand curve expresses the total number of working hours that firms demand at a given salary level, where the higher the salary the lower the demand, due to the existence of the law of decreasing outputs of the labor factor in the productive process. When supply equals demand, competitive salaries and equilibrium in employment levels are obtained. Once a competitive salary has been determined, each firm, in that branch of activity, keeps hiring workers until it reaches the point where the marginal product of labor is equal to the competitive salary (Borjas, 2002: 159-166).

The theoretical scheme of perfect competition is useful for explaining changes in employment and salary levels. Nevertheless, the behavior of the real world and urban economies differs from this model, making it necessary to introduce new elements and variables for the study of labor markets. Thus, for example, one of the most important questions in spatial economic theory is whether the population is following the new occupational demand or whether jobs are following the new population, derived primarily from migratory movements. Empirical results on this issue suggest that changes in the labor demand are usually more important than those in the labor supply, which is why the population is more likely to follow jobs (Partridge and Rickman, 2003).

Another element to consider is that the economy consists of several labor markets, even for workers with similar skills, and that these markets are different in each region and branch of activity. Likewise, labor markets are complex due to the juxtaposition of the production modes expressed in: 1) economic units based on the buying and selling of the labor force with formal and informal production relations; 2) large economic units with national and transnational capital, which acquire monopolistic (a single

producer or seller) or monopsonic market models (a single buyer of labor), and 3) domestic units based on self-employed workers (take-away workers, domestic workers, self-employed workers, renters or sub-contracted personnel) (Pedrero, 2000: 586-590). This allows labor markets to be more broadly defined than they would be if only salaried workers were included.

Finally, at the base of the city competitiveness pyramid is the quality of life. This is so because in the general definition, territorial competitiveness is understood as the degree to which cities can produce goods and services for the regional, national and international market, while at the same time increasing the sustainable development and the population quality of life (Lever and Turak, 1999: 792). Urban competitiveness has to do with the local economic structure, the durability of growth and the beneficiaries of local macroeconomic performance.

Quality of life is the set of physical, biological, psychological and social characteristics of the environment that must be achieved to promote a high level of well-being among the population. The analysis of the quality of life can be divided into two categories: 1) material conditions of existence (or physical-environmental aspects), and 2) lifestyle (or socio-demographic aspects). The disparities in the quality of life levels are the result of various factors including differential income levels, location of economic activities, provision of equipment and infrastructure and urban improvement policies (Moreno, 1995: 511-512).

Quality of life is not the same as social needs: the former refers to conditions of well-being as a whole, whereas the latter is associated with a minimum level that may include food, housing and clothes. There is also a gap between urban growth and the capacity to respond to the public services supply in order to meet population needs. This gap leads to a broad differentiation in the population's quality of life, both between and within cities.

Competitiveness between cities leads to improved productivity in productive units and changes in the supply and demand of the urban labor market. Nevertheless, the existing mechanisms for the provision of public services correspond to a different logic, regulated by the efficiency of local governments, inter-governmental relations, the country financial system and civic participation.

Linking the circuits of local competitiveness and quality of life con-
stitutes one of the main tasks that must be included on the agenda of
local governments in Mexico at the beginning of the third mil-
lennium.

2. EVOLUTION OF EMPLOYMENT IN THE NATIONAL CONTEXT,
1980-2000

During the last two decades of the 20th century, the country expe-
rienced significant changes in its demographic dynamics and eco-
nomic growth. The transformations in these two variables had
spatial repercussions, which in turn led to changes in the territo-
rial distribution of the population and economic activities.

The following information gives an idea of the changes in
population and economic growth. From the demographic point
of view, between 1960 and 1980 the country's population increased
from 34.9 to 66.8 million inhabitants, with an annual average
growth rate (AAGR) of 3.4% in the 1960s and 3.2% in the 1980s. The
number of urban localities rose from 123 to 227, while the number
of metropolitan areas rose from 7 to 31 in the same period. The
degree of urbanization rose from 37.4% to 53.2%, meaning that
by 1980 the country was largely urban, since over half its inhabitants
were concentrated in 227 urban localities. Migratory move-
ments were mainly from the countryside to the city, the main destina-
tions being the largest cities (Mexico City, Guadalajara, Monterrey
and Puebla), as well as the tourist port of Acapulco. The net migra-
tory balance of Mexico City during these two decades rose to just
over 3.5 million inhabitants, 5.6 times higher than the figure
for Guadalajara, the second largest destination for the migrant
population.

One of the main reasons for internal migration is the search
for better employment opportunities, which may be either real or
fictitious. One can infer from the principal destinations of this
migration during the period from 1960 to 1980 that the choice of
destination of the migrant population was mainly due to the ex-
ploration of the largest labor markets in the country, particularly
that of Mexico City. By 1980, Mexico City concentrated 19.6% of

the country's population, the highest rate achieved in the 20th century, although its share of urban population fell from 40 to 36.8% during this period. This suggests the emergence of a stage of regressive polarization in the cycle of national urban development (Sobrino, 2003: 157-161).

Between 1980 and 2000, however, the country's population rose from 66.8 to 97.5 million, with an AAGR of 2% in the 1980s and 1.8% in the 1990s. The number of urban localities increased from 227 to 362. Metropolitan areas rose from 31 to 48 (Sobrino, 2003a), accounting for 48.6% of the country's population and heralding, for the first decade of the 21st century, the shift from a predominantly urban to a largely metropolitan country. The degree of urbanization changed from 53.2% to 62.1%, constituting an increase of 8.9% as opposed to the 15.8% increase achieved over the previous twenty years. Internal migration fell, in terms of volume, giving rise to the phenomenon of urban-urban movements. Migrants' principal destination changed to the major cities on the northern borders (such as Tijuana and Ciudad Juárez), and the planned tourist development in Cancún, Toluca and Cuernavaca. It is worth noting that Mexico City drastically reversed its role as the principal receptor of migrant population to become the place with the largest absolute expulsion of population. This migrant population totaled just over two million people, whose main destination were the intermediate cities located in its hinterland, such as Toluca and Cuernavaca, which constituted centripetal movements. Internal migration thus now tended to choose labor markets in intermediate-size urban areas, with significant economic dynamics provided by their geographical position.

The fall in the rate of population growth has been attributed to the occurrence of a third stage in the demographic transition, characterized by major reductions in mortality levels but more particularly due to a decrease in fertility levels. This reduction translates into a declining natural growth, which at some stage reaches a post-transitional demographic equilibrium and may even exceed it when fertility falls below the intergenerational replacement level of 2.1 children per couple; therefore, there is an absolute decrease in the national population (Consejo Nacional de Población, 2000: 27). This demographic transition is due to a se-

ries of factors, including changes in economic growth, an increase in women's participation in the labor market, greater access to health and reproductive health services, higher educational levels and the implementation of population policies (Cabrera, 1994; Keyfitz, 1980).

From the economic point of view, the 1980s witnessed the end of the growth model based on attending the internal market, protection from outside competition, promotion of import substitution and active participation by the state in goods production and service provision. This model enabled the national economy to grow at an average annual rate of 6.5% in the 1960s and 6.6% in the 1970s. It also achieved a gross domestic product (GDP) of 891.1 billion pesos in 1980 (at 1993 constant prices) with a per capita increase in the GDP from 7,159 pesos in 1960 to 13,311 in 1980. This significant economic growth was combined with the reduction of regional inequalities (Ruiz, 2000; Sobrino, 2003: 292-309).

The expiration of the import substitution model was paralleled by significant imbalances in public finances, features that led to a severe economic crisis. In the early 1980s, the balance in the current account was over 5% of the GDP; programmed expenditure accounted for nearly 30% of the GDP while accumulated inflation during José López Portillo's administration totaled 360%.

Between 1980 and 1988, the GDP rose from 891.1 to 958.2 billion pesos, which implied an AAGR of 0.9%. During this same period, the national consumer price index rose 10,017%, with inflation reaching three digits in 1983, 1987 and 1988. Moreover, from 1988 to 1993, the GDP rose from 958.2 to 1,155.1 billion pesos with an AAGR of 3.8%. Two of the key variables in economic policy to generate growth were trade liberalization and inflation control. The latter was reduced through the implementation of orthodox policies to reduce the public deficit and heterodox mechanisms designed to control prices, salaries and exchange rates (Arrellano and González, 1993: 249).

The overvaluation of the peso, the continued deficit in the current account and the reformulation of banking activity in the provision of credits for production and consumption triggered another economic crisis. This crisis, which began in December 1994, was

the result of market failures and governmental mistakes. The market failures were a result of financial speculation, mainly of foreign capital, that was both optimistic and poorly informed about the outlook for the Mexican economy. On the other hand, government mistakes can be summarized as a policy of overvaluing the peso within the framework of a trade liberalization model, and a fiscal policy of successive reductions of value added tax. The exchange rate policy had negative effects on basic production factors (employment and capital), while fiscal policy reinforced the preference for liquidity instead of encouraging domestic savings (Ros, 1995).

Within this scenario, the GDP had an AAGR of 1.6% between 1980 and 1990, and of 3.5% between 1990 and 2000. The per capita GDP only rose from 13,311 pesos in 1980 to 15,177 in 2000. There was a slight tendency towards the exacerbation of regional inequalities, whereas in the area of employment, in the words of Eduardo Zepeda, "while the 1980s were characterized as the decade of enormous regressions in employment, salaries and well-being, the 1990s can be described as a period of great disappointment. The deterioration of the quality of employment and the collapse of salaries in the 1980s was compounded in the 1990s by the inability to create good jobs with reasonable figures and the stagnation of job salaries and incomes" (Zepeda, 2002: 10).

Statistical information on the labor market in Mexico is varied, although it suffers from problems of comparability. Population censuses and National Employment Survey (NES) are available for the analysis of the labor supply. Population censuses provide information on three basic characteristics of the employed population: 1) branch of activity (of the establishment where they work or what the person produces, manufactures or the type of service they offer); 2) main occupation (type of job or specific task they undertake), and 3) work status (person's position in his or her main job).[1] In addition to income and hours worked, censuses

[1] Census population defines the employed population as those ages 12 or over engaged in any paid economic activity during the week studied, in exchange for a wage, salary or any other type of payment in money or in kind. It also includes those who had a job but did not work during the week studied for a temporary motive, as well as people who helped on the plot of land, factory, shop or workshop of a relative without any wage or salary or payment in kind, in addition to apprentices and assistants that worked for no money.

from 1940 onwards provide information on the three main characteristics of the labor supply, while income and hours worked were incorporated from the 1980 census onwards, although income had been recorded in the 1950 and 1960 censuses.

The NES, taken first in 1988, has been undertaken annually since 1995 and is complemented by the National Urban Employment Survey, begun in 1992. The NES also provides information on branch of activity, principal occupation, position at work, hours worked and income of the employed population, adding indicators on employment and unemployment rates and level of instruction.

The first published version of the NES in 2000 revealed differences in the scope of the occupied population in relation to the population census for the same year: whereas the census found 33.7 million employed persons, the NES estimated 39 million. Because of this, a 1998-2001 series was produced in which absolute values were adjusted in keeping with a population projection based on the results of the census mentioned earlier. This adjustment affected the absolute values of the published series, although the percentage structure for each characteristic remained constant.

On the basis of information from population censuses, the employed population in Mexico was 17.3 million in 1980, rising to 23.4 million in 1990 and 33.7 in 2000.[2] Calculating the percentage of this population in relation to the total allows one to obtain the gross employment rate, which rose from 25.9% in 1980 to 28.8% in 1990 and 34.6% in 2000. This increase in the gross employment rate can be explained by the shift in the third stage of the demographic transition. At the same time, this produces a change in the age pyramid, reducing the base and creating a higher relative concentration in the potentially active age cohorts. Moreover, it also generates the emergence of the demographic bonus, which consists of a lapse of time in which the dependent population is smaller than the population of reproductive age, which provides

[2] The 1980 census population recorded an employed population of 21.9 persons, 29.9% of whom declared that they engaged in an insufficiently specified activity. This paper used the adjustment made by Teresa Rendón and Carlos Salas (1986), who, in view of the inconsistencies in the census information on activity rates by age and sex, type of activity and status of unpaid family workers, offered an adjustment proposal which eliminates the over-estimation of the employed population and those that are insufficiently specified by branch of activity.

the opportunity to take advantage of human capital and encourage the long-term development of labor markets (Melgar, 1999). It is worth mentioning that between 1950 and 1980, gross employment rate in Mexico fell from 32.3% to 25.9%, which, in theoretical terms, would imply a decrease in the per capita income levels. This was not the case in Mexico, however, as a result of which this decrease was interpreted as the opposite to a demographic bonus, accompanied by greater opportunities for the population to utilize secondary education services and problems in the comparability of information from the censuses (García, 1982).

Comparing the employed population with the population ages 12 and over yields the refined activity rate, an indicator that reflects the degree of employment of the population that is really exposed to risk (García, 1982: 214). This rate also experienced an increase, rising from 39.9% in 1980 to 41.9% in 1990 and 48.7% in 2000. It has already been mentioned that an increase in the time of the refined employment rate reflects the shift in the labor market towards more highly developed capitalist relations (Jusidman and Eternod, 1994: 61-70). However, this fails to explain the Mexican case during the period from 1980 to 2000, because of Eduardo Zepeda's remarks on the regressions in the labor market regarding forms of production, trading merchandise or providing services (García, 2002). In addition to these two elements, one should also include the female population's increased participation in the labor market, whose refined employment rate rose from 16.4% in 1970 to 29.6% in 2000, whereas male participation remained at approximately 70%.

The distribution of the employed population by sectors of activity reveals a trend towards the tertiarization of employment, since this sector (commerce, transport, communications and services) absorbed 44.1% of the labor supply in 1980, rising to 53.5% in 2000. At the same time, the share of the secondary sector (mining, manufacturing, construction, electricity, gas and water) rose slightly from 26.7% to 27.7% and, as a corollary, the share of those employed in the primary sector (agriculture) fell from 29.2% in 1980 to 15.8% in the year 2000. The advance of the tertiary sector in the labor supply does not typify this stage of trade liberalization and moderate increase in national wealth, since this sector

increased its share from 21.4% to 31.9% from 1950 to 1970, a period characterized by the consolidation of the import substitution model. Consequently, from the point of view of the labor market by activity sectors, the period from 1980 to 2000 is characterized by the slow relative growth of the secondary sector, in contrast with the dynamism observed between 1950 and 1970 when its share increased from 16.1% to 22.9%.

The change in the distribution of the employed population by branches of activity shows the following main elements: employment in agricultural activities remained at virtually the same level between 1980 and 2000, with an increase of just under 300,000 persons (Table 1). Calculating the percentage of this employed population in relation to the total population inhabiting non-urban localities yields a gross employment rate that fell from 16.1% in 1980 to 14.4% in 2000. This means that non-urban labor markets are increasingly less dependent on activities linked to the use of natural resources and more dependent on other types of occupations such as retail and customer services. Indeed, in 2000 only half the employed population in non-urban localities was engaged in agricultural work, while the remaining 50% was engaged in workshops, firms and activities in the tertiary sector.

In absolute terms, the branch with the greatest number of employees in 1980 was agriculture, which absorbed 29.2% of the total. This situation changed in 1990 with the emergence of consumer and social services as the largest branch, which accounted for 27.6% of the total labor supply in 2000 (Table 1).

Consumer and social services, with an increase of just over 4.5 million persons, experienced the main absolute increase in the period from 1980 to 2000. The second branch of activity with the greatest absolute growth was commerce, which absorbed nearly 3.8 million workers, the third being the manufacturing industry with just under 3.4 million. These three activities together accounted for 11.7 (71.3%) of the 16.4 million newly employed workers. At the opposite extreme, mining experienced a loss of over 125,000 employees, while the least absolute increase was recorded in the area of electricity, gas and water (Table 1).

Table 1

Mexico: Employed Population by Branches of Activity, 1980-2000

Branch of activity	Absolute values			Percentage structure		
	1980	1990	2000	1980	1990	2000
Total	17,296,325	23,403,413	33,730,210	100.0	100.0	100.0
Agriculture	5,056,430	5,300,114	5,338,299	29.2	22.6	15.8
Mining	269,639	260,515	144,421	1.6	1.1	0.4
Manufacturing	3,044,082	4,493,279	6,418,391	17.6	19.2	19.0
Construction	1,191,028	1,594,961	2,669,751	6.9	6.8	7.9
Electricity, gas and water	97,059	154,469	151,546	0.6	0.7	0.4
Commerce	1,809,441	3,108,128	5,597,992	10.5	13.3	16.6
Transport and communication	712,354	1,045,392	1,410,193	4.1	4.5	4.2
Financial and professional services	350,516	791,932	1,671,453	2.0	3.4	5.0
Consumer and social services	4,765,776	5,850,751	9,315,585	27.6	25.0	27.6
Unspecified	0	803,872	1,012,579	0.0	3.4	3.0

Sources: For 1980, Teresa Rendón and Carlos Salas (1986), "La población económicamente activa en el censo de 1980. Comentarios críticos y una propuesta de ajuste," *Estudios Demográficos y Urbanos*, Vol. 1, No. 2, pp. 291-309; for 1990 and 2000, General Population and Housing Censuses, general summary.

From the point of view of relative growth, the branch of financial and professional services (producer services) was by far the most dynamic, offering 1.3 million new jobs and increasing its share of the total aggregate from 2% to 5% between 1980 and 2000. It has already been widely proved that during the era of globalization this type of activities are the most dynamic in the labor markets in the nations and major cities of the developed world (Gemmell, 1986; Malecki, 1997; Sassen, 2000; and 2001). In 2000, they accounted for 6% of the total employed population in Portugal, 8% in Greece, 10% in Korea, Spain and Italy, 13% in Ireland, Sweden and Denmark, 15% in Australia, Holland and the United Kingdom, and over 25% in Luxembourg.

The industry with the second greatest relative growth was commerce, which in 1980 absorbed 10.5% of the employed population, whereas in 2000 it rose to 16.6%. In absolute numbers, over the past year this industry exceeded the agricultural industry, making it the third largest of the nine sectors as regards the total employed population. Thus, the share of those engaged in producer services and commerce in the labor structure rose from 12.5% in 1980 to 21.6% in 2000.

Construction and manufacturing were the next sectors with the greatest relative dynamism, although they displayed insignificant increases in comparison with the other two activities. The joint participation of these activities rose from 24.5% to 26.9% between 1980 and 2000. The next most dynamic branches were transport and consumer services, whose relative growth was similar to that experienced by the employment supply as a whole, meaning that its share remained virtually the same: 31.8% in 1980. Finally, the agricultural, mining and electricity industries recorded the least relative growth while their share of total employment fell from 31.4% in 1980 to 16.6% in 2000.

For the analysis of labor demand, Mexico has a number of data series. Two of these are the number of permanent and occasional affiliated workers to the Mexican Institute of Social Security (IMSS) and the Institute of Security and Social Services for the State Workers (ISSSTE);[3] and another is the occupied personnel reported in the economic census. Those affiliated to social security

[3] The acronyms IMSS and ISSSTE correspond to the abbreviations in Spanish.

institutes represent a part of the labor market that takes place be-
tween the population and the economic units that purchase labor
and engage in formal production relations. Meanwhile, the occu-
pied personnel in the economic census correspond to all those
working in the economic unit under its supervision and con-
trol, working for at least a third of a working day and regularly
receiving payment, or even those who do not receive payment.
This means that these figures do not include labor markets with
informal relations, or the self-employed, since those affiliated to
social security institutes are all salaried workers, whereas the eco-
nomic censuses include unpaid personnel.[4]

According to the figures from social security institutes, be-
tween 1980 and 2000 the number of members increased 2.1 times,
from 7.2 to 14.9 million people (Table 2).[5] As mentioned earlier,
this information only reflects part of the labor demand, in other
words, the labor market that develops primarily with formal pro-
duction relations and the purchase and sale of labor, i.e. formal
and salaried work.

Between 1980 and 2000, the activity branches with the great-
est absolute increase in the number of affiliates were manufactur-
ing, social services and commerce. These three sectors created
nearly six million new jobs, accounting for 76.7% of the total in-
crease (these three sectors were also those that experienced the
greatest absolute increase in the employed population and ac-
counted for 71.3% of the new labor supply). At the opposite ex-
treme, the industry with the least growth was mining, which only
created 11,000 new jobs. Of the 3.3 million new members of the
manufacturing sector, 1.2 million corresponded to the maquiladora
export industry and the rest to the non-maquiladora manufactur-
ing industry. In the year 2000, the maquiladora industry required

[4] The National Accounts System in Mexico also provides a series of calcula-
tions on paid employed persons, mean annual salaries and the productivity of
the work force. Employed personnel do not strictly represent the number of people
engaged in all economic activities but rather an estimate of the average annual
number of paid positions required by each activity to engage in their economic
production. In 2000, this estimate reached a total of 32 million persons, which
was very close to that of the employed population in the population census.

[5] This figure does not include students, self-employed workers, and volun-
tary affiliation continuation or family health insurance: this set of members to-
taled 2.5 million in 2000.

Table 2

Mexico: Permanent and Temporary IMSS and ISSTE Affiliates by Branch of Activity, 1980-2000
(thousands of persons up to December 31)

Branch of activity	Absolute values			Percentage structure		
	1980	1990	2000	1980	1990	2000
Total	7,198	11,114	14,926	100.0	100.0	100.0
Agriculture	364	485	398	5.1	4.4	2.7
Mining	57	84	68	0.8	0.8	0.5
Manufacturing	2,066	3,021	4,399	28.7	27.2	29.5
Construction	650	995	912	9.0	9.0	6.1
Electricity, gas and water	88	95	143	1.2	0.9	1.0
Commerce	752	1,604	2,322	10.4	14.4	15.6
Transport and communication	211	473	654	2.9	4.3	4.4
Producer and consumer services	1,416	1,543	2,415	19.7	13.9	16.2
Social services	1,594	2,814	3,615	22.1	25.3	24.2

Source: INEGI (2004), *Banco de información económica* (Website, April 12, www.inegi.gob.mx).

1.3 million workers. Mexico's northern border and South East Asia were consolidated as the most dynamic export processing zones (EPZ) in the world (Knox and Agnew, 1998: 336-350).

As for relative growth, the most significant branches as regards job creation were transport, commerce (which was also the second most important as regards labor supply) and social services. These branches increased their share of the total number of affiliates from 35.4% in 1980 to 44.2% in 2000. Conversely, the least relative growth occurred in the agricultural branch, followed by mining and construction.

A detailed analysis of the labor market in Mexico during the globalization era exceeds the aims of this paper, which is why it will be restricted to providing certain basic, quantitative elements by comparing figures from Tables 1 and 2. It is worth noting that this means comparing the labor supply with a particular section of the demand for employment, i.e. the formal, salaried section.

In 1980, those affiliated to social security institutes accounted for 41.6% of the employed population, a percentage that rose to 47.5% and apparently suggested an improvement in the country's labor market conditions, within the framework of the effects of the economic crisis and the reduction of workers' salaries. By 2000, this percentage had decreased to 44.3% due to the fact that the employed population grew more quickly than those affiliated to social security institutes.

The industry with the smallest proportion of affiliates in 2000 was agriculture, with just 7.5%. This can be explained by the fact that most of this labor supply works as *ejidatarios, comuneros* or unpaid family workers. The branch with the next lowest percentage of formal salaried workers was construction, with 34.2%, while the figure for mining, commerce and transport was less than 50%. Conversely, the industries with over 50% of their employees in formal working conditions, with salaries, were services in general, manufacturing and electricity.

In short, during the 1980s Mexico registered an annual average GDP growth rate of 1.6%, its employed population increased by 6.5 million, while the number of social security institute affiliates rose by 3.9 million (Table 3). To date, 1984 was the last year when the creation of formal, salaried jobs exceeded the labor sup-

Table 3
Mexico: Annual Occupational Supply and Demand, 1980-2000

Year	a Supply	b Demand	a-b	Year	a Supply	b Demand	a-b
1981	537	709	–172	1991	844	486	358
1982	557	–117	674	1992	881	45	836
1983	578	142	436	1993	933	–58	991
1984	600	708	–108	1994	985	240	745
1985	624	524	100	1995	1,041	–682	1,723
1986	656	–19	675	1996	1,088	805	283
1987	690	678	12	1997	1,138	820	318
1988	725	244	481	1998	1,185	847	338
1989	779	399	380	1999	1,233	742	491
1990	755	648	107	2000	1,404	567	837
1981-1990	6,501	3,916	2,585	1991-2000	10,732	3,812	6,920

Sources: Calculations made using information from Table 1 and INEGI (2004), *Banco de información económica* (Website, April 12, www.inegi.gob.mx).

ply, meaning a decrease of just over 100,000 people in the informal or unsalaried market. The demand for labor experienced negative absolute growth in 1982 due to the crisis at the end of José López Portillo's administration and in 1986 as a result of the sharp drop in international oil prices. During that decade, 2.6 million new members of the labor force failed to find formal, salaried work. Moreover, the heterodox economic policy mechanisms designed to control inflation and encourage productive investment led to a decrease in the average population's annual salaries from 24,050 pesos in 1980 to 15,897 in 1990, a 34% reduction in purchasing power (at 1993 constant prices).

The 1990s were disappointing in terms of employment. Although the increase in the GDP exceeded that of the preceding decade by an average of 3.5% annually, formal paid employment increased by just 3.8 million, 100,000 less than in the 1980s. Meanwhile, the labor supply increased by 10.7 million, meaning that seven million people were unable to join the formal salaried labor market (see Table 3). The financial crisis meant that 1995 was the country's worst year for employment, with a loss of nearly 700,000 formal jobs and an increase of the informal, non-salaried labor

market of over 1.7 million. The average annual salary of the employed population was 14,742 pesos in 2000, 7.3% lower than it had been in 1990.

3. ECONOMIC PERFORMANCE AND EMPLOYMENT GROWTH IN THE LARGEST METROPOLITAN AREAS

Since 1980, Mexico has been a predominantly urban country, with over half its population residing in urban localities. In 2000, the national urban system comprised 362 localities, 72 of which had over 100,000 inhabitants, and 48 of which had become metropolitan areas. The 362 localities absorbed 62.1% of the country's population, while 48.6% lived in the 48 metropolitan areas.

On the basis of population size, in 2000 the ten largest metropolitan areas of the country had a joint population of 34.3 million inhabitants, 35.2% of the national population (Table 4), while the 352 remaining urban localities housed 26.2 million, 26.9% of the national total. The importance of these ten metropolitan areas in the national total reflects their hegemony in the urban system in general, and in the regional sub-systems in which they are located in particular. This hegemony becomes increasingly evident when one adds the contribution of these cities to the national production of manufactured goods and income derived from commercial and private service activities, which was 61.6% in 1998, in other words, 1.8 times greater than their share of the population.

Between 1980 and 2000, the ten largest metropolitan areas' share of the national total population remained virtually unchanged. Mexico City alone was growing at a slower rate than the country as a whole, while the greatest dynamism was recorded in Tijuana and Ciudad Juárez, whose share rose from 1.5% in 1980 to 2.6% in 2000. The maquiladora program has been an important factor in the growth of these cities, since in the former, jobs in this sector rose from 56,500 to 189,700 between 1990 and 2000, whereas in the latter they increased from 120,900 to 255,500. During the last year in this period, the two cities together accounted for 34.5% of employment in the country's maquiladora industry. Their border location suggested that they would be among the Mexican

localities that benefited most from the North American Free Trade Agreement, since most of the trade involves sectors that are highly sensitive to distance (Richardson, 1995).

The slower rate of demographic growth of Mexico City compared with the rest of the country suggests a shift in the cycle of national urban development from a stage of concentration and primacy, to another of regressive polarization. This was characterized by the fact that investments and migratory movements are no longer primarily aimed at the capital city but rather towards intermediate cities, thereby leading to the territorial decentralization of human activities (Geyer and Kontuly, 1993). One of the main causes of the shift in this stage was the repercussion of the crisis of the 1980s on the economy of Mexico City (Sobrino, 2000). Income from industrial, commercial and service activities fell between 1980 and 1988 by approximately 100 billion pesos (at 1993 constant prices), equivalent to a quarter of production for 1980, as a result of which the mega-city's share of the national total fell from 46.7% to 36.9%. Mexico City's loss of its share of the national aggregate continued into the 1990s, albeit at a slower rate, and in 1998 its share totaled 32.2% (Table 4).

Conversely, the nine remaining metropolitan areas increased their share of the economy between 1980 and 1998, particularly Ciudad Juárez, León and Tijuana, whose economic growth rate amply exceeded not only the rates for the country as a whole, but also that of its local demographic dynamics. These cities were followed by Torreón and San Luis Potosí, while the lowest relative economic growth in comparison with their demographic dynamic was recorded by Toluca, Guadalajara, Monterrey and Puebla.

The first part of the concept of urban competitiveness, mentioned a few paragraphs earlier, refers to the degree to which an urban area can produce goods and services for the regional, national or international markets. If it is contrasted with the production data from Table 4, then one can say that, with the exception of Mexico City, the most important metropolitan areas in the country displayed elements of competitiveness between 1980 and 1998. This is because their participation in industrial, commercial and service production rose from 22.3% in the first year to 29.4% in the second and they were capable of attracting productive invest-

ments. The rest of this paper will analyze the degree to which this competitive situation led to an increase in local productivity and job creation (Table 5).

The information available to the public on IMSS and ISSSTE affiliates does not allow one to examine the evolution of employment on an urban scale, since the greatest territorial division is only available by state division. Therefore, some changes had to be made in order to be congruent with the analysis previously undertaken of the performance of the demand for labor in the national context. The data on IMSS affiliates in industrial, commercial and service activity sectors were used as part of the national total and this amount was proportionally distributed for the metropolitan areas on the basis of the economic census. In other words, the share of employment in each metropolitan area was included in the national total, for each year and industry. It is worth mentioning that the number of affiliates in the manufacturing industry and private services is very similar to that of employed personnel reported in the economic census (approximately 90%). Meanwhile, the census figures for trade are 160% higher than those provided by IMSS. This is because the former includes unpaid assistants and relatives working in the economic units.

On the basis of the calculations undertaken between 1980 and 1998, the personnel employed nationwide in industry, commerce and services rose from 4.4 to 9.3 million, creating 4.9 million additional jobs. At the same time, the number of employees in the largest metropolitan areas rose from 2.7 to 4.8 million, while their share of the national total shrank from 60.9% to 51.4 per cent. Once again, this decrease can be explained by the performance of Mexico City, now accompanied by Monterrey, whose joint percentage fell from 45.7% in 1980 to 30.6% in 1998. As a corollary, the remaining eight cities showed an improvement from 15.2% to 20.8%.

There are other factors that contributed to the backwardness in economic growth, employment, salary and welfare conditions in Mexico during the 1980s. The partial work productivity, in industry, commerce and private services, taken as a whole, shrank from 246,519 pesos in 1980 to 184,435 pesos in 1988, with an annual mean rate decline of 3.6%. The two possible key elements that explain the reduction in the partial productivity of work during

Table 4
Mexico: The Ten Largest Metropolitan Areas

Metropolitan areas	Population[a]			Production[b]		
	1980	1990	2000	1980	1988	1998
Mexico	66,846,833	81,249,645	97,483,412	1,082,956	1,114,727	1,738,183
Metropolitan areas	23,624,221	27,702,675	34,290,175	747,627	692,040	1,070,173
Mexico City	14,328,449	15,406,218	18,180,183	505,901	410,931	559,259
Guadalajara	2,358,807	3,029,938	3,733,895	58,228	62,602	106,952
Monterrey	2,043,720	2,610,786	3,302,411	87,734	87,069	144,499
Puebla	1,096,427	1,414,703	1,837,168	25,932	27,483	44,306
Toluca	785,323	1,061,065	1,471,146	15,084	16,871	30,460
León	822,631	1,097,084	1,414,196	9,267	13,935	29,732
Tijuana	461,257	747,381	1,274,240	12,556	19,731	48,598
Ciudad Juárez	567,365	798,499	1,218,817	13,099	27,069	62,610
Torreón	689,195	878,289	1,007,291	11,560	13,677	22,477
San Luis Potosí	471,047	658,712	850,828	8,266	12,672	21,280
Vertical percentages						
Mexico	100.0	100.0	100.0	100.0	100.0	100.0
Metropolises	35.3	34.1	35.2	69.0	62.1	61.6
Metropolitan areas	21.4	19.0	18.6	46.7	36.9	32.2
Guadalajara	3.5	3.7	3.8	5.4	5.6	6.2

Monterrey	3.1	3.2	3.4	8.1	7.8	8.3
Puebla	1.6	1.7	1.9	2.4	2.5	2.5
Toluca	1.2	1.3	1.5	1.4	1.5	1.8
León	1.2	1.4	1.5	0.9	1.3	1.7
Tijuana	0.7	0.9	1.3	1.2	1.8	2.8
Ciudad Juárez	0.8	1.0	1.3	1.2	2.4	3.6
Torreón	1.0	1.1	1.0	1.1	1.2	1.3
San Luis Potosí	0.7	0.8	0.9	0.8	1.1	1.2

[a] Corresponds to the inhabitants of the municipalities that comprised each metropolitan area.
[b] Millions of 1993 pesos; includes gross value of manufacturing production and income from commerce and private services.
Sources: Population and Housing Censuses, Economic Censuses and National Accounts System.

Table 5
Largest Metropolitan Areas: Occupied Personnel, 1980-1998[a]
(thousands of persons)

Metropolitan areas	Absolute values			Percentage structure		
	1980	1988	1998	1980	1988	1998
Mexico	4,393	6,044	9,260	100.0	100.0	100.0
Metropolitan areas	2,676	3,273	4,761	60.9	54.2	51.4
Mexico City	1,712	1,815	2,260	39.0	30.0	24.4
Guadalajara	240	328	533	5.5	5.4	5.8
Monterrey	293	366	573	6.7	6.1	6.2
Puebla	107	154	244	2.4	2.5	2.6
Toluca	57	82	140	1.3	1.4	1.5
León	59	107	207	1.3	1.8	2.2
Tijuana	52	94	231	1.2	1.6	2.5
Ciudad Juárez	68	161	309	1.5	2.7	3.3
Torreón	46	90	151	1.0	1.5	1.6
San Luis Potosí	42	76	113	1.0	1.3	1.2

[a] Includes branches of manufacturing, commerce and private services.
Sources: Table 2 and economic censuses.

the 1980s were, on the one hand, the lack of dynamism in productive investment and, on the other, the fact that it was attributed to depreciation. This increased the widespread deterioration of infrastructure, the net stock of capital and delayed the adoption of technological innovations (Dussel, 1997: 148-155). At the same time, given the shortage of productive investment, the demand for additional employment focused on persons with low training levels, worse working conditions and lower salaries, which delayed the incorporation of human capital into the national economic activity.

Between 1988 and 1998, the partial productivity of work improved slightly at an average annual rate of 0.2%, reaching 187,709 pesos during the last year. This last figure was 37% lower than that for 1980, despite the significant increase in investment, particularly foreign investment, which, between 1988 and 1994 rose by 52 billion dollars (Dussel, 1997: 162).

On the whole, metropolitan areas showed higher productivity with regard to the national total, due to their economies of agglomeration. This situation applied to seven out of the ten larg-

est metropolitan areas in the country in 1988, with Puebla, León and Torreón having the lowest productivity and falling below the national average. Between 1980 and 1988, all the metropolitan areas reduced their partial work productivity, with the greatest deterioration occurring in Mexico City, Puebla and Torreón, whereas between 1988 and 1998 eight of them raised their productivity, with the exception of Tijuana and Torreón. It is worth noting that the productivity of the ten metropolitan areas as a whole in relation to the national total increased from 1.13 times in 1980 to 1.20 in 1998, meaning an increase in relative efficiency of 6.2%.[6]

How is it possible to tell whether the competitive performance of the largest metropolitan areas led to a positive change in their productivity? In order to answer that question, one should first establish a measure of competitiveness and second, contrast the measure with the change in its relative efficiency.

The measure of competitiveness is a proposal by the author of this paper, which he has used in other works (Sobrino, 2002 and 2003), whose formulation is as follows:

$$CCP = \alpha\ IC + \beta\ CC + \chi\ CS$$

where CCP is the competitive position of the metropolitan area; IC is industrial competitiveness; CC is commercial competitiveness; and SC is service competitiveness, and α, β and χ are the share of each industry in national production in the last year, in this case 1998.

The competitiveness of each area is obtained using the average of the cardinal value of four competitive indicators: 1) change in absolute participation of the metropolitan area's production with regard to that of the country between 1980 and 1998 (CAP); 2) change in relative participation of the metropolitan area's production with respect to that of the country between 1980 and 1998 (CRP); 3) absolute growth (AG), and 4) change in the economic base, comparing the increase in the metropolitan area's production with that of its population (CEB) (see Table 6).

The measure used shows that Ciudad Juárez was in the best

[6] The change in relative efficiency was obtained by taking 1.13 from 1.20, dividing the result by 1.13 and multiplying the quotient by 100.

Table 6
Largest Metropolitan Areas: Competitive Position and Relative
Efficiency, 1980-1998

Metropolitan areas	Rank	Change in efficiency
Ciudad Juárez	1	37.81
León	2	20.15
Tijuana	3	13.90
Guadalajara	4	8.75
Monterrey	5	10.69
San Luis Potosí	6	26.49
Toluca	7	7.97
Torreón	8	–22.15
Puebla	9	–1.86
Mexico City	10	9.96

Source: Author's calculations.

competitive position between 1980 and 1998, due to the macro-economic performance of its industrial, commercial and service activities in comparison with that of the nine remaining metropolitan areas. Ciudad Juárez was followed by León, Tijuana, Guadalajara and Monterrey, which means that the first three included two border cities, while the first five included the second and third largest metropolitan areas of the country. At the opposite extreme, Mexico City was the least competitive, with Puebla only slightly above it.

Regarding the comparison between competitiveness and change in relative efficiency, at first sight, there would seem to be a positive link, since Ciudad Juárez, the most competitive city, also experienced the greatest change in relative efficiency, while Torreón experienced the least change in efficiency, and was the eighth most competitive. In order to prove this link statistically, first of all each city was assigned a range in accordance with the change in relative efficiency, and then the correlation coefficients of Kendall tau-b (τ) and Spearman (ρ) were calculated and the following results obtained:

$$\tau = 0.556; n = 10; p < 0.05$$

$$\rho = 0.709; n = 10; p < 0.05$$

As one can see, both correlations are statistically significant, with an acceptable level of reliability (0.05). It can therefore be inferred that competitiveness between the ten largest metropolitan areas of the country during the period from 1980 to 1998 was linked to a positive change in the local economic efficiency. This does not mean a competitive zero sum game, but another one that results in the generation of greater aggregate value. This conclusion should be qualified, bearing in mind the sharp fall in the partial productivity of work that took place in commercial activity, and its slight recovery in the 1990s, which, except in the manufacturing industry, was not sufficient to restore productivity levels to those of the early 1980s. Thus, in 1998 commerce has a partial labor productivity of 53% lower than in 1980 and 21% lower in services. One should also recall that the increase in the relative efficiency of the largest metropolitan areas of the country was combined with a reduction of this indicator in the rest of the national territory, allowing one to hypothesize about the increase of regional disparities as a result of trade liberalization.

Finally, what was the effect of metropolitan areas' competitive performance in the creation of employment? Urban-regional studies have generally used the technique for the analysis of change and participation to analyze the increase in employment or economic activity in a particular territory and over a period of time (Blair, 1995; Garza, 1980; Healey and Dunham, 1994). This technique consists of an identity that compares growth rates and establishes the fact that the absolute growth of a territory in a specific sector is divided into three additional components. The first is national, reflecting the change in size that it would have had if the territorial sector i had grown at the same rates as the national economy as a whole. The second is structural, measuring the change attributed to the relative importance of the sector i in the national economic sector. The third is differential, comparing the growth rates of the local sector i with that of the same sector in the national context, a component that has generally been

used as an indicator of the competitive position of local sectors (Salazar, 1983: 23-24).

A second alternative that has been used for the study of the growth of macroeconomic variables in the territory consists of the application of macroeconomic models, in which regional or urban performance is determined by the particularities of its internal structure and by national trends (Drennan, 1997; Lilien, 1982). Although these models are useful for studying the evolution of the economic structure of a territory, they are based on many assumptions that could easily affect the analysis.

A third set of methods has been the instrumentation of time series analysis, particularly auto-regression models (Coulson and Rushen, 1995; McCarthy and Steindel, 1997; Partridge and Rickman, 2003). In the auto-regression model process of the order p, current observation y_t is generated by the weighted average of past observations that date back to p periods, together with a random disturbance ε in the current period. This process is expressed as follows:

$$X_t = \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \dots + \alpha_r X_{t-r} + \varepsilon_t$$

In order to adapt the auto-regression model to the purposes of this study, the following equation was first established:

$$\Delta E_{ij} = \beta_1 + \beta_2 \Delta E_i + \beta_3 \Delta C_{ij} + \beta_4 \Delta P_j + \beta_5 \Delta I_j + \varepsilon$$

where the increase in employment in the group of activity i of the metropolitan area j (ΔE_{ij}) is a function of four variables. First, the increase in employment in this group in the national total (ΔE_i), which denotes the trend in the national occupation demand. Second, the competitive position of group i in the metropolitan area j (ΔC_{ij}), showing the relative performance of the local group as a function of what happened in other metropolitan areas. Third, the population growth of the metropolitan area j (ΔP_j), which expresses a demand derived from employment in the activity group i due to an increase in demand by the resident population. Fourth, the relative growth of activity group i in the local economic structure of the metropolitan area j (ΔI_j) indicating a change in local de-

mand by units in the same sphere of activity, or the possible emergence of a cluster in this group of activity.

In order to explore in greater detail the demand for employment due to sectoral behavior, the three branches of activity were divided into twenty groups:

- *Manufacturing:* 31, food, beverages and alcohol: 32, textiles, clothing and footwear; 33, wood and wood products; 34, paper, cardboard and publishing houses; 35, chemistry, rubber and plastic; 36, non-metal minerals; 37, basic metal; 38, metal products; 39, other manufacturing industries.
- *Commerce:* 61, non-food wholesale; 62, food wholesale; 63, supermarkets and department stores; 64, retail food; 65, non-food retail.
- *Services:* 91, restaurants and hotels; 92, real estate; 93, professional and technical; 94, education and health: 95, recreation and entertainment; 96, personal and social.

Time series for each metropolitan area were constructed using information from the economic censuses taken in 1980, 1985, 1988, 1993 and 1998. In order to be congruent with the auto-regression model, as regards the homogeneity of the period, 1980 was regarded as 1978 and 1985 was transformed into 1983.

The representation of the vector auto-regression model for the change in national employment, competitive position, population and specialization is expressed as follows:

$$X_t = C + A\,(\phi)\,X_{t-1} + \varepsilon_t$$

where X_t is the vector column (ΔE_t, C_t, P_t, I_t), C is a vector of constant terms that denotes the tendency in X in the period; A (ϕ) X_{t-1} is the auto-regression operator and ε_t is the vector column of residuals.

The model used provides information on the variance forecast for each independent variable in the generation of employment, in other words, the percentage of the metropolitan demand for employment that can be attributed to the behavior of national employment, metropolitan competitive position, population growth and productive specialization (see Table 7).

Table 7
Largest Metropolitan Areas: Occupational Growth Factors,
1980-1998

Metropolitan areas	Competitive rank	Factors (percentage)[a]				
		A	B	C	D	E
Metropolitan areas		25	41	26	3	5
Ciudad Juárez	1	5	60	30	1	4
León	2	25	38	31	5	1
Tijuana	3	15	63	15	3	4
Guadalajara	4	29	43	22	1	5
Monterrey	5	37	31	27	3	2
San Luis Potosí	6	22	37	32	2	7
Toluca	7	21	30	34	5	10
Torreón	8	22	35	35	2	6
Puebla	9	30	34	30	1	5
Mexico City	10	47	34	3	10	6

[a] A, national component; B, competitiveness; C, population growth; D, specialization; E, residual.
Source: Author's calculations from the auto-regression model.

For the set of metropolitan areas in the study, between 1980 and 1998 the generation of employment in the branches of manufacturing, commerce and services was initially determined by the competitive position of each city in certain activity groups, representing an average of 41% of the occupational growth. This data is significant since it reflects the important relationship between the expansion of the metropolitan export base, determined by its competitive performance and the demand derived from employment. This situation is more obvious in Ciudad Juárez and Tijuana, where 60% or more of the employment generated during the period of study is forecast in the model as a result of its competitive role. These two metropolitan areas were the only ones to have a percentage of occupational demand by competitive position that was higher than the non-weighted average of the ten units of study. At the opposite end are Monterrey, Puebla and Mexico City, where only a third of the predicted variance can be explained by their competitive performance. The non-parametric correlation between competitive range and range of employment growth that can be attributed to competitiveness obtains a level of significance

of 0.02, which confirms the close link between the two variables. Thus, the success of the attraction of investments for the quantitative expansion or qualitative restructuring of the metropolitan export based has led to the creation of jobs for its residents.

The second variable with the greatest explanatory prediction corresponded to population growth, meaning that the growth of the demand for end goods and services among the resident population accounted for 26% of the creation of new local jobs. This variable is more important in Torreón, Toluca, San Luis Potosí and León. With the exception of the first, the rest of these cities experienced significant demographic dynamism during the twenty years of study. As a result, the expansion of their export base and the attention to their growing internal market accounted for nearly 70% of job creation, with Toluca being the most illustrative case of job creation as a function of its endogenous condition of local economic growth. On the other hand, the slow rate of demographic growth in Mexico City meant that only 3% of its job creation was associated with this variable.

The national component in the local job creation explained 25% of the additional demand for employment in the metropolitan areas of the study. This variable was the third most important one in the model and showed that the country's four largest cities — Mexico City, Guadalajara, Monterrey and Puebla — have an employment structure dominated by important, dynamic national activity groups. This means that between 30% and 47% of new employment in these cities can be attributed to the change in national employment by group of activity. Mexico City and Monterrey are the cities where this variable has the greatest statistical predictive power in absolute terms. Conversely, the employment dynamics in Ciudad Juárez and Tijuana were very different from that in the rest of the country.

The hypothetical creation or consolidation of the cluster of activities, taking advantage of location economies, played a marginal role in job creation, accounting for just 3%. This means that the growth of metropolitan economies led to a greater diversification of its structure and lesser specialization, because of the economies of urbanization and scope (Duranton and Puga, 2000). It is important to note that the significant concentration of maquiladora

firms in Ciudad Juárez and Tijuana and the large firms located in Guadalajara and Puebla do not show the emergence of a cluster of activities. This reflects the low degree of contact and the few input-product relations (commodity channels) between local firms in the same group of activity. The opposite happened in Mexico City, since 10% of its job creation can be explained by the use of economies of location by the activity groups involved with producer services, and recreation and entertainment services.

The results presented correspond to the growth of employment in the set of branches of activity under study. The auto-regression model also provided the predicted variance of the new demand for occupation for each branch of activity, which enables one to complement the analysis and determine the groups of activity where the local competitive position leads to the greatest job creation (see Table 8).

The percentage change of employment in the manufacturing industry derived from the local competitive position is greater than the change in commerce and services. The manufacturing industry has traditionally been regarded as the leading sector of the local export base, as shown by the results of the model. On average, 42% of industrial job creation in the metropolitan areas of the study is associated with their competitive performance in this branch, as opposed to 38% in services and 33% in commerce. The industrial activity groups that correlate most highly with the demand for employment derived from competitive performance were 35, paper, cardboard and publishing houses; 38, metal products, and 39, other manufacturing industries.

In Ciudad Juárez and Tijuana, 70% and over of the new demand for industrial employment can be explained by competitiveness, which is a congruent percentage, since a large part of the manufacturing structure of both cities corresponds to maquiladora export firms. Guadalajara is in second place, with 50%, a fact that can also be explained by the contemporary location of maquiladora firms in the electronic fields and firms in the automobile industry. In third place are León and Torreón, over a third of whose new employment can be explained by competitiveness, expressed by the partial restructuring of production towards the automobile industry in the former and clothing industry in the latter. The

Table 8

Largest Metropolitan Areas: Competitiveness and Occupational Growth, 1980-1998

Metropolitan areas	Manufacturing		Commerce		Services	
	Competitive rank	Derived occupation (%)	Competitive rank	Derived occupation (%)	Competitive rank	Derived occupation (%)
Metropolitan areas		42		33		38
Ciudad Juárez	1	70	3	30	6	34
León	4	38	1	33	1	44
Tijuana	2	77	4	55	9	32
Guadalajara	3	50	6	33	6	40
Monterrey	9	24	2	32	2	41
San Luis Potosí	5	40	7	36	10	34
Toluca	8	26	5	30	5	36
Torreón	6	36	9	30	3	37
Puebla	7	32	8	20	4	46
Mexico City	10	30	10	34	8	37

Source: Author's calculations.

Spearman correlation between the manufacturing competitive rank and the rank by occupational demand by competitiveness shows a significance level of 0.000.

The demand for employment in commerce is associated less with local competitive position (33%), and far more with population growth (51%), a highly predictable result because the basic location pattern in these activities, particularly in retail, is their accessibility to the resident population. However, the groups of wholesale food trade (fruit and vegetable markets) and supermarkets and department stores operate as activities that are gradually becoming part of the local economic base, meaning that job creation in them forms part of employment derived from competitive position. In Tijuana over half the new demand for employment in commerce was due to competitive performance, a figure that accounts for less than a third in Ciudad Juárez, Toluca, Torreón and Puebla, where the local population's demand is the most powerful explanatory variable. The non-parametric correlation in this sector has a significance level of 0.881. In other words, it provides no statistical explanation, proving that the percentage of job creation derived from the competitive position is due more to the particularities of the commercial structure of each city, especially to the major role played in the latter by wholesale food trade groups and large supermarkets.

Finally, the percentage of new services jobs due to competitiveness is 38% on average, particularly so in Guadalajara, Monterrey, Puebla and León and less so in Tijuana, Ciudad Juárez and San Luis Potosí. With the exception of Mexico City and the border cities, the larger the population size, the higher the percentage of service employment derived from competitiveness, which is mainly contributed by the groups of producer services and recreation and entertainment services. The Spearman correlation in this branch provided a significance level of 0.026.

Services have permitted the diversification of the main economic functions in urban zones. In general terms, the shift towards services in urban economies has been accompanied by an increase in their share of the job market and a restructuring of the urban hierarchy. The metropolitan areas in the study have not changed their share of the job market, since in both 1980 and

1998 they accounted for 33.8% of employment. Some services, such as customer services and lower social services are found everywhere, while others, such as producer, distribution and higher social services are concentrated in order to enjoy the economic advantages of large cities. The general rule for producer services is that the larger the population size, the higher the concentration of this type of activities. The information in Table 8 proves this rule for Mexico.

4. Conclusions

This document reviews the debate between a city's competitive position and its effect on the change in productivity and job creation, in the case of the ten largest metropolitan areas in Mexico. It begins with a bibliographical review of the concept of territorial competitiveness, describing the factors involved in this, the competitive advantages and its impact and highlighting the behavior of the urban labor market. It then analyses the evolution of the labor market in Mexico during the period from 1980 to 2000, using information from population censuses (employment supply) and those on IMSS and ISSSTE affiliates (employment demand). The period under study is characterized by a slow rate of growth in the demand for formal and paid employment, a situation that was worse in the 1990s than in the 1980s. As a result, a large section of the employment supply has joined the labor market as self-employed workers in informal economic units or as unpaid workers. From the sectoral point of view, the labor market has increased in the area of financial and professional services.

In 2000, the ten largest metropolitan areas of the country were home to over a third of the national population and produced nearly two thirds of the income from manufacturing, commercial and service activities. The partial productivity of work in these branches of activity experienced a sharp decline in the 1980s and a slight recovery in the 1990s, in both the national total and each of the cities under study. Productivity performance was accompanied by a sharp decline in employees' average salaries. Both elements reflect, on the one hand, the low levels of productive

investment and, on the other, a labor market with an increasing demand for unskilled labor.

The relative efficiency of the metropolitan areas improved with respect to the rest of the country, implying that its competitive position was linked to a relative improvement in its productivity. Likewise, the use of an auto-regression model showed that competitive performance was the main explanatory variable for local occupational growth. This empirically proves the theoretical proposition of territorial competitiveness from the point of view of its product or effect on the economic structure of the city. These findings contribute to the knowledge of the dynamics of the country's urban economies, within the framework of trade liberalization and the rules of globalization. Further research is required to explore the link between a city's competitive position and improvements in its residents' quality of life.

5. References

Arellano, Rogelio, and Eduardo González (1993), "Dinámica de la inflación: un análisis econométrico del ajuste heterodoxo mexicano," *Estudios Económicos*, Vol. 8 (2), pp. 249-261.

Arrighi, George (1994), *The Long Twentieth Century. Money, Power and the Origins of Our Times*, London, Verso.

Begg, Iain (1999), "Cities and Competitiveness," *Urban Studies*, 36 (5-6), pp. 795-809.

Beristáin, Javier (1991), "Las ventajas competitivas de México," in Luis Mercado (comp.), *Competitividad*, Mexico, second seminar of El Economista, pp. 91-110.

Blair, John (1995), *Local Economic Development*, Thousand Oaks, California, Sage Publications.

Body, Martin (2002), "Linking Competitiveness and Cohesion," in Iain Begg (ed.), *Urban Competitiveness*, Bristol, England, The Policy Press, pp. 33-53.

Borjas, George (2002), *Labor Economics*, Boston, McGraw-Hill.

Budd, Leslie (1998), "Territorial Competition and Globalization: Scylla and Charybdis of European Cities," *Urban Studies*, Vol. 35, No. 4, pp. 663-685.

Cabrera, Gustavo (1994), "Demographic Dynamics and Development: the Role of Population Policy in Mexico," *Population and Development Review*, supplement, No. 20, pp. 105-120.

Camagni, Roberto (2002), "On the Concept of Territorial Competitiveness: Sound or Misleading?," *Urban Studies*, 39 (13), pp. 2395-2411.

Consejo Nacional de Población (2000), *La situación demográfica de México, 2000*, Mexico, Secretaría de Gobernación.

Coulson, Edward, and Steven Rushen (1995), "Sources of Fluctuations in the Boston Economy," *Journal of Urban Economics*, No. 38, pp. 74-93.

Drennan, Matthew (1997), "The Performance of Metropolitan Area Industries," *Economic Policy Review*, 3 (1), pp. 49-60.

Duranton, Gilles, and Diego Puga (2000), "Diversity and Specialisation in Cities: Why, Where and When Does It Matter?," *Urban Studies*, 37 (3), pp. 533-555.

Dussel, Enrique (1997), *La economía de la polarización*, Mexico, Jus/Universidad Nacional Autónoma de México.

Fajnzylber, Fernando (1988), "Competitividad internacional: evolución y lecciones," *Revista de la CEPAL*, No. 36, pp. 12-26.

García, Brígida (1982), "La participación de la población en la actividad económica," in Alejandro Mina (comp.), *Lecturas sobre temas demográficos*, México, El Colegio de México, pp. 211-240.

——— (2002), "Medición del empleo y el desempleo. Indicadores complementarios," *Demos. Carta demográfica sobre México*, No. 15, pp. 5-6.

Garza, Gustavo (1980), *Industrialización de las principales ciudades de México*, Mexico, El Colegio de México.

Gemmell, Norman (1986), *Structural Change and Economic Development*, London, The MacMillan Press.

Gereffi, Gari (1990), "Paths of Industrialization: An Overview," in Gari Gereffi and Daniel Wyman, *Manufacturing Miracles*, New Jersey, Princeton University Press, pp. 68-94.

Geyer, H., and T. Kontuly (1993), "A Theoretical Foundation for the Concept of Differential Urbanization," *International Regional Science Review*, 17 (2), pp. 157-177.

Gordon, Ian (1999), "Internationalization and Urban Competition," *Urban Studies*, Vol. 36, Nos. 5-6, pp. 1001-1006.

Guzmán, Alenka (1987), "Productividad y especialización manufactureras en México, Canadá y Estados Unidos, 1972-1994," *Comercio Exterior*, 47 (3), pp. 179-191.

Healey, Michael, and Philip Dunham (1994), "Changing Competitive Advantage in a Local Economy: The Case of Coventry, 1971-1990," *Urban Studies*, Vol. 31, No. 8, pp. 1279-1301.

Hirsch, Werner (1977), *Análisis de economía urbana*, Madrid, Instituto de Estudios de Administración Local.

John, P., and A. Cole (1998), "Urban Regimes and Local Governance in Britain and France. Policy Adoption and Coordination in Leeds and Lile," *Urban Affairs Review*, Vol. 33, No. 3, pp. 382-404.

Jusidman, Clara, and Marcela Eternod (1994), *La participación de la población en la actividad económica en México*, Aguascalientes, INEGI/ Instituto de Investigaciones Sociales de la UNAM.

Keyfitz, Nathan (1980), "Do Cities Grow by Natural Increase or by Migration?," *Geographical Analysis*, Vol. 12, No. 2, pp. 142-156.

Kleinknecht, Adams, and Thomas Poot (1992), "Do Regions Matter for R & D?," *Regional Studies*, Vol. 26, No. 3, pp. 221-232.

Knox, Paul, and John Agnew (1998), *The Geography of the World Economy*, London, Arnold.

Kresl, Peter (1998), "La respuesta de la economía urbana al Tratado de Libre Comercio de América del Norte: planificar para la competitividad," *Economía, Sociedad y Territorio*, Vol. 1, No. 4, pp. 695-722.

Lever, William (1999), "Competitive Cities in Europe," *Urban Studies*, Vol. 36, Nos. 5-6, pp. 1029-1044.

――― and Ivan Turak (1999), "Competitive Cities: Introduction to the Review," *Urban Studies*, Vol. 36, Nos. 5-6, pp. 791-793.

Lilien, David (1982), "Sectoral Shifts and Cyclical Unemployment," *Journal of Political Economy*, Vol. 15, No. 6, pp. 777-793.

Link, Albert (1987), *Technological Change and Productivity Growth*, London, Hardwood Academic Publishers.

Malecki, Edward (2002), "Hard and Soft Networks for Urban Competitiveness," *Urban Studies*, Vol. 39, Nos. 5-6, pp. 929-945.

――― (1997), *Technology and Economic Development*, London, Longman.

McCann, Philip (1995), "Rethinking the Economics of Location and Agglomeration," *Urban Studies*, Vol. 32, No. 3, pp. 563-577.

McCarthy, Jonathan, and Charles Steindel (1997), "National and Regional Factors in the New York Metropolitan Economy," *Economic Policy Review*, Vol. 3, No. 1, pp. 5-19.

Melgar, Ivonne (1999), "Bono demográfico. La última oportunidad," *Reforma*, July 10.

Moreno, Adrián (1995), "Calidad de vida en el sistema metropolitano de San Luis Potosí," in Carlos Garrocho and Jaime Sobrino (coords.), *Sistemas metropolitanos. Nuevos enfoques y prospectiva*, Zinacantepec, El Colegio Mexiquense/Secretaría de Desarrollo Social, pp. 483-530.

Notimex (2001), "Globalización," *Reforma*, international sector, January 9.

Partridge, Mark, and Dan Rickman (2003), "The Waxing and Waning of Regional Economies: The Chicken-egg Question of Jobs versus People," *Journal of Urban Economics*, No. 53, pp. 76-97.

Pedrero, Mercedes (2000), "La clasificación de la situación en el trabajo y los estudios de mercados de trabajo: el caso de los trabajadores a domicilio," *Estudios Demográficos y Urbanos*, Vol. 15, No. 3, pp. 583-612.

Pilat, Damon, and Bernd van Ark (1994), "Competitiveness in Manufacturing: A Comparison of Germany, Japan and the United States," *Banca Nazionale del Lavoro Quarterly Review*, Vol. 48, No. 1, pp. 24-42.

Potts, Gereth (2002), "Competitiveness and the Social Fabric: Links and Tensions in Cities," in Iain Begg (ed.), *Urban Competitiveness*, Bristol, England, The Policy Press.

Rendón, Teresa, and Carlos Salas (1986), "La población económicamente activa en el censo de 1980. Comentarios críticos y una propuesta de ajuste," *Estudios Demográficos y Urbanos*, Vol. 1, No. 2, pp. 291-309.

Richardson, Harry (1995), "El Tratado de Libre Comercio y el México urbano," in Carlos Garrocho and Jaime Sobrino (coords.), *Sistemas metropolitanos. Nuevos enfoques y prospectiva*, Zinacantepec, El Colegio Mexiquense/Secretaría de Desarrollo Social, pp. 167-205.

Ros, Jaime (1995), "La crisis mexicana: causas, perspectivas, lecciones," *Nexos*, No. 209, pp. 43-49.

Ruiz, Clemente (1999), "Territorialidad, industrialización y competitividad local en el mundo global," in Clemente Ruiz and Enrique Dussel (coords.), *Dinámica regional y competitividad industrial*, Mexico, UNAM/ Fundación Friedrich Ebert/Editorial Jus, pp. 13-56.

Ruiz, Crescencio (2000), "Desigualdades regionales en México, 1900-1993," *Estudios Demográficos y Urbanos*, Vol. 15, No. 3, pp. 533-582.

Salazar, Héctor (1983), "Críticas y correcciones a la técnica de análisis de cambio y participación," *Demografía y Economía*, Vol. 17, No. 1, pp. 21-37.

Sassen, Saskia (2001), *The Global City*, Princeton, New Jersey, Princeton University Press.

——— (2000), *Cities in a World Economy*, Thousand Oaks, California, Pine Forge Press.

Sobrino, Jaime (2003), *Competitividad de las ciudades en México*, Mexico, El Colegio de México.

——— (2003a), "Zonas metropolitanas de México en 2000: conformación territorial y movilidad de la población ocupada," *Estudios Demográficos y Urbanos*, Vol. 18, No. 3, pp. 461-507.

——— (2002), "Competitividad y ventajas competitivas: revisión teórica y ejercicio de aplicación a 30 ciudades de México," *Estudios Demográficos y Urbanos*, Vol. 17, No. 2, pp. 311-361.

——— (2000), "Participación económica en el siglo xx," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, El Colegio de México/Gobierno del Distrito Federal, pp. 162-169.

Taylor, Peter (1997), "Hierarchical Tendencies Amongst World Cities: A Global Research Proposal," *Cities*, Vol. 14, No. 3, pp. 323-332.

Tinbergen, Jan (1942), *On the Theory of Trend Movements*, New York, Harper.

Van Etten, Joris (2002), "Public-private and Community Partnerships for Urban Low-cost Housing in Indonesia," in Meine Van Dijk, Marike Noordhoek and Emiel Wegelin (eds.), *Governing Cities*, London, Institute for Housing and Urban Development Studies, pp. 172-189.

Villarreal, René, and Rocío Villarreal (2002), *México competitivo 2020*, Mexico, Océano.

Zepeda, Eduardo (2002), "Empleo y salarios. Los vaivenes del estancamiento," *Demos. Carta Demográfica sobre México*, No. 15, pp. 10-12.

III. DISTRIBUTION OF THE MEXICAN POPULATION DURING THE 20TH CENTURY

Interpretation of an article

Crescencio Ruiz Chiapetto

This article seeks to analyze some of the data on the urbanization of Mexico during the last century. It draws from Williams' article (1983), which he calls a "paradigm of the redistribution of the population," as a framework for studying a few variables referring to sectors of the population. The source of information used is column 1 of Table 4 in Garza (2003) and the paper studies the data in this column on total population, urban population and degree of urbanization (see Table A-1).

This article is then divided into two parts, the first of which presents William's mathematical formula for three indices: urbanization rate, growth rates of the urban and rural population (net urban growth and net rural growth) and the urban-rural ratio. These indices shed light on the S-shaped curve in the process of urbanization.

The second part includes a calculation of these indices for Mexico's population data. A description of the bell shapes created by these indices is followed by a brief review of the S-shaped curve for the urbanization of the country and a comparison of Unikel, Garza and Williams' urbanization rates, and the article ends with a commentary.

1. WILLIAMS' PARADIGM OF POPULATION REDISTRIBUTION

This "paradigm" is reduced to three indices: *a)* the urbanization rate, *b)* the interrelation between urbanization rates and the growth rates of the urban and rural population, and *c)* the rates of change of the urban-rural ratio.

a) Urbanization Rate

When one examines the demographic aspect of urbanization, the transformation of a rural into an urban society can be seen as the redistribution of a fraction of the total population into the urban sector. This redistribution can be formulated as follows:

$$U_{t+n} = U_t e^{\theta n} + nqT_t e^{\theta n} \qquad (1)$$

where

T_t is the total population in time t
U_t is the urban population in time t
θ is the growth rate in n years
e is the base of the natural logarithm and
(100%) q is the mean annual percent of the total population which is redistributed through the urban sector:
      the urban sector.

Equation (1) says that the urban population in time $t+n$ can be defined as the sum of two components: urban growth (previous) and a redistribution of the population.
     In Equation (1):

$$nqT_t e^{\theta n} = U_{t+n} - U_t e^{\theta n}$$

$$q = \left[U_{t+n} \Big/ T_t e^{\theta n} - U_t \Big/ T_t \right] \Big/ n$$

If $T_t e^{\theta n}$ is by definition the population in time $t + n$, the equation can be re-written as:

$$(100\%) \, q = (\% \text{ urban in } t + n - \% \text{ urban in } t)n \tag{2}$$

where (100%) q is the rate of annual urbanization.

The q value is independent of the population's growth rate and the degree of urbanization. The redistribution of 1% of the total population in the urban sector will increase the value of q by 1% without being subordinated to population growth or the percentage of the urban population.

b) Growth Rates of the Urban and Rural Population

Net population growth can be measured as the difference from the total urban population growth rate minus the growth rate of the total population. This index, known as *net urban growth* (NUG), can be calculated as follows:

$$NUG = \left[\ln\left(U_{t+n} \big/ U_t \right) - \ln\left(T_{t+n} \big/ T_t \right) \right] \Big/ n \tag{3}$$

in which the variables were previously defined. From Equation (3), it follows that:

$$NUG = \ln\left[\left(U_{t+n} \big/ T_{t+n} \right) \Big/ \left(U_t \big/ T_t \right) \right] \Big/ n \tag{4}$$

NUG is equivalent to the change in the annual percentage of degree of urbanization (per cent of urban population). This index, or a similar form, is the one we have used to measure urbanization rates.

Equations (3) and (4) can be used to obtain an association between the urbanization rate and NUG. Equation (5) shows the impact of the urbanization rate and the degree of urbanization on NUG:

$$NUG = \frac{q}{\left(U_{\big/T}\right)}, U \neq T \text{ or zero} \qquad (5)$$

NUG is directly proportional to the urbanization rate and inversely proportional to the degree of urbanization.

Just as in NUG, one can calculate Net Rural Growth (NRG). This growth can be defined by the difference between the growth of the rural population minus the growth of the total population. If we replace the rural population in equations (3) and (4) with the urban population, we can draw, just as we did for equation (5), a link between NUG and the degree and rate of urbanization:

$$NRG = \frac{-q}{\left(R/T\right)}, \quad R \neq T \text{ or zero} \qquad (6)$$

Net rural growth (NRG) is inversely proportional to the rate of urbanization and directly proportional to the ratio between the rural and total population.

The relations presented in equations (5) and (6) enable us to understand the behavior of the growth rates of the urban and rural population in the process of urbanization. These relations are illustrated in Graph 1. This graph illustrates the impact of the degree and rate of urbanization on the growth rates of the urban and rural population. In the latter, the horizontal axis shows the percentage of the urban population, while the vertical axis shows the urbanization rate; the two measures are given on a logarithmic scale. The right-hand side shows NUG, indicating how different NUG value correspond to the same rate, according on the lower or higher degree of urbanization. The left-hand side of the graph shows the values of NRG that would occur with different degrees and rates of urbanization.

One can see that there is a reciprocal relationship between NUG and NRG. With a given rate of urbanization, NUG will be greater at the stages where the degree of urbanization is high than in the periods in which it is low. Conversely, NRG will be lower when the degree of urbanization is small and greater when it is large.

Graph 1
Illustration of Degree and Rate of Urbanization
on Urban and Rural Growth
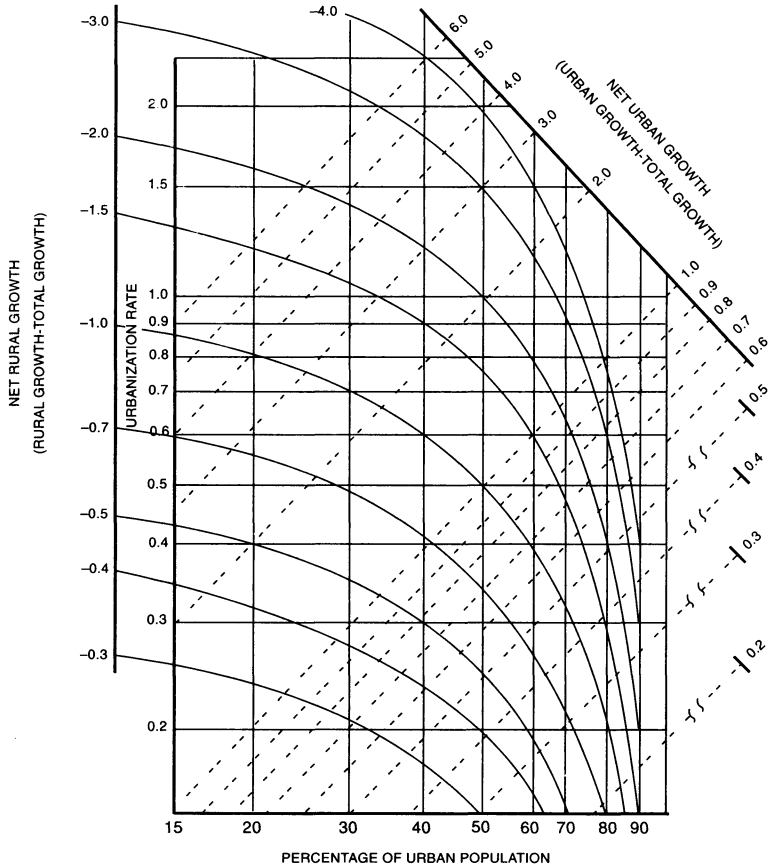
Source: Williams (1983).

Graph 1 shows, for example, that an urbanization rate of 1% when the urban population is 20% will produce a 5% increase in the urban growth rate (NUG) and reduce the rural growth rate by just 1.25%, whereas when the urbanization rate is 80%, the increase in the urban growth rate will be 1.25% while the reduction in the rural growth rate will reach 5%.

Williams says that Graph 1 illustrates the main tendencies of urban and rural growth during the process of urbanization, which, since they are obvious, are often ignored:

1) The growth rates of the population in the urban and rural sectors decline during the course of urbanization. NUG reduces its positive values, while NRG increases its negative values. This situation occurs even when population growth is constant.

2) During the initial stages of urbanization, explosive urban growth rates are accompanied by rural growth rates, which are slightly lower than national growth rates, whereas during the final stages of the process urban growth rates that are only slightly above national growth rates mean negative rural growth rates.

3) Only in the intermediate stages can high urbanization rates occur without causing rural depopulation.

4) If one uses the Net Urban Growth Index as the urbanization rate, countries with a low percentage of urban population will appear to have high urbanization rates while countries with higher percentages will have low urbanization rates. This situation will occur despite the fact that in the former countries, the redistribution of the rural population to the urban population is lower than in the latter group.

c) The Urban-Rural Ratio

Thus far, we have seen that the urbanization rate defined as the difference in the degree of urbanization (percentage of urban population) between a "t+n" time and a "t" time shows us the impact of the degree and rate of net urban and rural growth (see Graph 1). The graph shows that with an urban population of 50%, a 0.2 rate causes net urban growth (NUG) of 0.4 and net rural growth (NRG) of –0.4, whereas a rate of 1.0 creates a NUG of 2.0 and or a NRG of –2.0.

This mechanical association tells us that in the first case, the degree of urbanization only rose by 2% (50 to 52) whereas in the second, there was a 10% increase (50 to 60). If these data are presented as a ratio (urban-rural), in the first case the U-R ratio changed from 1.0 (0.5/0.5) to 1.08 (0.52/0.48), whereas in the second it changed to 1.5 (0.6/0.4). The urbanization rate shows the extent to which a fraction of the population is distributed from the rural to the urban sector, while the changes in the urban-rural ratio show us the forms that this process of population redistribution takes.

During the 20th century, several Latin American countries experienced a rapid increase in the urban-rural ratio. This phenomenon, common to several societies, led to the terms urbanization, development and industrialization being used to express the same process (Richardson, 1977).

When these terms (urbanization, development and industrialization) are associated with theoretical elements drawn from the economy, dual growth models and the "infant industry" policy are presented as possible explanations of this social transformation. At the risk of summarizing years of research in a few words, these models can be summarized in two points: the role of agriculture in development and import substitution as a form of industrial protection.[1]

d) Role of Agriculture in Development

In Mexico, the agricultural sector produced labor for cities, salary-goods and cheap raw materials and, on the basis of export crops, was the main source of foreign currency. This phenomenon has led to several articles on the rural-urban migration issue.

e) Protection of Industry by Governments

Economic policy protected national industry from foreign competition, through favorable fiscal policies, limited increases in real salaries, low fuel prices, infrastructure construction for industry and commercial agriculture and favorable credits for the manu-

---

[1] Gollas (2003) simple, readable article presents these analytical elements in an account of Mexico's economic history during the 20th century.

facturing sector. During the import substitution period, transfers were made from agriculture to the rest of the economy, with different planning instruments (fiscal mechanisms, banking system and terms of exchange). We do not know the extent to which this policy accentuated the change in the urban-rural ratio of the population in Mexico.

The rate of change of the urban-rural ratio [RC (U-R)] can be calculated as:

$$\left[RC(U-R)\right] = \ln\left[\left(U_{t+n}\Big/R_{t+n}\right)\Big/\left(U_t\Big/R_t\right)\right]\Big/ n \qquad (7)$$

Where the terms have been defined from equation 7.

$$\left[RC(U-R)\right] = \left[\ln\left(U_{t+n}\Big/U_t\right) - \ln\left(R_{t+n}\Big/R_t\right)\right]\Big/ n \qquad (8)$$

In other words, [$RC(U-R)$] is equal to the difference between the growth rates of the urban and rural population. Although the rate of change of the urban-rural ratio does not measure the rate at which a society is transformed from rural to urban (urbanization rate), it is significantly related to this rate.

Since [$RC(U-R)$] is equal to the difference between rural and urban growth rates (equation 8) it must be equal to the difference between the NUG and NRG.

Thus one can say that:

$$\left[RC(U-R)\right] = NUG - NRG \qquad (9)$$

By substituting from equations (5) and (6):

$$\left[RC(U-R)\right] = \left[q\Big/(U/T)\right] - \left[-q\Big/(R/T)\right] = q\Big/U/T + q\Big/(R/T)$$

When we factorize by $(U/T)(R/T)$, we find:

$$\left[RC(U-R)\right]=\left[q\left(R\!\!\big/\!_T\right) + q\left(U\!\!\big/\!_T\right)\right]\Big/\left(U\!\!\big/\!_T\right)\left(R\!\!\big/\!_T\right)$$

Since (R/T) plus (U/T) must be equal to 1.0:

$$\left[RC(U-R)\right]= \frac{q}{\left(UR/T^2\right)}, \quad U \neq T \text{ or zero} \tag{10}$$

The $[RC(U - R)]$ is proportional to the urbanization rate and inversely proportional to the measure of the potential for the interaction between the urban and rural sectors.

The interaction between the urbanization rate and the rate of exchange of the urban-rural ratio outlines the route of the urbanization process.

The urbanization process can be drawn using an "S" shape, showing low urbanization rates at pre-urban stages that increase and remain high during periods of intense urbanization and decline in subsequent stages. The "S" shaped curve can be associated with an inverted "U" shown by the values of the urbanization rate and those of the rate of change of the urban-rural ratio.[2]

2. WILLIAMS' INDICES FOR MEXICO'S POPULATION IN THE 20TH CENTURY

a) The Total and Urban Population of Mexico: 1900-2000

The first column of Table 4 in Garza (2003) gives data on the total population, the urban population and the degree of urbanization (percentage of urban population) for the years 1900, 1910, 1921, 1930, 1940, 1950, 1960, 1970, 1980, 1990, 1995 and 2000. These variables allow one to estimate the indices proposed by Williams: ur-

[2] If the urbanization rate were constant, it would not create an inverted "U" in either the urban-rural rate or ratio.

banization rate, net urban growth, net rural growth and rate of change of urban-rural ratio.

I did not use the data for 1921, 1980 or 1995 from Garza's chart, in order to make the indices clearer and simpler. Using the remaining figures from the population census, I reduced Garza's data to eight periods and elaborated Williams' indices for the urban and rural population of Mexico in the 19th century (see Table 1).

The table shows that during the period from 1940 to 1990, the values of the indices (urbanization rate, net urban growth, net rural growth and rate of change of urban-rural ratio) are greater than in the earlier periods (1900-1940) or the last decade (1900-2000). With the exception of net urban growth, the mode of these values occurred during the period from 1950 to 1960.

Graph 2 illustrates the variables in Table 1. The urbanization rate shows a bell-shaped curve from 1930 to 2000, while the indices directly associated with this rate (net urban growth and rate of urban-rural change) show more pronounced bell shapes for this same period. Conversely, net rural growth, which has an inverse relationship with the rate of urbanization, displays a "U" shape.

This bell shape (inverted "U") of the urbanization rate was suggested by Kuznets (1995) in a study of economic growth and unequal income in the United States. Kuznets states that discovering an inverted "U" in his study should be regarded as speculation, although he adds that this behavior may occur in a similar fashion in the population's growth rate and urbanization rates.

The pattern Kuznets discovered spread to other forms of development. In the case of population distribution, bell-shaped forms were used to support primacy, rural-urban migration and the distribution of cities by population size.

El-Shakhs (1972) says that the behavior of the primacy of countries is similar to an inverted "U." Countries increased their primacy during the period when their economies expanded, when the centralization and concentration of economic activities were conditions for starting industrialization. When the economy achieved a greater degree of development, the spread of the latter gave rise to the decentralization of activities and the relative decline in the predominance of the capital city.

Table 1

Mexico: Urbanization Rate (UR), Net Urban Growth (NUG), Net Rural Growth (NRG) and Rate of Change of Urban-Rural Rate [RC(U-R)], 1900-2000

Year	Urbanization Rate (UR)[a]	Net Urban Growth (NUG)[b]	Net Rural Growth (NRG)[c]	Urban-Rural Rate of Change [(U-R)RC][d]
1900-1910	0.12	1.07	-0.16	1.23
1910-1930	0.29	2.01	-0.33	2.34
1930-1940	0.25	1.39	-1.32	1.70
1940-1950	0.80	3.51	-1.07	4.58
1950-1960	1.07	3.41	-1.65	5.06
1960-1970	0.84	2.06	-1.52	3.58
1970-1990	0.82	1.53	-1.86	3.39
1990-2000	0.39	0.62	-1.16	1.78

[a] *(UR)* This is the difference in the degree or urbanization during a period of "t + 1" and "t" (Equation 2).

[b] *(NUR)* This is the difference between the total urban growth rate and the growth rate of the total population, during a period of "t + 1" and "t" (Equation 3).

[c] *(NRG)* This is the difference between the total rural growth rate and the total population growth rate, during a period of "t + a" and "t" (equivalent to Equation 3).

[d] *[CR(U-R)]* This is equal to the sum of the net urban growth rate and the net rural growth rate, during a period of "t + 1" and "t" (Equation 9).

Source: Tables A2-I, A2.II, A2-III y A2-IV.

Graph 2
Mexico: Urbanization Rate (UR), Net Urban Growth (NUG), Net Rural
Growth (NRG) and Urban-Rural Rate of Change [(U-R)RC], 1900-2000
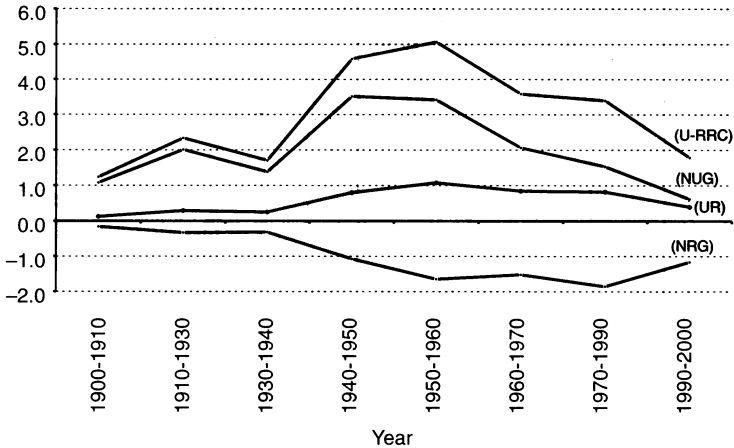
Source: Table 1.

Zelinsky (1971) proposed that, like demographic transition, the mobility of the rural-urban population rises and falls with economic development (urban transition). It involves five stages of development, during which rural-urban migration displays a bell-shaped pattern. The intermediate stages are characterized by massive migrations that decrease as the country's development advances.

When comparing the Pareto distribution in the urban hierarchy of twelve countries, grouped by degree of development, Parr (1985) finds indications of the U-shaped form in the Pareto coefficient ("α"). In less developed countries, the coefficient reduces its value (the concentration of population rises), while countries with medium development begin to see a process of decentralization of the population (the coefficients change from decreasing to increasing) whereas in countries with higher levels of development this transition has already taken place.

It is striking that Kuznets' suggestion regarding the possibility of finding a bell shape in urbanization rates has not been heeded by scholars of population concentration. Although it is true that Zelinsky approaches this with his hypothesis of population mo-

bility (urban transition), despite the economy in the calculation of the rates, or perhaps precisely because of this, it was not until Williams' study (1983) that the behavior of urbanization rates began to emerge with a bell shape.

b) The S-Shaped Curve in the Urbanization Process

The bell shape of urbanization rates translates into an S-shape. Graphs 3 and 4 display this curve for the percentages of the urban population of Mexico and the United States. The "Y" axis indicates the degree of urbanization, while the "X" axis shows the rates by decade. The graphs summarize long periods of population concentration in the two countries.

In Mexico, one of the most interesting features of this curve (Graph 3) is the period from 1940 to 1970, in which the urbanization of Mexico experienced the fastest rate of concentration of the population. (In 1940, the degree of urbanization was 20.0, a figure that had risen to 47.1 by 1970.) During the 1960s and 1970s, Mexico's urban development began to elicit interest in the field of population studies. The outlook for urbanization during this period was alarming, particularly for less developed countries, whose populations were being concentrated at an unprecedented rate.

Several decades later, one is struck by Preston's article (1979) which provides a simple description of some of the characteristics of this phenomenon: *1)* the importance of natural growth in the urban growth of developing countries, *2)* the predominance of Latin America in the urbanization of these countries, and *3)* the link between high urbanization and low industrial growth.

1) Davis (1965) points out that in less developed countries, one of the main components of high population growth in cities is natural growth. Preston states that the rural-urban migration in these countries has been exaggerated, since it has failed to take Davis' observations into account. In Mexico, during the period from 1940 to 1970, the total urban growth rate was 6.03% annually, while the total population growth rate was 3.03 (see Table A2-II).

2) During the 1950s and 1960s, several Latin American countries displayed higher urban growth than the rest of the underdeveloped

Graph 3
Mexico: Degree of Urbanization
(percentage of urban population)[a] 1900-2000
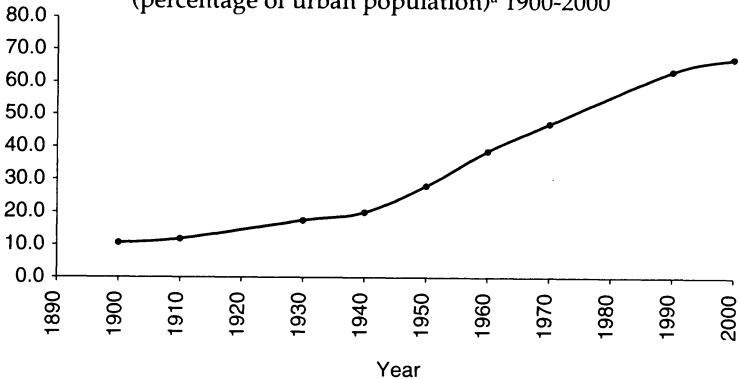
Year

[a] Population in towns with 15,000 inhabitants or over.
Source: Table A2-1.

countries. This phenomenon is new in the history of urbanization and appears to have an uncertain future. Over the years, other blocs of underdeveloped countries experienced a similar phenomenon to Latin America, leading once again to talk of uncertain futures.

3) Concern over the growth of the urban population in less developed countries gave rise to the issue of over-urbanization. It was said that high population growth — the fall in mortality rates together with the persistence of high fertility — in most Latin American countries, linked to a high concentration of the population and sluggish industrial development, gave rise to the "over-urbanization" or "tertiarization" of these countries. According to this idea, there may be an imbalance between the growth of the urban population and the growth of the share of the industrial sector in the product and the labor force (Hoselitz, 1953 and 1957; Sovani, 1969). Preston, however, proves the opposite, in other words, that countries with a high degree of urbanization experienced greater economic growth. Mexico was by no means the exception in Preston's tests: its periods of greatest urbanization were accompanied by strong economic growth, which some dubbed a "miracle."

After the problems of the 1980 Population Census data, the 1990 and 2000 censuses revealed a new pattern in the urbaniza-

Graph 4
United States: Degree of Urbanization
(percentage or urban population)[a], 1790-1980
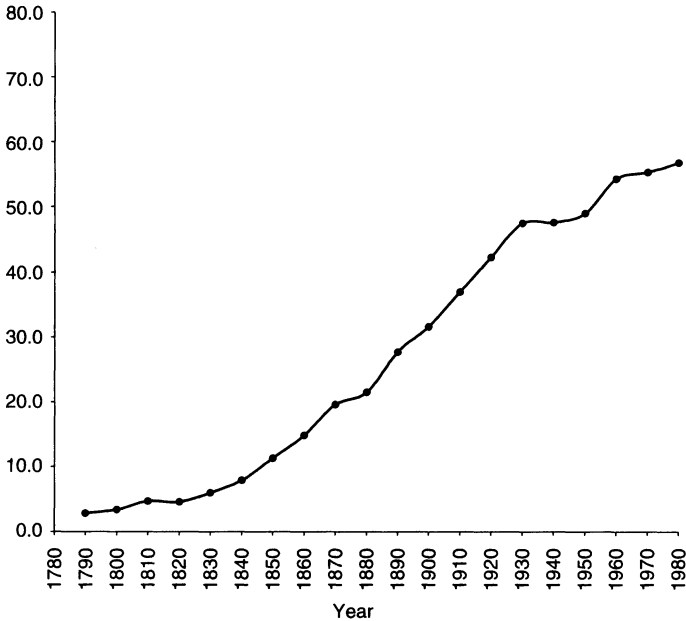
[a] Population in towns with 10,000 immigrants or over.
Source: Table A2-V.

tion of Mexico. From 1970 to 2000, the degree of urbanization in Mexico was adjusted, to a greater or lesser extent, to an "S" curve shape. Graph 3 shows the hundred years of Mexico's urbanization, summarizing the data on the total population and the urban population in Column 1 of Table 4 in Garza (2003). The three stages of urbanization mentioned by Williams can be clearly distinguished: the pre-urban stage, from 1900 to 1940, with a rate of 0.24; the period of rapid concentration of the population, from 1940 to 1970, with an 0.90 rate, and the years of less intense urbanization, displaying an S-shaped curve, from 1970 to 2000, with a rate of 0.67.

During the years of intense urbanization in Latin American countries, sɟecialists on the issue compared this phenomenon with

that of similar years in developed countries. For Latin American countries, the main point of reference was the United States, which constituted an extremely odious comparison. Durand and Peláez (1969) exemplified the case of Venezuela, among other countries. "For example... in 24 years, the degree of urbanization in Venezuela advanced as much as it had done in the United States over a period of 89 years" (p. 81). In 1936, Venezuela had an urban population of 16%, a figure that had risen to 47% by 1960, figures that the United States experienced between 1871 and 1960. An equivalent comparison for Mexico is somewhat similar. During the period of most intense urbanization (1940-1970), Mexico's urban population rose from 20.0 to 47.1%, whereas urbanization in the United States rose from 19.6 to 47.5 over a period of sixty years (1870-1930). During these periods, Mexico's urbanization rate was twice as high as it had been in the United States: 0.90 and 0.46 respectively (see Tables A2-I and A2-V).

Over the years, the urbanization processes of several Latin American countries had completed an urban cycle. Comparisons have become more subtle, making it possible to establish a difference between the years of intense concentration of the population and the period of extended duration in the United States and Mexico. In 1850, in the United States, the degree of urbanization was 11.3, a figure which had reached 56.8 by 1980. Over this period of 130 years, the average urbanization rate was 0.35. In 1900, in Mexico, the percentage of the urban population was 10.6 and in the year 2000, it was 67.3. Over a period of 100 years, the average rate of urbanization was 0.57. Urbanization in Mexico has obviously been more intense than in the United States, but it lacks the alarming characteristics attributed to it in the 1960s.

c) Urbanization Rates of Unikel (1976), Garza (2000)
and Williams (1983)

I will now provide a brief description of the way in which census data associated with population distribution are presented, in order to contextualize the urbanization rates of the authors mentioned in the title of this section.

The information from the population censuses referring to the distribution of the population is usually given in three ways: by population sector (urban and rural), by groups based on the size of localities (number of localities and volume of population contained in each level) and by urban hierarchy (cities arranged according to population size). Population sectors are used to calculate the degree of urbanization, and their growth rate is sometimes called the urbanization rate (Durand and Peláez, 1969; Hauser, 1979; Berry, 1981; Garza, 2003). Groups of population size are used to provide indices of the concentration of population (Gibbs, 1966), while Unikel (1976) used one of them to measure the urbanization rate. This type of information allows one to estimate the Pareto distribution, although the latter has been used in research on urbanization in Mexico. The distribution of the population of cities by size can be used to estimate primacy indices and the range-size rule (Zipf, 1949). I am sure, however, that this list does not include other indices or indicators of the concentration of the population.

d) Unikel's Urbanization Rate (1976)

The urbanization rate index proposed by Unikel is presented in a note to a table in his book *El desarrollo urbano de México* (note *a* in Table 1-8).

The urbanization rate corresponds to the mean annual increase of the level of urbanization, calculated using the following expression:

$$T_u = \frac{2(Ii - Io)}{(Ii + Io)} \cdot \frac{1}{n} \cdot k$$

in which *Ii* and *Io* are the urbanization indices at the end and beginning of the period, "*n*" is the number of years in the period and *k* is a constant.

The urbanization index is defined in a footnote (p. 36, note 36):

In this study, an urbanization index was applied whose numerical expression is as follows:

$$I_u = \frac{1}{4}\left(\frac{U_1}{P} + \frac{U_2}{P} + \frac{U_3}{P} + \frac{U_4}{P}\right)$$

In which U1, U2, U3 and U4 are the population in localities with 15,000 inhabitants and over, 20,000 and over, 50,000 and over and 100,000 and over respectively. P is the total population of the country or the territorial unit studied...

It would be unlikely for such an uneven index of urbanization rates to yield results that were easy to interpret. In Table I-8, Unikel shows his calculation of rates for different periods. When he takes periods of various decades, the rates follow the familiar pattern of population concentration in Mexico. From 1900 to 1940, the rate was 2.0 and from 1940 to 1970, it rose to 2.8, but when he takes the period from 1940 to 1970 by decade, he obtains very different values. The estimated rates for 1940 to 1950 are 3.7, from 1950 to 1960, 2.9, and from 1960 to 1970, 2.4.

It is useful to recall that in the 1960s and 1970s, indices of urbanization rates sought to incorporate urban hierarchy into the degree of urbanization, i.e. the importance of cities by size, in the percentage of the urban population. However, the information used to propose these indices prevented researchers from achieving the objectives they had set, i.e. to achieve indices that would simply and clearly weight the degree of urbanization.

Since the information that served as the basis for these indices is given by population strata according to the number of localities, the population volumes in each stratum may show abrupt changes from one year to the next, meaning that the indices may show very different rates from one period to another. This is true of the rates Unikel estimated per decade during the period from 1940 to 1970.

e) Garza's Urbanization Rate (2003)

Garza defined "urbanization rate" in the *a* note to Table 4 (Table A-I) in his book *La urbanización de México en el siglo xx:*

the degree of urbanization is the mean annual increase in the degree of urbanization...

The estimate of this growth rate is equivalent to the net urban growth rate (equation 4) in Williams' paradigm, the only difference being that Garza calculates an arithmetic rather than a geometric rate:

$$NUG = \ln\left[\frac{U_{t+n}}{T_{t+n}} \Big/ \frac{U_t}{T_t}\right] \Big/ n$$

This method of estimating the urbanization rate has been used by other authors (Durand and Peláez, 1969; Hauser, 1979; Berry, 1981). The most outstanding of these is the study by Durand and Peláez, which proposes an index of the rate as an alternative to the growth rate of the degree of urbanization:

Growth rate (r)

$$r = 100\left(\frac{(u) - (t)}{100 + (t)}\right)$$

where (u) is the total urban growth rate and (t) is the total population growth rate (Durand and Peláez, 1969: 178).

As one can see, this index is similar to Williams' net urban growth rate calculated in equation (3):

$$NUG = \left[\ln\left(U_{t+n} \Big/ U_t\right) - \ln\left(T_{t+n} \Big/ T_t\right)\right] \Big/ n$$

The difference between these indices is that the former add the [100 + (t)], but the authors do not explain why this denominator is included.

The justification for this index, they argue, is to provide a clearer idea of the process than simply the consideration of changes in the percentage of urbanization at different periods.

This argument was common during the 1960s and 1970s. At the time, it was thought that a complicated urbanization index was more convincing than a simple one. These indices were even thought to be more capable of explaining the phenomenon of the concentration of the population.

f) Williams' Urbanization Rate (1983)

The calculation of Williams' urbanization rate is given in equation (2):

$$(100\%)\ q = [\text{urban \% in } t + n -\text{urban \% in } \pm]/n$$

Although this means of estimating the rate appears in other authors (Davis, 1965; Kolars and Nystuen, 1974; Preston, 1979), Williams' proposal enables one to differentiate between the traditional way of studying urbanization and the possibilities that the new paradigm offers for analyzing this phenomenon.

We are used to regarding the degree of urbanization as a sort of barometer that indicates when a country changes from rural to urban, indicating the year when the population censuses registers the fact that over 50% of the population lives in cities. The rate has been treated as a superfluous indicator, which has virtually been ignored, except for the calculations to obtain it, which are fairly complicated. It is hardly surprising that this way of studying the urbanization process, which refers solely to sectors of the population, is so unappealing.

As we have seen, using Williams' simple calculations to obtain the rate, we drew the S-shaped curve of urbanization in the 19th century in Mexico and a graph of the indices associated with it, the bell-shaped curves of the urbanization rate, net urban growth and the rate of urban-rural change, as well as the U-shaped curve of net rural growth.

These bell shapes accompany the familiar shapes of the concentration of population: primacy, rural-urban migration and distribution of cities by size, and those that appear t psuggest the analysis of urban cycles in research on the urbanization process.

3. A Final Comment

I read Williams' work almost by chance. In one of his footnotes, Vinning (1986) suggests one "see (Williams, 1983) for a treatment of the basic mathematics of the spatial redistribution of the population" (p. 6, note 3). As we have seen, the redistribution of the population refers to the urban and rural sectors, a level of information that current research on the population of cities barely takes into account.

Williams's study incorporates the type of study of urbanization of previous years into current issues of analysis referring to population distribution. It is striking that the simplest definition of the urbanization rate (differences in the degree of urbanization by period) enables one to obtain other indices associated with the latter (net urban growth, net rural growth and rate of change of the urban-rural ratio). A means of calculating these rates that was previously thought to be too simple to explain the process of urbanization is the key to understanding the link between the indicators of population concentration.

Although Williams does not refer to the bell shapes, which can be drawn using the indices from his paradigm (see Graph 2), it is worth wondering about the link that may exist between these indices of urbanization and the bell shapes of other indicators for the concentration of population, particularly the urban cycles proposed in more recent models (Berry, 1981, 1988 and 1991; Geyer and Kontuly, 1993; Geyer, 1996).

Finally, I would like to note that Williams' article does not take us away from those who began the study of urbanization of less developed countries, particularly those in Latin America. On the contrary, for those of us involved in this area of research, the names of Browning, Davis, Gibbs, Preston and Unikel will continue to accompany us in our work for many years to come.

4. References

Berry, B. J. L. (1981), *Comparative Urbanization; Divergent Paths in the Twentieth Century*, New York, St. Martin's Press.

———— (1988), "Migration Reversals in Perspective: The Long Wave-Evidence," *International Regional Science Review*, Vol. 11, No. 3, pp. 245-251.

———— (1991), *Long Wave Rhythms in Economic Development and Political Behavior*, Baltimore, Johns Hopkins University Press.

Davis (1965), "The Urbanization of Human Population," *Scientific American*, Vol. 214, pp. 40-53.

Durand, J., and C. Peláez (1969), "Patterns of Urbanization in Latin American," in G. Breese (ed.), *The City in Newly Developing Countries*, Englewood Cliffs, N. J., Prentice Hall, pp. 166-188.

El-Shakhs, S. (1972), "Development, Primacy and Systems of Cities," *The Journal of Developing Areas*, Vol. 7, pp. 11-36.

Garza, G. (2003), *La urbanización de México en el siglo xx*, Mexico, El Colegio de México.

Geyer, H. S. (1996), "Expanding the Theoretical Foundation of the Concept of Differential Urbanisation," *Tijdschrift voor Economische en Sociale Geografie*, Vol. 87, No. 1, pp. 44-59.

———— and T. Kontuly (1993), "A Theoretical Foundation for the Concept of Differential Urbanization," *International Regional Science Review*, Vol. 15, No. 2, pp. 157-177.

Gibbs, J. (1966), "Measures of Urbanization," *Social Forces*, Vol. 45, pp. 170-177.

Gollás, M. (2003), *México, crecimiento con desigualdad y pobreza*, Working Document III, Centro de Estudios Económicos, Mexico, El Colegio de México.

Hauser, P. H. (1979), "Introduction and Overview," in P. H. Hauser (ed.), *World Population and Development*, Syracuse, Syracuse University Press, pp. 1-61.

Hoselitz, B. F. (1953), "The Role of Cities in the Economic Growth of Underdeveloped Countries," *Journal of Political Economy*, Vol. 61, pp. 195-208.

———— (1957), "Urbanization and Economic Growth in Asia," *Economic Development and Cultural Change*, Vol. 6, pp. 42-54.

Kolars, J., and J. D. Nystuen (1974), *Human Geography: Spatial Design in World Society*, New York, McGraw-Hill.

Kuznets, S. (1955), "Economic Growth and Income Inequality," *American Economic Review*, Vol. 45, No. 1, pp. 1-28.

Parr, J. B. (1985), "A Note on the Size Distribution of Cities over Time," *Journal of Urban Economics*, Vol. 18, pp. 199-212.

Preston, S. H. (1979), "Urban Growth in Developing Countries: A Demographic Reappraisal," *Population and Development Review*, Vol. 6, pp. 195-215.

Richardson, H. W. (1977), *City Size and National Spatial Strategies in Developing Countries*, Working Document WP/252, Washington, D.C., The World Bank.

Sovani, N. V. (1969), "The Analysis of Over-Urbanization," in G. Bresse (ed.), *The City in Newly Developing Countries*, Englewood Cliffs, N.J., Prentice Hall, pp. 322-330.

Unikel, L. (1976), *El desarrollo urbano de México*, Mexico, El Colegio de México.

Vinning, D. R. (1986), "Population Redistribution Towards Core Areas of Less Developed Countries, 1950-1980," *International Regional Science Review*, Vol. 10, No. 1, pp. 1-45.

Williams, L. S. (1983), "The Urbanization Process: toward a Paradigm of Population Redistribution," *Urban Geography*, Vol. 4, No. 2, pp. 122-137.

Zelinsky, W. (1971), "The Hypothesis of the Mobility Transition," *Geographical Review*, Vol. 61, pp. 219-249.

Zipf, G. K. (1949), *Human Behavior and the Principle of Least Effort: An Introduction to Human Ecology*, Cambridge, Addison-Wesley.

Table A-1
Mexico: Population Distribution by Size of City, 1900-2000[a]

		Small			Medium			Large		
		15,000 to 19,999	20,000 to 49,999	Sub-total	50,000 to 99,999	100,000 to 499,999	Sub-total	500,000 to 999,999	1,000,000 or more	Sub-total
1900										
Total population	13,607									
Urban population	1,437	173	539	712	280	446	726	—	—	—
%	100.0	12.1	37.3	49.4	19.5	31.1	50.6	—	—	—
Cities	33	10	17	27	4	2	6	—	—	—
Degree of urbanization	10.6									
Urbanization rate										
1910										
Total population	15,160									
Urban population	1,783	115	715	830	363	590	953	—	—	—
%	100.0	6.4	40.1	46.6	20.4	33.1	53.4	—	—	—
Cities	36	7	22	29	5	2	7	—	—	—
Degree of urbanization	11.8									
Urbanization rate	1.1									
1921										
Total population	14,335									
Urban population	2,100	201	560	761	534	143	677	662	—	662
%	100.0	9.6	26.7	36.3	25.4	6.8	32.2	31.5	—	31.5
Cities	39	12	17	29	8	1	9	1	—	1

Degree of urbanization	14.6									
Urbanization rate	2.0									
1930										
Total population	16,553									
Urban population	2,892	275	564	839	575	429	1,004	—	1,049	1,049
%	100.3	9.5	19.5	29.0	19.9	14.8	34.7	—	36.6	36.6
Cities	45	16	17	33	8	3	11	—	1	1
Degree of urbanization	17.5									
Urbanization rate	2.1									
1940										
Total population	19,649									
Urban population	3,928	304	694	998	589	781	1,370	—	1,560	1,560
%	100.0	7.7	17.7	25.4	15.0	19.9	34.9	—	39.7	39.7
Cities	55	18	23	41	8	5	13	—	1	1
Degree of urbanization	20.0									
Urbanization rate	1.3									
1950										
Total population	25,779									
Urban population	7,209	392	1,210	1,602	808	1,927	2,735	—	2,872	2,872
%	100.0	5.5	16.8	22.3	11.2	26.7	37.9	—	39.8	39.8
Cities	84	22	39	61	12	10	22	—	1	1
Degree of urbanization	28.0									
Urbanization rate	3.3									
1960										
Total population	34,923									
Urban population	13,513	616	1,558	2,174	1,731	3,051	4,782	1,563	4,994	6,557
%	100.0	4.6	11.5	16.1	12.8	22.6	35.4	11.6	37.0	48.5
Cities	124	35	49	83	23	14	37	2	1	3
Degree of urbanization	38.7									

Table A-1
(continued)

		Small			Medium			Large		
		15,000 to 19,999	20,000 to 49,999	Sub-total	50,000 to 99,999	100,000 to 499,999	Sub-total	500,000 to 999,999	1,000,000 or more	Sub-total
Urbanization rate	3.2									
1970										
Total population	48,225									
Urban population	22,730	740	2,123	2,863	1,750	6,142	7,892	629	11,346	11,975
%	100.0	3.3	9.3	12.6	7.7	27.0	34.8	2.8	50.0	52.7
Cities	174	43	71	114	25	30	55	1	3	4
Degree of urbanization	47.1									
Urbanization rate	2.0									
1980										
Total population	66,847									
Urban population	36,739	947	2,947	3,894	1,633	10,275	11,908	2,553	18,384	20,937
%	100.0	2.5	7.8	10.3	4.3	27.3	31.7	6.8	48.9	55.7
Cities	227	55	96	151	24	44	68	4	4	8
Degree of urbanization	55.0									
Urbanization rate	1.5									
1990										
Total population	81,250									
Urban population	51,491	1,396	3,755	5,151	2,800	10,847	13,647	10,219	22,474	32,693
%	100.0	2.7	7.3	10.0	5.4	21.1	26.5	19.8	43.6	63.5
Cities	304	80	124	204	39	41	80	16	4	20
Degree of urbanization	63.4									

Urbanization rate	1.5									
1995										
Total population	91,158									
Urban population	59,961	1,445	4,413	5,858	3,033	10,938	13,971	11,645	28,487	40,132
%	100.0	2.4	7.4	9.8	5.1	18.2	23.3	19.4	47.5	66.9
Cities	343	84	149	233	42	44	86	17	7	24
Degree of urbanization	65.8									
Urbanization rate	0.7									
2000										
Total population	97,483									
Urban population	65,653	1,205	4,810	6,015	3,259	10,815	14,074	12,590	32,974	45,564
%	100.0	1.8	7.3	9.2	5.0	16.5	21.4	19.2	50.2	69.4
Cities	350	70	164	234	46	42	88	19	9	28
Degree of urbanization	67.3									
Urbanización rate	0.6									

[a] The total and urban population is given in thousands of inhabitants; cities are localities with 15,000 or more inhabitants; the table includes those classified as metropolitan zones (51 in 1995 and 56 in 2000); the degree of urbanization is the percentage of the urban population of the whole population; the urbanization rate is the mean annual increase in the degree of urbanization. The 1910 rate refers to the 1900-1910 decade and so on.

Source: Garza (2003), Table 4.

Table A2-I.
Mexico: Urbanization Rate,[a] 1900-2000

Year	Degree of urbanization		Urbanización rate
	Ut	Ut+1	(2)-(1)/n
	(1)	(2)	(3)
1900-1910	10.6	11.8	0.12
1910-1930	11.8	17.5	0.29
1930-1940	17.5	20.0	0.25
1940-1950	20.0	28.0	0.80
1950-1960	28.0	38.7	1.07
1960-1970	38.7	47.1	0.84
1970-1990	47.1	63.4	0.82
1990-2000	63.4	67.3	0.39

[a] Urbanization rate is calculated on the basis of equation (2):

$(100\%)q = [\% \text{ urban in } t + 1 - \% \text{ urban in } t]/n$

where $(100\%)q$ is the annual urbanization rate.
Source: Calculations based on data from Table A-1.

Table A2-II
Mexico: Net Urban Growth,[a] 1900-2000

Year	Growth rate of total urban population (GRTUP)	Total population growth rate (TPGR)	Net urban growth (NUG) = (1) - (2)
	(1)	(2)	(3)
1900-1910	2.18	1.11	1.07
1910-1930	2.45	0.44	2.01
1930-1940	3.11	1.73	1.38
1940-1950	6.26	2.75	3.51
1950-1960	6.49	3.08	3.41
1960-1970	5.34	3.28	2.06
1970-1990	4.17	2.64	1.53
1990-2000	2.46	1.84	0.62

[a] Net urban growth calculated on the basis of equation (3):

$$NUG = \left[\ln\left(U_{t+n}\big/U_t \right) - \ln\left(T_{t+n}\big/T_t \right) \bigg/ n \right]$$

$$NUG_{(3)} = TCPUT_{(1)} - TCPT_{(2)}$$

Source: Calculations based on data from Table A-I.

Table A2-III
Mexico: Net Rural Growth,[a] 1900-2000

Year	Total rural population growth rate (TRPGR) (1)	Total population growth rate (TPGR) (2)	Net rural growth (NRG) = (1)-(2) (3)
1900-1910	0.95	1.11	–0.16
1910-1930	0.11	0.44	–0.33
1930-1940	1.41	1.73	–0.32
1940-1950	1.68	2.75	–1.07
1950-1960	1.43	3.08	–1.65
1960-1970	1.76	3.28	–1.52
1970-1990	0.78	2.64	–1.86
1990-2000	0.68	1.84	–1.16

[a] The urban population in equation (3) was replaced by the rural population to calculate net rural growth

$$NRG = \left[\ln\left(R_{t+n}/Rt \right) - \ln\left(T_{t+n}/Tt \right) \Big/ n \right]$$

$$NRG_{(3)} = TCPRT_{(1)} - TCPT_{(2)}$$

Source: Calculations based on data from Table A-I.

Table A2-IV
Mexico: Rate of Change of Urban-Rural Ratio, [a] 1900-2000

Year	Net urban growth (NUG) (1)	Net rural growth (NRG) (2)	Rate of change of urban-rural ratio [RC(UR-R)] = (1)-(2) (3)
1900-1910	1.07	−0.16	1.23
1910-1930	2.01	−0.33	2.34
1930-1940	1.38	−0.32	1.70
1940-1950	3.51	−1.07	4.58
1950-1960	3.41	−1.65	5.06
1960-1970	2.06	−1.52	3.58
1970-1990	1.53	−1.86	3.39
1990-2000	0.62	−1.16	1.78

[a] Rate of change of urban-rural ratio calculated on the basis of equation (7) or (9):

$$[RC(U-R)] = \ln\left[\left(U_{t+n}\Big/R_{t+n}\right)\Big/\left(Ut/Rt\right)\right]\Big/ n$$

or

$$[RC(U-R)]_{(3)} = (NUG)_{(1)} - (NRG)_{(2)}$$

Source: Calculations based on data from Table A-I.

Table A2-V
United States: Urbanization Rate,[a] 1790-1980

Year	Degree of urbanization		Urbanization rate (2)-(1)/n (3)
	Ut (1)	Ut+1 (2)	
1790-1800	2.8	3.4	0.06
1800-1810	3.4	4.7	0.13
1810-1820	4.7	4.6	−0.01
1820-1830	4.6	6.0	0.14
1830-1840	6.0	7.9	0.19
1840-1850	7.9	11.3	0.34
1850-1860	11.3	14.8	0.35
1860-1870	14.8	19.6	0.48
1870-1880	19.6	21.5	0.19
1880-1890	21.5	27.7	0.62
1890-1900	27.7	31.6	0.39
1900-1910	31.6	37.0	0.54
1910-1920	37.0	42.3	0.53
1920-1930	42.3	47.5	0.52
1930-1940	47.5	47.6	0.01
1940-1950	47.6	49.0	0.14
1950-1960	49.0	54.3	0.53
1960-1970	54.3	55.3	0.10
1970-1980	55.3	56.8	0.15

[a] The urbanization rate is calculated on the basis of equation (2):

$$(100\%)q = [\% \text{ urban in } t + 1 - \% \text{ urban in } t]/n$$

where $(100\%)q$ is the annual urbanization rate.
Source: Calculations based on data from Table 3 of Williams (1983).

IV. THE EVOLUTION OF URBAN AND RURAL POVERTY IN MEXICO

*Araceli Damián**

1. INTRODUCTION

The economic development experienced during the period of import substitution led to a widespread improvement in living conditions, particularly in urban areas, which benefited from the industrialization process and most of the socio-economic investment (education, health, infrastructure, etc.). Despite the expiration of the import substitution model, the increase in public spending followed by the oil boom enabled the population's living standards to be maintained, to a certain extent. The debt crisis and the subsequent stabilization and adjustment programs led to a significant increase of poverty in the country. Various calculations confirm this: according to ECLAC, between 1977 and 1989, poverty rose from 39.5 to 47.8%; according to the World Bank it increased from 34 to 36%, and according to the calculations of Hernández-Laos-Boltvinik it climbed from 58 to 64% (Damián and Boltvinik, 2003: 523). Many of the policies implemented to offset the economic crisis significantly affected the advances achieved in combating poverty. Universal subsidies was abandoned and replaced by targeted subsidies. This particularly affected the urban population, which absorbed most of the benefits of universal subsidies (see Damián, 2002). Likewise, the prices of the goods and services produced by the government increased in an attempt to ensure

* Professor-researcher, Center for Demographic, Urban and Environmental Development Studies (CEDUA), El Colegio de México. E-mail: adamian@colmex.mx.

that they reflected their actual costs. Both policies led to an increase in the price of products such as tortilla, beans, milk and meat as well as water, transport, electricity and gasoline, affecting the population's level of consumption and contributing to the increase in poverty (see Damián, 2002).

During periods of economic crisis (and adjustment) urban poverty tends to increase more than rural poverty, since the urban population is more dependent on the income generated by labor, which was (and still is) subject to wage controls. Thus it is in this context that an enormous number of jobs (particularly the so-called formal ones) were lost during these periods (see Damián, 2002). Despite the unfavorable situation faced by the urban population, the main government policy for reducing poverty, implemented in 1997, focussed on combating extreme rural poverty.

The aim of this paper is to describe the evolution of overall poverty during the 1990s. The first part presents the methodologies for measurement used to measure the poverty figures referred to throughout the article, with a description of the evolution of poverty at the national level, followed by a section on urban-rural differences. In the third part, the extent of urban-rural poverty is presented by states and the main cities in Mexico. This will permit the identification of the states and cities with the most acute shortages. The fourth part questions the way in which resources are distributed to combat poverty, which has a strong rural bias, meaning that it tends to overlook urban settings.

2. METHODS FOR MEASURING POVERTY USED IN THE SERIES ANALYZED

a) The Poverty Line Method

The most commonly used method for identifying poverty in Mexico is the poverty line (PL). This is an indirect or potential method (since it determines whether or not a household is able to satisfy its basic needs, on the basis of its income, but not whether it actually satisfies them) which measures households' current income against a poverty line. Nearly always, although it does not have to be so, income and poverty lines are expressed in per

capita terms,[1] meaning that the poor are regarded as those living in households whose per capita income is lower than the PL expressed in the same terms. One of the main limitations of the PL method is that it assumes that the satisfaction of basic needs depends exclusively on households' current income or private consumption and fails to take into account other sources of welfare such as the household's accumulated patrimony (which in some cases includes its dwelling); access to free education, health and other services; free time and the time available for domestic chores and study, and knowledge and capabilities. Thus, in the PL method, a household may have certain unsatisfied needs (such as education, health and housing) yet not be regarded as poor if its income is above the poverty line (Boltvinik, 1999: 36).

The most frequently applied variant is that of the Normative Food Basket (NFB). This method has been used by ECLAC for the past two decades and was taken up (albeit with certain modifications) by the Technical Committee for Poverty Measurement, appointed by the Mexican government in 2002. The first stage of the method involves defining a basic food basket (list of foods and the amounts of each) to cover caloric requirements.[2] The cost of the NFB is considered, in the case of ECLAC, as the extreme PL (see ECLAC, 2001: 39)[3] whereas the Technical Committee calls it the PL1 and Sedesol dubbed it the food poverty line. In order to obtain the PL, the NFB is multiplied by a factor that should be defined, in principle, as the

[1] See Boltvinik and Marín (2003), which criticizes the consequences of proceeding in this way, by ignoring the differences in the costs of satisfying basic needs between people of different ages and sexes and the economies of scale that households achieve as they increase their number of members. The PL measurements presented in this article are calculated in per capita terms whereas the IPMM income component is calculated by equivalent adult.

[2] Although proteinic requirements are included, other essential nutrients are ignored. An exception to this rule was the NFB elaborated by Coplamar (1983), in which other essential nutrient requirements were included, such as Vitamin A, D, B12, thiamin, niacin, riboflavin, folic acid, ascorbic acid, iron and calcium.

[3] The cost of the ECLAC NFB was obtained on the basis of food prices in the metropolitan areas, on the assumption that these were 5% lower in the rest of the urban centers and 25% lower in rural areas (ECLAC, 1997: 26). Nevertheless, it is worth noting that there is no empirical evidence that this is so for Latin American countries. Nor is there any evidence that the differences in age structures between the two settings (assuming that there is a greater number of children in rural areas) justify this difference in costs.

inverse of Engel's observed coefficient or the proportion that food spending represents of the total spending of the households in a reference group.[4] Once again, ECLAC in principle chooses households able to meet their basic food needs as a group of reference, meaning that their spending on food is equal to or greater than the NFB. The proportion spent on food by households is not a constant over time. However, since 1979, for Latin American countries, including Mexico, ECLAC has used factor 2 for urban areas and factor 1.75 for rural areas, meaning that the procedure described is not actually used, which in turn leads to the underestimation of poverty. In Mexico, for example, following the criterion expressed, albeit not used, by ECLAC to choose the stratum of reference, and using the INEGI-ECLAC's cost of the NFB,[5] the inverse of Engel's coefficient for the reference strata was higher than the one established by this organization in the early 1990s. In 1992, it was 2.2 in urban areas, rising to 3.8 in the year 2000.[6] Meanwhile, whereas the urban PL for 1992 was underestimated by 11.3%, the PL for 2000 was underestimated by 40.5%. A similar situation has arisen in the rural setting.

The NFB method has also been criticized because of the instability of the Engel´s coefficient.[7] Moreover, this procedure does not establish norms for a household's other needs and, as Altimir notes (1979: 45), it is based on the assumption that "households above the minimum threshold of food are also above the minimum thresholds for other basic needs." However, this reasoning leads to a circular method of measuring poverty, since by assuming that those who meet their food requirements also meet their other needs, *one is assuming that the reference stratum is not poor,* in other words, one is assuming what one is trying to measure (see Boltvinik, 1990).

[4] This procedure is equivalent to defining the PL as the sum of the CNFB plus per capita expenditure observed in the reference group in the other headings.

[5] This NFB is used by the Technical Committee for Poverty Measurement (2002) to calculate poverty.

[6] Calculations based on the microdata from National Household Income and Expenditure Surveys (ENIGH).

[7] Aldi J. M. Hagenaars (1986: 21) notes that the PL is extremely sensitive to the exact value of the Engel´s coefficient used. Studies of the latter show that estimated values may vary considerably between the different surveys. Orshanksy found values of 0.25 and 0.33 in two surveys.

Moreover, the assumption is empirically false. Various studies have shown that certain households regarded as not poor by the PL are found to be poor when their condition of poverty is measured using the unsatisfied basic needs (UBN) method and, vice versa, not all the poor households according to the PL are poor due to unsatisfied basic needs. This has been proved for both developing and developed countries, where household income measurement is more reliable. These studies have found a weak link between income and deprivation (or UBN poverty) (see Boltvinik, 1990; Nolan and Whelan, 1996; and Damián, 2002).

For its poverty line 3, the Technical Committee for Measuring Poverty (2002) proposed a modified version of this variant, without refuting or discussing the criticisms of the NFB method. The modification meant that, instead of calculating the Engel´s coefficient on the basis of a reference group whose *per capita expenditure on food* (EF) was equal to the NFB, it chose one household whose *per capita income* (Y) was equal to the NFB. This assumes that households allocate all their income to raw food (Technical Committee, 2002: 98), which does not cover any of their needs, since they are not even able to cook their foods. Spending all one's income on food means having an Engel´s coefficient equal to 1. In fact, the Engel's coefficients of the poorest people, such as the households chosen by the Technical Committee as a reference group (decile 2 of the urban setting and decile 5 of the rural setting) precisely to calculate this coefficient, are 0.4 and 0.44 (meaning that they spend 40% and 44% of their total expenditure on food).[8]

With this method, instead of being those that satisfy their nutritional requirements, the urban and rural reference groups for calculating Engel's coefficient proved to be extremely poor groups, even by the Committee's own standards. These groups

[8] The Technical Committee admits the incongruence of its choice of reference group but fails to realize the consequences of this: "the reference household is one that has sufficient per capita income to satisfy nutritional norms, in other words, is has the necessary resources to purchase goods from the basket, yet without *satisfying any additional need. This is obviously a hypothetical condition...* We do not know whether the consumption strategy arranges goods in a hierarchical order, the only thing we know is that in restrictive situations, households *channel* resources *away* from food to meet other needs (Technical Committee, 2002: 98-99; italics added).

had a deficit in spending on food (the difference between their spending on food and the NFB) of nearly 60% in both urban and rural areas. By choosing poor reference groups, the Technical Committee overestimated Engel's coefficient and therefore underestimated the PL and the incidence of poverty. The Committee calculated factors of 2.5 and 2.3 for its PL3, meaning that the poverty lines were 52.17 pesos daily per person for urban areas and 34.91 pesos in rural settings. However, choosing the decile whose spending on food is slightly higher than the NFB,[9] as ECLAC establishes, meant that Engel's coefficient was 0.26 in urban settings and 0.36 in rural settings, as a result of which the factors for calculating the poverty line were 3.9 and 2.8 respectively, which would have yielded a PL of 84.73 pesos per person per day for urban areas and 45.53 pesos for rural areas. The decision taken by the committee led it to have a circular reasoning, since by choosing extremely poor households as reference groups, the parameters observed in poverty were converted into norms or desirable standards.[10]

The Technical Committee proposed another PL: the PL2, which resulted from considering expenditure on food, health, housing, clothing, transport and education (in the denominator, instead of the numerator, so that Engel's coefficient is calculated by dividing expenditure on food by the sub-total of household expenditure, which only covers the six sections mentioned). The government discredited and rejected the Committee's PL3 , and used the PL2 as its official line, which it called patrimony poverty, without offering any explanation. In this way, the government further reduced the PL, and therefore the satisfiers which it recognizes as necessary and to which all Mexicans are entitled.[11]

[9] In order to recalculate Engel's coefficient, the decile whose EF was closest to the NBF was located. The concept of EF also had to be corrected, since the Technical Committee includes gifts in this section, yet eliminates them from the concepts of total household income and expenditure.

[10] For a more complete criticism of the official method of measuring poverty, see Boltvinik and Damián (2003).

[11] On the basis of the methodology for calculating the PL2, the following have been excluded from Mexicans' rights: household repairs and extensions; all cleaning products, for both the household and personal grooming (brooms, detergent, soap, toothpaste, combs, haircuts, disposable diapers, sanitary towels); all household goods and domestic appliances (iron, blender, scrubbing boards, lamps, light bulbs, gas tank, gas heater, television, tape recorder or stereo, refrigerator); all

Another of the elements under discussion in the Technical Committee's methodological proposal, which is particularly important in the analysis of poverty by urban-rural settings, is the determination of the limits of human settlement size. The Committee used a threshold of 15,000 inhabitants to differentiate rural from urban settings. This has serious implications for the calculations of poverty levels, since the PL in rural areas represented only 67.2% of the urban PL in the year 2000. The Committee therefore compared the income of the population living in localities of between 2,500 and 15,000 inhabitants (13.7% of the total national population in the year 2000, according to the ENIGH) with a lower PL (i.e. the rural PL), than the one that would correspond to it if they had used the limit of 25,000 inhabitants, which is in fact used to identify the households that benefit from the government program Oportunidades (formerly known as Progresa). On the basis of the 1998 ENIGH, a profile was drawn of the needs of the poor by locality size and it was found that localities of 2,500 to 15,000 inhabitants were similar to larger localities, yet sharply different from those with fewer than 2,500 inhabitants (see Table 1). The equivalent incidence (HI)[12] of poverty according to the IPMM is 0.55 in localities with fewer than 25,000, drops sharply in the group between 2,500 and 14,999 (0.38) and is virtually the same in those from 15,000 to 99,999 (0.35). A similar situation occurs in UBN and income (Y), as borne out by the majority of separate NBO indicators (see Table 1).[13] On the

_____

furniture (tables, beds, cots, chairs, WC, kitchen cupboards); all linen (towels, sheets, pillows, curtains, blankets); needles, zips and hooks and eyes; all private vehicles (including bicycles and carts), books, magazines, cassettes and records; all cultural, sports and recreational events; toys and board games; sports articles; all forms of communication, including telephone, mail and telegraphs; all personal accessories (hats, caps, bags, belts); funerals and legal expenses (see Boltvinik and Damián, 2003).

[12] HI is the result of multiplying the incidence or proportion of poor, H, by the mean poverty gap (I): Boltvinik has called it equivalent incidence because H is standardized when multiplied by I. In the table, the values presented are always the result of multiplying the H of poverty according to the IPMM by the I of the concept of the respective column.

[13] The same happens when one compares the equivalent incidences by size of locality of the IPMM components on the basis of the sample from the 12th General Population and Housing Census 2000.

Table 1
Mexico: Equivalent Incidence (EI) of IPMM, Income (Y), Unsatisfied Basic Needs (UBN) and Various Components by Size of Locality, 1998 (Data Adjusted to CN)

IPMM Component/ Size of locality	IPMM	Y	UBN	LAHSS	LDG	QSLS	LOS	LS	EL
500,000 and more inhabitants	0.2019	0.1532	0.1454	0.2186	−0.0426	0.1590	0.2133	0.0635	0.0818
100,000 to 499,999	0.3028	0.2318	0.2417	0.3602	−0.0232	0.2480	0.2987	0.1496	0.1578
15,000 to 99,999	0.3528	0.2910	0.2956	0.4450	0.0239	0.3308	0.0254	0.2154	0.2184
2,500 to 14,999	0.3757	0.3278	0.2925	0.5013	0.0609	0.2385	−0.0072	0.2750	0.2544
Fewer than 2,500	0.5526	0.4987	0.4995	0.7430	0.3368	0.4248	0.1251	0.5975	0.4337
Total	0.3256	0.2731	0.2658	0.4056	0.0683	0.2483	0.1669	0.2359	0.2027

IPMM: Integrated Poverty Measurement Method; Y: Income; UBN: Unsatisfied Basic Needs; LAHSS: Lack of Access to Health Services and Social Security; LDG: Lack of Durable Goods; QSLS: Quantity and Standard of Living Spaces; LOS: Lack of Other Services; LS: Lack of Sanitary Services in Dwelling; EL: Educational Lag.

Source: Own calculations based on ENIGH 1998.

basis of this evidence, one can say that *the appropriate cut-off point for the analysis of poverty is that of localities with over and under 2,500 inhabitants*. Below is a description of the evolution of urban-rural poverty using IPMM and analyzing the changes in its various components.

b) The Integrated Method of Measuring Poverty

The Integrated Poverty Measurement Method (IPMM)[14] largely overcomes the limitations of the PL methods we have discussed and those of the UBN (which remains a partial method). Its measurement includes income, UBN and a crucial element, which is nearly always omitted: the time available for domestic chores, education and recreation (see Boltvinik, 1999, and Damián, 2003).

This method identifies the shortages associated with limitations on the six sources of well-being: *1)* current income (both monetary and non-monetary); *2)* rights of access to free (or subsidized) government services or goods; *3)* ownership or rights of use to assets that provide basic services (basic patrimony), and *4)* educational levels, capacities and capabilities, understood not as a means of obtaining income but rather as expressions of the capacity to understand and do; *5)* time available for education, recreation, rest and domestic chores, and *6)* ownership of non-basic assets and the household's capacity to assume debts.[15] The evolution of poverty according to the aforementioned methods is analyzed below.

3. EVOLUTION OF POVERTY IN MEXICO

In this section, the evolution of poverty between 1992 and 2000 is analyzed according to the three official poverty lines (food, capacities and patrimony); the Technical Committee's PL3; the Tech-

---

[14] See Boltvinik (1999).

[15] Although the empirical applications based on households' current income fail to take this source into account, if the current account is replaced by households' current private consumption, it is indirectly taken into account. In order to see how this method is calculated, see Boltvinik (1999), methodological appendix. For a discussion of the criticisms of the IPMM, see Boltvinik (2000).

nical Committee's corrected PL3[16] and the IPMM. The period cov-
ered provides data from before the passage of NAFTA and shows
the evolution of poverty since then (without establishing causal
relations), which includes a period of rapid growth in the United
States, not seen since the end of the Second World War. None of
these series is adjusted to national accounts.[17] Nationwide
(Graph 1), poverty is greater in 2000 than it was in 1992, accord-
ing to most of the calculations presented. At the same time, the
graph also shows that in all the series poverty peaked in 1996,
after which it began to decline.

On the basis of the series that measure poverty by income
(PL3, corrected PL3 and the official series) we can reach the follow-
ing conclusions: 1) that poverty identified in this way, whose limi-
tations we have seen earlier, increased in the 1990s despite the

---

[16] The committee's corrected PL3 is a calculation by Boltvinik and Damián
(2003) performed on the basis of the SPSS syntax by the Technical Committee ob-
tained from Sedesol's web site.

[17] It is common practice, when measuring poverty, to adjust the income re-
corded by household surveys to that reported by national accounts, due to house-
holds' underreporting of their income in surveys. This is the case of ECLAC and
other studies on poverty in Mexico (Lustig, Hernández-Laos, Boltvinik, Damián,
etc.). The Technical Committee, however, proposed a method without adjusting
to national accounts. Failure to adjust to national accounts hampers the analysis
of the evolution of poverty, particularly when changes are undertaken in the
methodologies for recording information, since income may increase as the qual-
ity of data gathering improves, rather than reflecting the actual situation. For
example, if poverty is calculated without adjusting between 1984 and 1989, when
the number of households surveyed by ENIGH grows by 200%, then one can con-
clude that poverty has declined despite the contraction of the economy. If we
adjust the evolution of poverty to national accounts, then its behavior will reflect
that of the economy, in other words, it will increase. There are obvious signs that
the 2000-2002 ENIGH are not comparable. Firstly, the size of the sample double
and the design of the questionnaire changes, particularly in the section where
income is recorded, where the number of questions increases from 36 to 48. More-
over, there in an increase in certain income headings over what other sources of
information report. For example, whereas the income from Procampo rose by
131% according to the ENIGH surveys, in the Appendix to the Tercer Informe de
Gobierno 2003, its budget fell by 2% in real terms. Income from grants received
from Oportunidades rose by 11% whereas data from the administration report an
increase of 59%. Likewise, income from remittances decline in the ENIGH surveys
when the Banco de México (Central Bank of Mexico) reports an increase of 50%.
At the same time, the ENIGH overestimates the number of employed persons by
60% in comparison with the data from the National Employment Survey for the
same period. This is why the evolution of poverty in 2002 has not been analyzed
since the data are not comparable.

Graph 1

Evolution of Poverty in Mexico According to IPMM, TC and the Official Measurement of Poverty for 1992-2000
(percentage of poor persons)

	1992	1994	1996	1998	2000
IPMM	75.3	75.8	81.9	80.3	79.8
PL3 CorrectedTC	64.1	63.1	79.8	76.5	77.8
PL3 TC	58.6	57.7	71.9	67.4	67.1
OPL Patrimonial	52.6	55.6	69.6	63.9	53.7
OPLG Capabilities	28.0	29.4	45.3	40.7	31.6
PLG Food	22.5	21.1	37.1	33.9	24.2
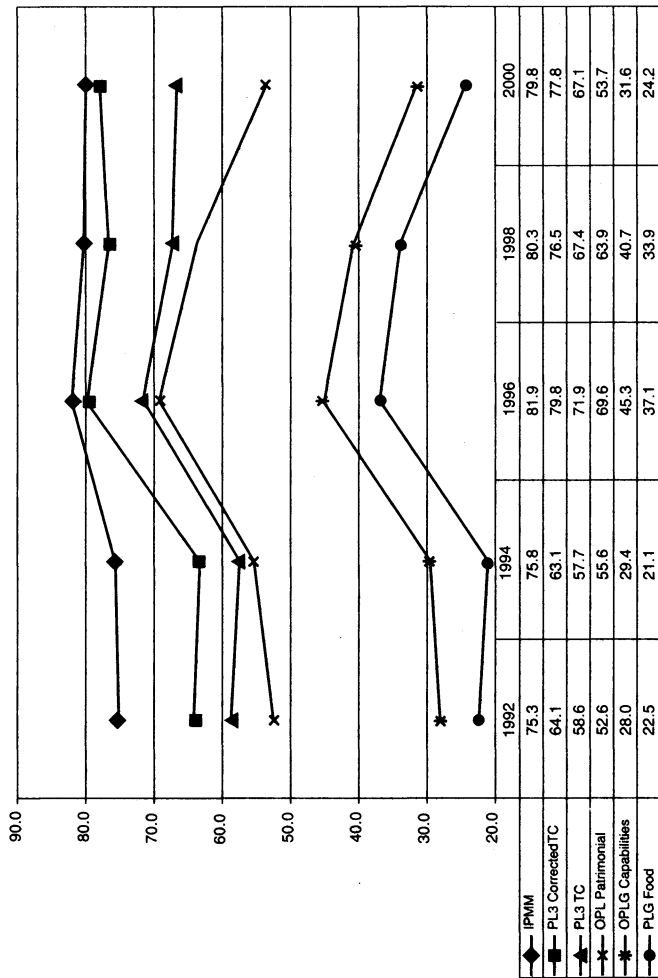
Sources: IPMM, PL3, Corrected LP3 CT, and PL3 CT; own calculations based on ENIGHS; OPLS (Patrimony, Capacities and Food); Cortés *et al.* (2002, Table 2, p. 15).

rapid growth the economy experienced after 1996, and 2) that the increase in poverty experienced during the 1994 crisis has not been reversed (except in the patrimony poverty series), since it increased by between 14 and 17 percentage points between 1994 and 1996 and decreased by between 10.1 and 13.4 points between 1996 and 2000.

For its part, the IPMM did not experience extreme fluctuations during crisis periods since it is a method that does not depend exclusively on income (or spending) but also includes indicators such as the UBN, which rarely deteriorates over short periods, and time. Nevertheless, according to this method, poverty reached 81.9% in 1996.

Given that the economy recovered rapidly between 1996 and 2000 (with a 4.2% growth rate of the GDP per capita annually) yet failed to recoup the losses suffered between 1994 and 1996 in terms of poverty, the current development model can be said to have severe limitations on enabling its benefits to trickle down to those below. On the basis of these conclusions and what was observed in the 1980s, i.e. a sharp increase in poverty (see Boltvinik and Damián, 2001), one can say that despite the widely acclaimed benefits of globalization, the increase in poverty caused by the crisis was not offset during periods of growth, meaning that poverty has followed an upward trend.

As for the absolute number of poor, in the year 2000 the government acknowledged 52.5 million,[18] refusing to acknowledge the 7.8 million identified by the Technical Committee (PL3, TC), a figure that rises to 15.3 million with the corrected PL3 and to 24.4 million according to the IPMM (see Table 2). At the same time, depending on the calculation with which it is compared, the increase in the number of poor during the 1990s exceeded the total population growth. The total population increased by 13.6 million between 1992 and 2000 (from 84.1 to 97.7 million, according to the ENIGH), while the increase in the number of poor according to the Technical Committee's corrected PL3 was 13.9 million. The number of nutritionally poor rose by 4.7 million, accounting for

[18] This figure is calculated on the basis of the national population estimated in the 2000 ENIGH, which was 97.7 million. According to Conapo, however, that year there were approximately 100 million Mexicans, meaning that, if Conapo is right, the number of poor would be approximately 53.7 million.

Table 2
Total Poor According to IPMM,- Corrected PL3, TC, ST, LP3 TC
and Official PLS, 1992-2000
(million persons)

	1992	1994	1996	1998	2000	Increase
Total population	84.05	89.37	92.59	95.27	97.65	13.6
IPMM	63.71	67.72	75.81	76.54	76.87	13.16
Corrected PL3 TC*	53.84	56.39	73.92	72.92	67.76	13.9
PL3 CT*	49.29	51.53	66.56	64.23	60.27	11.0
OPL Patrimony*	44.22	49.66	64.46	60.60	52.51	8.3
OPL Capabilities*	23.53	26.25	41.94	38.76	31.11	7.6
OPL Food*	18.96	18.88	34.33	32.28	23.69	4.7

*Without changing expenditure on food (except presents), without correcting cost of CAN or changing size threshold.
   Sources: IPMM, corrected PL3 CT; own calculations based on ENIGH; official PLS; own estimates of total population based on percentages calculated by Cortés *et al.* (2002, Table 2, p. 15).

34.6% of the total population increase. The Technical Committee's PL3 calculations showed an increase of 11 million; the IPMM showed an increase of 13.16 million while the number of patrimonial poor rose by 8.3 million, between 1992 and 2000. These figures show that the increase in the number of poor accounts for 60% of the whole increase in the total population if the patrimony poverty line is used (i.e. the official PL) and over 100% if the Technical Committee's corrected PL3 is utilized.

a) Analysis of IPMM Components at the National Level

Calculating the IPMM included other sources of well-being that show changes in the quality of life that cannot be determined when poverty is measured exclusively on the basis of income. Graph 2 shows the percentage of poor according to the IPMM and its three dimensions (UBN, income and time) at the national level (without adjusting to national accounts). Although the percentage of poor increased slightly between 1992 and 2000 (75.3% and 79.8%), the various components of the IPMM behaved differently. Income-based

Graph 2

Evolution of Incidence of Poverty by IPMM Dimensions, 1992, 1994, 1996, 1998 and 2000
(percentage of poor persons)

	1992	1994	1996	1998	2000
IPMM	75.3	75.8	81.9	80.3	79.8
PL	58.5	64.2	74.7	72.9	71.7
UBN	77.7	72.4	72.2	70.3	69.4
TP	48.3	44.5	46.3	48.2	46.6
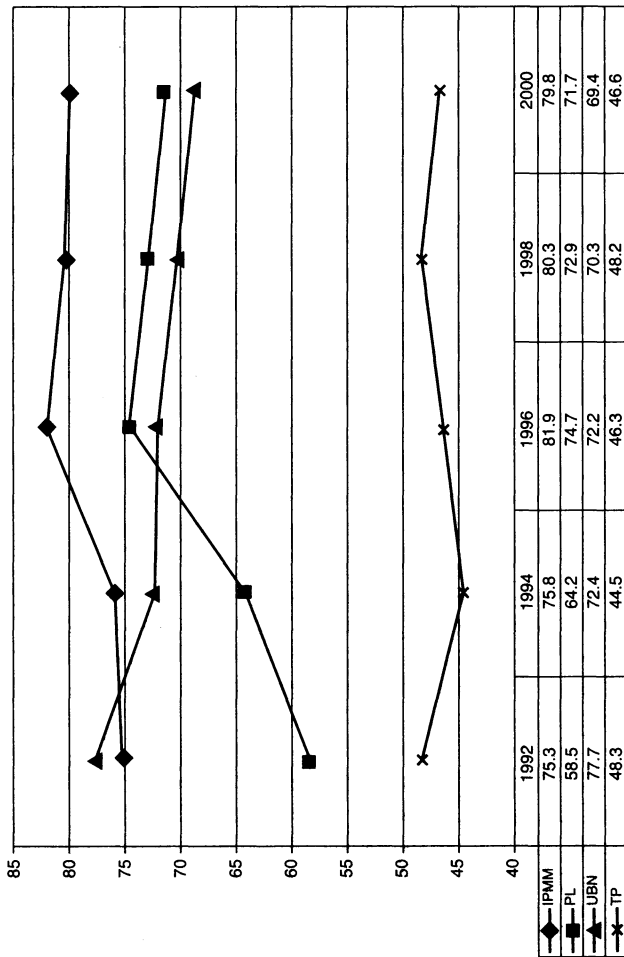
Source: Own calculations based on ENIGH.

poverty rose 13.2 percentage points between 1992 and 2000 (from 58.5% to 71.7%), while time poverty (TP) and UBN poverty fell (from 48.3% to 46.6% and from 77.7% to 69.4% respectively).

The income dimension of the IPMM is extremely susceptible to changes in economic growth, while the UBN aspect tends to decrease over time. This paradox can largely be explained by two factors: 1) The "stock" nature of most of the variables in the UBN indicators as opposed the nature of income flow. While flow variables can easily change their values, this is not true of stock variables, which can only experience slight changes. Thus, the current level of stock variables is largely determined by its level during the previous period. 2) A significant number of UBN indicators are determined by other sources of well-being which may move in the opposite direction to private income during periods of recession. This can be explained by the non-mercantile nature of a large number of goods and services (such as education, healthcare, water and drainage) (Boltvinik, 1998: 323). Even indicators such as the size and quality of dwellings, which are partially determined by income, have other determinants that are not related to this factor, such as access to legal possession of land, which, in the case of the poor population, is largely determined by the policies in force in cities and by family work in self-construction.

4. URBAN-RURAL POVERTY[19]

In terms of the differences by setting, poverty affects rural areas more than urban ones. In 2000, over half the rural population was classified as nutritionally (or extremely) poor, 85% were poor according to PL3, 87.1% according to the corrected PL3, while 94.9% were poor according to the IPMM. As for urban poverty, only 14.5%

[19] In keeping with the criticism at the beginning of this paper of using a threshold of 15,000 inhabitants to differentiate urban from rural settings, in this section I analyze poverty on the basis of a threshold of 2,500 inhabitants. However, it is worth noting that the only change made was to regroup the population in accordance with this threshold. The various PLS (by the TC and the government) have yet to be recalculated, since, due to the enormous differences in the CNBF between urban and rural settings, the change in the size threshold modifies Engel's coefficients, expansion factors and therefore poverty levels.

of the population were classified as food poor, while 57.6% were rated poor by the committee's PL3, a percentage that rises to nearly 75% with the corrected PL3 and falls to 73.2% according to the IPMM (see Table 3). As one can see, poverty rose significantly in urban settings. This may be due to the fact that Engel's coefficient varies more in this setting than in rural areas. The committee's method and therefore the official method obviously considerably under-estimate urban poverty.

It is important to note that as a result of the 1994 financial crisis, poverty has increased more among the urban than the rural population. These increases range from 7.9% according to the IPMM to 20.5% according to the corrected PL3 between 1994 and 2000. Rural poverty increased by between 1.9 % according to the IPMM and 11.4% among the food poor.

Despite the fact that the economy began to recover in 1996, food poverty in rural areas continued to increase until 1998 (to 57.5%). Likewise, in 2000, food poverty in urban settings rose 5.3% above the 1994 level and 12.8% in rural settings. In other words, extreme poverty increased more in rural settings, and failed to

Table 3
Evolution of Incidence of Urban-Rural Poverty (2,500 Threshold)
According to Food LP, LP3 TC, Corrected PL3 TC and IPMM,
1992, 1994, 1995, 1996, 1998 and 2000
(percentage of poor people)

	1992	1994	1996	1998	2000
Urban poverty					
PL food	20.3	9.8	23.4	19.3	14.5
PL3 TC	53.5	48.9	66.3	60.9	57.6
Corrected PL3 TC	58.6	56.1	76.6	71.6	74.7
IPMM	67.9	68.5	76.4	74.4	73.2
Rural poverty					
Food PL	50.9	40.0	51.4	57.5	52.8
PL3 PC	72.3	81.2	86.7	85.0	85.1
Corrected PL3 PC	78.4	81.9	88.3	89.9	87.1
IPMM	94.9	94.4	96.3	96.4	94.9

Source: Own calculations based on ENIGH.

decline during the period of economic growth. At other levels of income poverty (PL3 and corrected PL3), urban poverty was much higher than that observed in 1994, nearly 19% higher on the corrected PL3, while rural poverty increased to a lesser extent. By way of a conclusion, one can say that the deterioration of the urban population's income level affects broader sectors of the population, which failed to recover during the second decade of the 1990s.

In another paper, in which we analyzed the period from 1994 to 2000 (Boltvinik and Damián, 2001) we reached the following conclusions: 1) that the greatest number of poor and extremely poor live in urban areas, 2) that poverty mainly increased in urban areas, and 3) that the growth of poverty can primarily be explained by the increase in extreme poverty. The figures here confirm the rapid growth of poverty in the urban setting and of extreme poverty in the rural setting.

a) Evolution of Various Components of IPMM in Urban and Rural Settings

As for the evolution of poverty in other IPMM, in 1992, 48.6% of the urban population and 84.9% of the rural population was income poor. These percentages reached their historic maximums in 1996: 68.1% and 92.3% respectively, constituting an increase in urban poverty of nearly 20 percentage points and of rural poverty of just under 8 points. In 2000, income poverty fell to 64.4% and 93.2% respectively in each setting, with poverty levels at the end of the century exceeding 1992 levels (see Table 4). This shows that although rural zones were given monetary support from 1997 onward through Progresa-Oportunidades, the conditions of extreme poverty in which the population lived as a result of its income were more acute at the end of the decade.

Differences in UBN poverty were also more pronounced between the two settings. In rural areas, this type of poverty affected 97.2% of the population and 70.3% of the population in urban areas in 1992 (see Table 4). In both cases, this type of poverty fell during this period. However, it decreased more in the urban setting, as a result of which the differences were more pronounced (92.3% of poor people in rural settings as opposed to nearly two thirds in

Table 4
Evolution of Incidence of Poverty by IPMM Dimensions. Urban and
Rural (Size Threshold of 2,500 Inhabitants), 1992, 1994, 1996, 1998 and
2000 (percentage of poor persons)

	IPMM		PL		UBN		Time poverty	
Year	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
1992	67.9	94.9	48.6	84.9	70.3	97.2	45.1	56.8
1994	68.6	95.4	54.9	89.7	64.1	95.0	41.0	53.7
1996	76.5	96.3	68.1	92.3	63.7	94.5	43.0	55.0
1998	74.4	96.4	65.6	92.6	61.5	94.4	46.2	53.4
2000	73.2	94.9	64.4	93.2	60.3	92.3	45.5	49.6

Source: Own calculations based on ENIGH.

urban settings). At the same time, variations in the intensity of the shortages of the various UBN components reflect more substantial changes in the living conditions of urban than rural poor (see Table 5). For example, between 1992 and 2000, the educational lag among the poor in rural areas fell from 0.48 to 0.41 (a reduction of 15%), whereas in urban areas it fell from 0.24 to 0.16 (35% less). Health conditions did not substantially improve in rural areas either, since the intensity of this indicator fell from 0.67 to 0.61, whereas urban areas saw a decrease from 0.23 to 0.16. As for the shortage of durable goods, the urban poor are already above the norm with an indicator of success (negative shortage) of 0.12 whereas the rural poor have a gap of 0.27. It is worth noting that the indicator of access to health services and social security deteriorated in both cases and in similar proportions.[20] (For other components, see Table 5.) This shows, once again, the limited scope of the current

[20] The indicator for the lack of access to health services and social security is a mixed indicator. For the population with social security, this factor is what determines access. This is why the value of this indicator is determined, in these cases, by the UBN. For those without social security, given the deficiencies of the services for the general public, access depends basically on household income, which is why they calculate this indicator on the basis of income. This is the first explanation of the different behavior of the indicator. The second explanation is that, whereas other aspects of social welfare saw a sustained improvement in the 1990s, social security coverage reached a standstill (and in fact deteriorated between 1989 and 1995 after which it recovered). For an analysis of the evolution of living conditions between 1970 and 2000, see Boltvinik (2003).

Table 5

Poverty Gap Between UBN Components. Urban, Rural and National Figures, 1992 and 2000

(size threshold: 2,500 inhabitants)

Intensity/ Year and sphere	Lack of access to health services	Lack of quantity and quality of dwelling	Lack of durable goods	Lack of sanitary services	Lack of access to other services*	Educational lag
1992						
Urban	0.4874	0.564	0.0706	0.2265	0.2588	0.2422
Rural	0.8171	0.7007	0.4557	0.6696	0.2472	0.4815
Total	0.6012	0.6112	0.2035	0.3794	0.2548	0.3248
2000						
Urban	0.5250	0.4400	−0.1187	0.1558	0.1516	0.1582
Rural	0.8572	0.5802	0.2681	0.6114	0.0577	0.4100
Total	0.6214	0.4843	0.0035	0.2997	0.1220	0.2378

* Cooking fuel, electricity and telephone.
Source: Own calculations based on ENIGH.

program for combating poverty. The living conditions of the rural population have not been radically modified, and major shortages remain. Key forms of support to improve the population's living conditions have been ignored, particularly as regards the components of UBN (housing, sanitary conditions, etc.).

The time component behaves differently from the other two in the IPMM. Time poverty is measured by the index of excess working time (EWT). This index depends on the time spent on extra-domestic work by all the household members and on the demands of housework (which depend on the size of the household, the presence of children up to the age of ten, access to childcare services, the need to fetch water and the absence of labor saving devices, such as refrigerators, washing machines, blenders and motor vehicles). Likewise, it explicitly takes into account the time required for study, the presence of domestic workers and the number of people that can work domestically and/or extra-domestically. It implicitly recognizes the time required for personal grooming, eating and free time (see Boltvinik, 1999, and Damián, 2003). Time poverty may also vary due to various factors, including the improvement of indicators related to the conditions of domestic work (such as the acquisition of durable goods, the introduction of piped water, etc.). At the same time, this indicator may be affected by the incorporation of a greater number of women or other household members into the labor market or studies. This type of poverty fell during the period of analysis (from 48.3% in 1992 to 46.6% in 2000; see Graph 2) and affects the rural more than the urban population. Likewise, the reduction observed nationwide can largely be explained by the reduction of time poverty in rural areas (from 56.8% to 49.6%).

Time and income poverty are dynamically linked (Damián, 2002, 2003 and 2004). During periods of crisis, income-poor rather than time-poor households tend to increase. This evidence shows that despite the increase in the percentage of households with insufficient income to cover their needs, they have few or no possibilities of incorporating more labor into the job market in order to offset the drop in income.[21] The trend followed by time

---

[21] This evidence is reinforced by the fact that equivalent participation rates in the economically active population (in other words, standardized by the num-

poverty suggests that additional extra-domestic work does not have a positive link with income reduction, as some authors have thought, but with economic growth, since this permits job creation and therefore the incorporation of more labor.

Various forces determine the population's living conditions. As we have seen, although income poverty increases considerably during periods of crisis, other sources of income such as basic assets, access to public services or the availability of free time may have a different and even opposite tendency. An analysis of the various components of IPMM provides a better perspective on the changes in the population's living conditions, according to the different sources of welfare. Poverty measurements based solely on income provide a partial view of these changes. Denying the role played by other sources of welfare in the evolution of living conditions and poverty is tantamount to ignoring reality.

5. URBAN-RURAL POVERTY BY STATES AND IN CERTAIN CITIES IN MEXICO

As we have seen throughout this paper, although rural areas have a higher proportion of poverty, urban areas concentrate the greatest number of poor, a situation that tends to be exacerbated as urbanization continues. In 1992, there were 41.7 million urban poor, according to the IPMM, and 22 million rural poor, in other words, 65% of the total number of poor people lived in localities with 2,500 inhabitants. By the year 2000, the number of poor had risen to 53.3 in urban settings and 23.6 in rural settings, as a result of which 69.3% of the total number of poor people lived in urban localities. In other words, by this last year, poverty was even more concentrated in urban settings. However, the intensity of poverty (I), in other words, how poor the poor really are, is less in urban than in rural areas. Whereas in urban settings the intensity of poverty was 0.3939 in 1992, in rural settings it reached 0.6119.[22] The incidence of poverty also increases during periods of crisis,

---

ber of hours worked) calculated on the basis of employment surveys tend to decline during periods of crisis (see Damián, 2002, and 2004).

[22] Own calculations based on ENIGHS.

reaching a peak in 1996 (0.4450 and 0.6608 in urban and rural set-
tings respectively). In 2000, this indicator was higher in rural
settings (0.6180) and slightly lower in urban settings (0.3997) than
in the early 1990s.

A policy that seeks to distribute resources to combat poverty
according to the scope of the latter must not only consider the
differences in the total number of poor (Q) but also the intensity of
poverty (I). By multiplying these two indicators, we obtain what
Boltvinik has called equivalent poor (QI). In the year 2000, the
number of equivalent poor in urban areas was 19.2 million as
opposed to 14.4 in rural areas, meaning that 57.8% of equivalent
poverty was located in the former and 42.2% in the latter
(equivalent extreme poverty according to IPMM is slightly ruralized,
since 46.8% are located in urban areas and 53.2% in rural areas).
This section presents an analysis of equivalent incidence and
poverty of the urban-rural zones by states and of the main cities
in Mexico on the basis of the calculation of poverty obtained using
the sample of the 12th General Population and Housing Census,
2000. This will enable us to locate the states and cities requiring
the most resources to combat poverty.

Graph 3 shows a list of the urban and rural areas in the coun-
try by state, according to the scope of equivalent poverty. It shows
that the urban or rural areas of nine states (Federal District, Mexico
State conurbation, Veracruz, Jalisco, Puebla, Guanajuato,
Michoacán, Chiapas and Oaxaca) contain over 50% of the total
equivalent poverty in the country. At the same time, the urban
areas of twelve states or the rural areas of another seven are home
to approximately 30% of equivalent poor. Finally, the remaining
20% of the poor were located in twelve urban and twenty rural
areas in various Mexican states.

Although in terms of the volume of equivalent poverty states
with large urban concentrations (except for Nuevo León) led the
previous list, in the case of equivalent incidence (HI) the states
with major shortages in the rural setting are those with the high-
est indices (Graph 4). The rural areas with the highest HI incidence
of poverty are Chiapas, Guerrero, Oaxaca and Puebla, whose HI
value is over 0.7. The first urban conglomerate with the highest
HI of poverty is Chiapas, with a higher HI (0.56) than that of the

Graph 3
Urban and Rural Areas Arranged by Equivalent Poverty (QI), 2000

Source: Own calculations based on sample from XII General Population and Housing Census, 2000.

México, MCMZ
Federal District
Veracruz U
Jalisco U
Veracruz R
Puebla U
Chiapas R
Oaxaca R
Guanajuato U
Michoacán U
México U
Puebla R
Chiapas U
Guerrero R
Guerrero U
México R
Nuevo León U
Michoacán R
Tamaulipas U
Oaxaca U
Guanajuato R
Chihuahua U
Hidalgo R
Sinaloa U
Yucatán U
Coahuila U
San Luis Potosí R
Morelos U
Sonora U
Baja California U
San Luis Potosí U
Tabasco R
Tabasco U
Hidalgo U
Jalisco R
Durango U
Tlaxcala U
Zacatecas R
Querétaro U
Sinaloa R
Zacatecas U
Aguascalientes U
Chihuahua R
Quintana Roo U
Nayarit U
Durango R
Querétaro R
Campeche U
Yucatán R
Tamaulipas R
Colima U
Nayarit R
Sonora R
Campeche R
Nuevo León R
Quintana Roo R
Tlaxcala R
Morelos R
Baja California Sur U
Coahuila R
Aguascalientes R
Baja California Sur R
Colima R
Hidalgo MCMZ
Baja California R

0
500,000
1,000,000
1,500,000
2,000,000
2,500,000
3,000,000
3,500,000
4,000,000

Graph 4

Urban and Rural Zones by States Arranged by Equivalent Incidence (HI), 2000

State	
Chiapas R	
Guerrero R	
Oaxaca R	
Puebla R	
Yucatán R	
Veracruz R	
Quintana Roo R	
Campeche R	
San Luis Potosí R	
México R	
Tabasco R	
Guanajuato R	
Michoacán R	
Hidalgo R	
Durango R	
Tamaulipas R	
Querétaro R	
Tlaxcala R	
Morelos R	
Zacatecas R	
Nayarit R	
Chihuahua R	
Chiapas U	
Coahuila R	
Aguascalientes R	
Sinaloa R	
Nuevo León R	
Guerrero U	
Oaxaca U	
Jalisco R	
Coahuila R	
Sonora R	
Tlaxcala U	
Puebla U	
Yucatán U	
Veracruz U	
Michoacán U	
Morelos U	
Baja California Sur U	
Campeche U	
Tabasco U	
Hidalgo MCMZ	
Hidalgo U	
Zacatecas U	
México, MCMZ	
Guanajuato U	
Baja California R	
Nayarit U	
San Luis Potosí U	
Durango U	
Quintana Roo U	
Colima U	
Sinaloa U	
Jalisco U	
México U	
Querétaro U	
Aguascalientes U	
Tamaulipas U	
Sonora U	
Coahuila U	
Chihuahua U	
Federal District	
Baja California U	
Baja California U	
Nuevo León U	

Scale: 0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000, 0.8000

rural areas of Colima and Aguascalientes (0.55) among others. Guerrero (0.52) and Oaxaca (0.51) are in a similar situation, in other words, they have a higher urban HI than the rural HI of other states. Although urban areas dominate the second half of the list, rural areas such as those in Baja California Sur are in a better situation than the urban areas of Tlaxcala, Puebla, Yucatán, Veracruz, Michoacán and Morelos. Likewise, rural areas in Baja California have a lower equivalent incidence than the Mexico State conurbation (MSC), for example. Finally, the Federal District, together with urban areas of the two Baja Californias and Nuevo León, have the lowest equivalent incidence of poverty.

The conclusion one can draw from this analysis is that implementing a policy to combat poverty requires overcoming the implicit assumption that the division between urban and rural settings is all that is required to allocate resources. Policy design should emerge from a diagnosis of poverty that will enable one to determine the scope of the problem not only in terms of the proportion it represents in each place but also of the volume and intensity of the latter. The fact that programs to combat poverty ignored urban areas with vast shortages in Chiapas, Guerrero and Oaxaca was a major error on the part of the previous administration. As we shall see further on, however, the current administration has failed to solve this problem, since densely populated areas that are also home to a significant proportion of poverty, such as the MCMZ, for example, were excluded from Oportunidades until 2004. Let us now examine the poverty status of the country's main cities.

The 56 metropolitan cities with over 100,000[23] inhabitants contain nearly 42% of the country's equivalent poverty. Graph 5 shows that the arrangement of the main cities on the basis of their equivalent poverty is similar to that of its total population. Nevertheless, given that certain cities have enormous shortages, their total volume of equivalent poverty is greater than that of other larger cities. For example, Acapulco, which has the 14th largest population, has the 8th largest number of equivalent poor. The most dramatic case is Poza Rica, with the 30th largest total population and

---

[23] The delimitation of these metropolitan cities was taken from Gustavo Garza (2003, Methodological Appendix), who uses the term "metropolitan cities" to refer to cities comprising two or more municipalities.

Graph 5
Main Metropolitan Cities (56) in the Country. Equivalent Poverty (QI) 2000

City	
MSC	
Federal District	
Guadalajara	
Monterrey	
Puebla	
Toluca	
León	
Acapulco	
Juárez	
Torreón	
Mérida	
Tijuana	
Coatzacoalcos	
Cuernavaca	
Querétaro	
Culiacán	
Tuxtla	
Poza Rica*	
Aguascalientes	
Tampico	
Morelia	
Celaya	
Veracruz	
Villahermosa	
Irapuato*	
Durango*	
Xalapa*	
Saltillo	
Reynosa	
Hermosillo	
Oaxaca*	
Mexicali	
Cuautla*	
Orizaba*	
Chihuahua	
Cancún*	
Matamoros*	
Mazatlán*	
Uruapan*	
Los Mochis*	
Tepic*	
Ciudad Obregón*	
Ensenada*	
Córdoba*	
Tehuacán*	
Nuevo Laredo*	
Tlaxcala*	
Ciudad Victoria*	
Pachuca*	
Zamora*	
Monclova*	
Puerto Vallarta*	

Horizontal axis: 0, 500,000, 1,000,000, 1,500,000, 2,000,000, 2,500,000, 3,000,000, 3,500,000, 4,000,000

the 18th largest in terms of equivalent poor. The opposite is true of Chihuahua, the 16th largest in terms of population and 35th in terms of equivalent poverty.
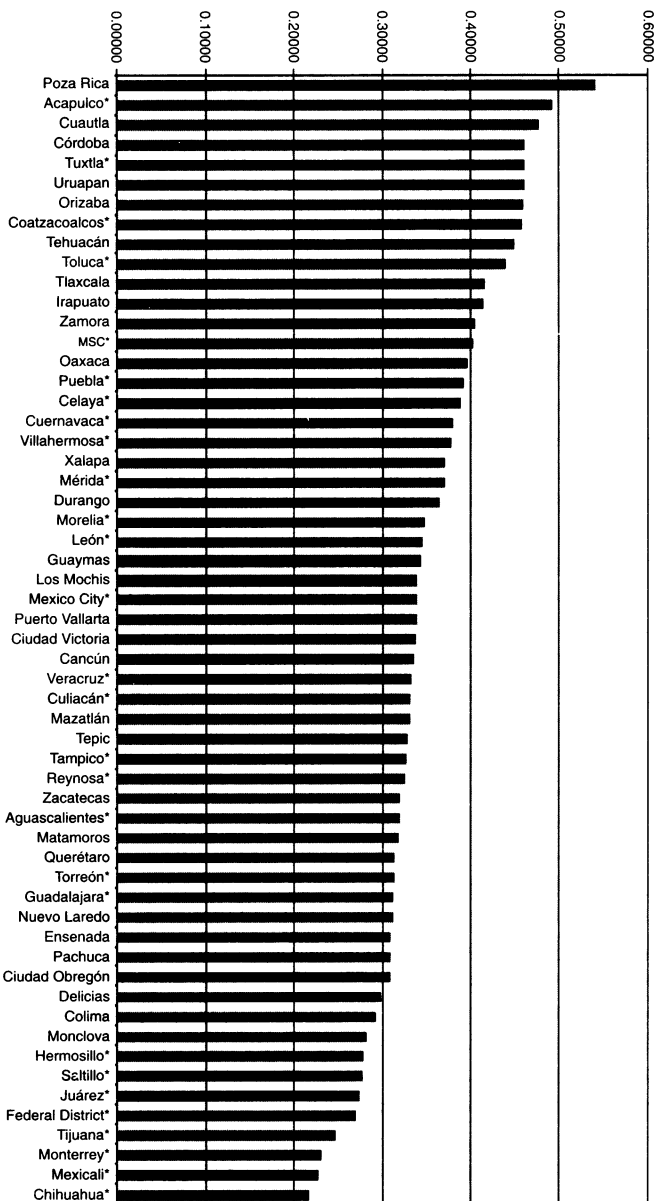
In Graph 6, the same cities are arranged in order of equiva-lent incidence, the cities with the greatest equivalent incidence being Poza Rica (0.5406) and Acapulco (0.4921).[24] At the opposite extreme of Monterrey, Mexicali and Chihuahua, with an equiva-lent incidence of just over 0.2, although the first has a population size of 3.2 million and the last a population of approximately 0.7 million, in other words, very similar to the size of Acapulco.

The graph also shows the enormous differences between the Mexico State conurbation and the Federal District. While the former has an equivalent incidence (0.4021) similar to that of cit-ies like Oaxaca (0.3958) and Puebla (0.3915), the Federal District (0.2696) is in the fifth best position, surpassed only by Monterrey (0.23), Tijuana (0.24), Mexicali (0.23) and Chihuahua (0.21).

In this section, we have been able to determine the areas in the country with the greatest shortages as well as the status of the main cities and metropolitan zones. Once these zones have been identified, it will be important to establish the shortages that re-quire the most attention. For example in both urban and rural zones, the greatest shortages are found in areas such as income and access to health services. Nevertheless, although education is a crucial component that must continue to be supported, the prob-lems that most severely affect the population after income and health are access to sanitary services (LS) in dwellings and hous-ing quality and size, drainage, etc. (SC) and housing quality and size (QSD), whereas in the rural sector, the former index (LS) has higher values than that of housing. However, since the opposite is true in urban settings, priorities should vary according to the setting (see Table 5). It is also important to consider the social struc-ture of the different settings, since this largely determines the pro-file and priorities to be dealt with. Thus, for example, in areas with a high degree of extreme poverty, such as, for example, the rural setting in Chiapas, funds aimed at combating poverty must consider all spheres of welfare (income, health, housing, health

[24] Cities with over 500,000 inhabitants are marked with an asterisk in the graph.

Graph 6

Main Metropolitan Cities (56) in the Country. Equivalent Incidence (H_I), 2000

| City | 0.00000 | 0.10000 | 0.20000 | 0.30000 | 0.40000 | 0.50000 | 0.60000 |

Poza Rica
Acapulco*
Cuautla
Córdoba
Tuxtla*
Uruapan
Orizaba
Coatzacoalcos*
Tehuacán
Toluca*
Tlaxcala
Irapuato
Zamora
MSC*
Oaxaca
Puebla*
Celaya*
Cuernavaca*
Villahermosa*
Xalapa
Mérida*
Durango
Morelia*
León*
Guaymas
Los Mochis
Mexico City*
Puerto Vallarta
Ciudad Victoria
Cancún
Veracruz*
Culiacán*
Mazatlán
Tepic
Tampico*
Reynosa*
Zacatecas
Aguascalientes*
Matamoros
Querétaro
Torreón*
Guadalajara*
Nuevo Laredo
Ensenada
Pachuca
Ciudad Obregón
Delicias
Colima
Monclova
Hermosillo*
Saltillo*
Juárez*
Federal District*
Tijuana*
Monterrey*
Mexicali*
Chihuahua*

services, drinking water and education), whereas in the case of the Federal District programs to support income, access to health and housing should take priority. Below is an analysis of the social structure of the country's urban and rural areas.

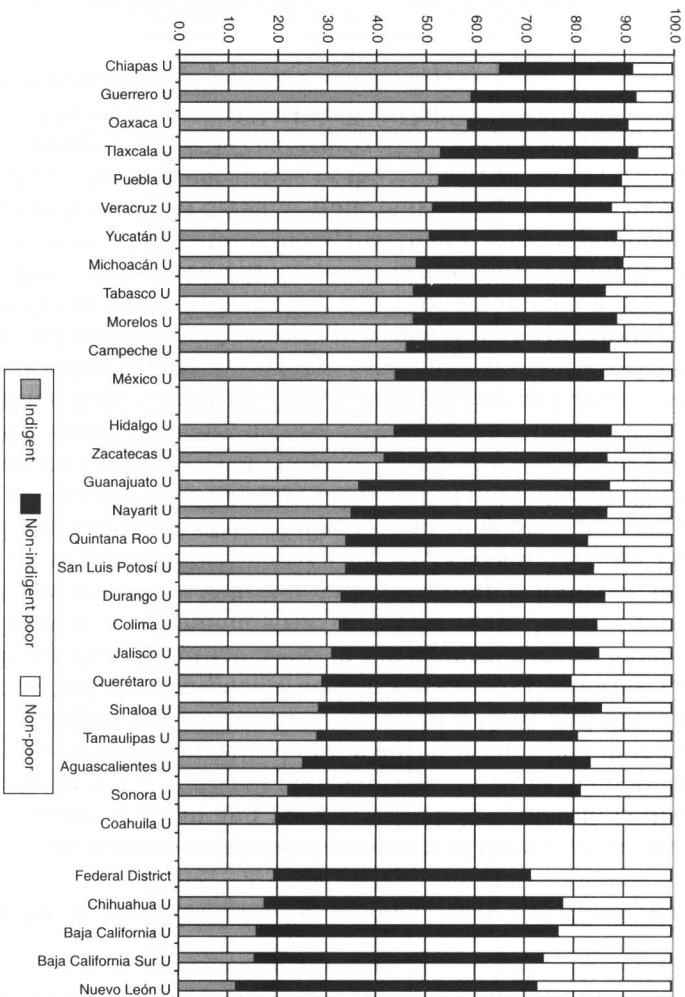## 6. Social Structure in the Country's Urban and Rural Areas

This section contains a brief description of the social structure of the country's urban and rural areas. The population is divided into three strata: indigent poor, corresponding to the population that meets less than a third of the norms established in the IPMM; non-indigent poor, who cover between a third and 99% of the norms, and the non-poor, who fulfill or exceed the norms. Graph 7 shows that the urban areas in the country's states have three different socio-economic structures. First of all, there is a group of states in which the largest population group is indigent, including the urban areas of Chiapas, Guerrero, Oaxaca, Tlaxcala, Puebla and another seven states.[25] The second conglomerate comprises the states where the majority are poor but not indigent. These include the urban areas of Hidalgo, Jalisco, Zacatecas and another twelve states.[26] Finally, there are five states (Federal District, Chihuahua, Baja California, Baja California Sur and Nuevo León) where indigent poverty accounts for a minority of their social structure and non-indigent poverty prevails, as in the previous group, with the non-poor constituting the second population group.

Rural areas have a different social structure (Graph 8), one of the most striking features being that their non-poor population is extremely small. At the same time, only two groups can be distinguished. The first, consisting of the majority of the rural areas on the country's states, is characterized by having an indigent majority. The rural areas of the two Baja Californias are the only ones where non-indigent poor are a majority.

---

[25] This group also includes Veracruz, Yucatán, Michoacán, Tabasco, Morelos, Campeche and Mexico State.

[26] Also included are Guanajuato, Nayarit, Quintana Roo, San Luis Potosí, Durango, Colima, Querétaro, Sinaloa, Tamaulipas, Aguascalientes, Sonora and Coahuila.

Graph 7
Social Structure of Country's Urban Zones by State, 2000

Legend:
- Indigent
- Non-indigent poor
- Non-poor

X-axis: 0.0, 10.0, 20.0, 30.0, 40.0, 50.0, 60.0, 70.0, 80.0, 90.0, 100.0

States:
Chiapas U
Guerrero U
Oaxaca U
Tlaxcala U
Puebla U
Veracruz U
Yucatán U
Michoacán U
Tabasco U
Morelos U
Campeche U
México U

Hidalgo U
Zacatecas U
Guanajuato U
Nayarit U
Quintana Roo U
San Luis Potosí U
Durango U
Colima U
Jalisco U
Querétaro U
Sinaloa U
Tamaulipas U
Aguascalientes U
Sonora U
Coahuila U

Federal District
Chihuahua U
Baja California U
Baja California Sur U
Nuevo León U

Graph 8
Social Structure of Country's Rural Zones by State, 2000

Legend: Indigent | Non-indigent poor | Non-poor

States (top to bottom): Baja California R, Baja California Sur R, Sonora R, Coahuila R, Nuevo León R, Sinaloa R, Colima R, Jalisco R, Aguascalientes R, Chihuahua R, Nayarit R, Tlaxcala R, Morelos R, Tamaulipas R, Querétaro R, Hidalgo R, Durango R, Zacatecas R, Guanajuato R, Tabasco R, México R, Michoacán R, Veracruz R, Campeche R, San Luis Potosí R, Quintana Roo R, Yucatán R, Puebla R, Oaxaca R, Guerrero R, Chiapas R

Axis: 100.0, 90.0, 80.0, 70.0, 60.0, 50.0, 40.0, 30.0, 20.0, 10.0, 0.0

Source: Own calculations based sample from *XII General Population and Housing Census, 2000.*

One conclusion of the analysis presented here is that, given the social profile of their population, both urban and rural settings require programs to combat poverty, albeit with different characteristics. A predominantly indigent population, such as that found in the urban settings of Chiapas or Oaxaca or the rural setting in virtually all the country, will have a wider range of shortages, meaning that the programs to combat poverty will have to be more complete or integral. Conversely, in areas where indigence is a secondary component, priorities will include more specific areas, such as income, health and housing.

7. DIFFERENCES BETWEEN URBAN AND RURAL SETTINGS AND THE FIGHT AGAINST POVERTY

The resources for combating poverty are mainly concentrated in the rural setting. In a previous study (Boltvinik and Damián, 2001), we criticized the miscalculation and the ecological fallacy on which Ernesto Zedillo's administration has based its decision to focus its policy for combating poverty virtually exclusively on rural settings.

The program to combat poverty during Zedillo´s administration was (and in fact is still partly) based on the premise that extreme poverty, conceived mainly as hunger, is a condition that prevents individuals from participating in the "market game." It is therefore the responsibility of the state (and virtually its only one in a world where the market does everything) to eliminate this type of poverty in order to enable all individuals to "play the market game." At the same time, on the basis of a miscalculation by Santiago Levy, who promoted Progresa (now known as Oportunidades), extreme poverty was said to be predominantly rural (for a more extended discussion, see Boltvinik and Damián, 2001). In 1996, a year before Progresa-Oportunidades was launched, and on the basis of the PL used by Santiago Levy (1994), the government decided that 62.8% of the poor lived in localities with fewer than 2,500 inhabitants whereas 37.2% lived in urban localities. In other words, according to the plan for combating poverty that focused on rural settings, 7.1 million urban poor

proved dispensable for the previous administration. It was not until 2001, in the face of widespread criticism of Progresa, that the current administration (2000-2006) decided to expand the program to urban areas.[27]

Nevertheless, coverage was (and still is) insufficient. In 2002 (and 2003) the percentage of urban families classified as food poor benefiting from Oportunidades accounted for 27% of the total, despite the fact that 47% of food (or extremely) poor households lived in urban settings. At the same time, a comparison of the number of families that benefited from Oportunidades and those living in poverty in both settings shows that in 2002, Oportunidades attended 3.09 million rural households, despite the fact that there were 2.07 million food poor households. Thus the program over-attended this setting by 49% (on the basis of government parameters). Conversely, in urban settings, 1.15 million families benefited from the program, thereby merely covering just 62.8% of the food poor (see Table 6).

Another flaw in the current system to combat poverty is the lack of congruence between the official method for measuring poverty and that used by Oportunidades. The current administration uses basically the same method as the previous one to identify households that benefit from Progresa (now Oportunidades). The universe identified by the program's method has very little to do with the one detected using the official method. First of all, Oportunidades chooses localities or Basic Geostatistical Area (AGEB) (rather than households when poverty is measured) with severe or extremely severe marginalization according to the Conapo index. This index is constructed on the basis of indices of shortages (illiteracy, dwellings without water, etc.) but excludes income, the only variable used in the official method for measuring poverty. Consequently, Oportunidades excludes poor households that do not live in severely or extremely severely marginalized localities, even if they are extremely or nutritionally poor. It also excludes the poorest households in the country, since in order for the selected areas to be included they must have (or be near) health services (clinics) and education facilities (primary and secondary school).

[27] Until 2004, oportunidades attended urban areas with between 2,500 and 1,000,000 inhabitants.

Table 6
Oportunidades Coverage of Food and Skills Poor Families, 2002
(by thousands of households)

Concept	Rural	Urban	Total
Absolute values			
Families benefited (2001-2002)*	2,524.5	713.2	3,237.7
Families benefited (2002-2003)*	3,090.8	1,149.2	4,240.0
Families that declared they received			
Oportunidades (2002)**	2,451.6	636.0	3,090.4
Food poor	2,068.5	1,830.3	3,899.4
Skills poor	2,602.8	2,590.0	5,192.8
Horizontal percentage			
Families benefited (2001-2002)*	78.0	22.0	100.0
Families benefited (2002-2003)*	72.9	27.1	100.0
Families that declared they received			
Oportunidades (2002)**	79.4	20.6	100.0
Food poor	53.0	47.0	100.0
Skills poor	50.1	49.9	100.0
Program Deficit/Surplus (2001-2 coverage)%			
Food poor	122.0	39.0	83.0
Skills poor	97.0	27.5	62.4
Program Deficit/Surplus (2002-3 coverage)%			
Food poor	149.4	62.8	108.7
Skills poor	118.7	44.4	81.7

*According to State of the Union Address.
**According to ENIGH 2002.
Sources: Coverage figures, *Tercer Informe Presidencial*, 2003, and own calcula-
tions based on report on official poverty measurement, Sedesol and ENIGH 2002.

At the same time, the household selection model in urban areas
has serious problems of exclusion. Incorporation modules are set up
in these areas to enable local residents to enroll in the program; they
are subsequently visited at home to determine whether or not they are
in fact eligible. According to the document used to evaluate the pro-
gram in urban areas, this method fails to identify 40% of the house-
holds that should be beneficiaries (Gutiérrez *et al.*, 2003). The docu-
ment notes that the other method for identifying households used in
rural areas, which consists of surveying the entire population that
lives in the localities selected, is more effective, since it identifies 79%

of households that should be benefited, but that the cost of incorporating new families is extremely high, which is why the evaluators do not recommend using it in urban settings.

In addition to all these filters, both rural and urban households that own a refrigerator, washing machine, car or have access to social security (IMSS, ISSSTE) are potentially eliminated from the program, since these variables have an extremely high weight in the selection process. For example, a refrigerator has a weight of 25% and over 46% of urban food poor households and 20% of rural food poor households have this basic equipment. Since urban areas have less of a shortage of durable goods, the likelihood of being excluded from the program is higher than it would be in rural areas.

The contradictions produced by using one method to identify households that are eligible to be beneficiaries and another to measure poverty are illustrated by analyzing the data from the 2002 National Household Income and Expenditure Survey (ENIGH). The number of households that benefited from Progresa-Oportunidades (3.1 million) is similar to that for 2001 (Fox Quesada, 2003). The distribution of the families that have benefited from the program is nearly 80% in rural zones and just over 20% in urban zones (see Table 6).[28] There is, for example, an enormous difference between the spatial location of food poor families: 53% in rural areas (2,500 inhabitants)[29] and the remaining urban families. Even more serious, though, is the fact that 61% of food poor families did not receive benefits from Oportunidades, while 40% of the beneficiaries are above the capacities poverty line, the line which, according to the government, would identify the universe of households that the program should deal with. Equally worrisome is the fact that 16.1% of the households that receive this support are above the patrimony poverty, in other words, they are not even

[28] Most of the new households incorporated into Oportunidades apparently receive their income from October of each year. Since the ENIGH is taken between August and November, it barely includes the new households that have benefited in 2002, as a result of which the data are compared with the administrative records of families that benefited in 2001.

[29] This is the delimitation established by Oportunidades, whereas the official method for measuring poverty regards localities with fewer than 15,000 inhabitants as rural, evincing yet another contradiction.

poor according to the official definition. As one can see, there is an enormous incoherence between the mechanism for fighting poverty and the official measurement of the latter. The incoherence in the spending of public resources should be a subject of national debate. If the government wishes to expand the coverage of this program, it should first correct the incongruence in its methods of identification.

8. FINAL REFLECTIONS

The evolution of poverty in Mexico is showing discouraging signs: the successes achieved during the import substitution period have been devastated by the countless crises experienced since the early 1980s. Despite the periods of economic recovery during the past decade (1990-1994 and 1996-2000), poverty declined much more slowly than the rate at which it grew during periods of crisis (for example, 1994-1996). In addition to this, the period from 2001 to 2002 has seen negative growth of GDP per capita, and the outlook for 2005 suggests that a rapid recuperation is unlikely, given the economic recession of 2003 in the United States and Europe and their slow recovery in 2004. The economic policy adopted by federal government is procyclical, meaning that the mechanisms used (such as the increase in currency in circulation by the Banco de México, which raised interest rates, reduced public spending and led to salary increases below the inflation rate) produced greater recession in 2003 and an even slower recovery in 2004. Consequently, more Mexicans will be plunged into poverty.[30]

At the same time, empirical evidence suggests that conditions of extreme poverty are shared by large groups of the population in both rural and urban settings. Not only has urban poverty been increasing more rapidly, but it is also the most vulnerable type of poverty during crises. These millions of Mexicans were once again faced with a new crisis (2000-2004).

---

[30] Official figures show a reduction in poverty despite the increase in unemployment and the underground economy and low economic growth between 2000 and 2004 (with an annual GDP per capita of 0.5%). An initial hypothesis might be that the constant changes in ENIGH since 2000 make comparison impossible.

The present administration has publicly recognized the rural bias of the programs to combat poverty. Among the measures oriented towards correcting this bias is incorporating Oportunidades (formerly known as Progresa) into urban zones. Reviewing the rural bias of the policy to combat poverty (without obtaining a rural bias) requires far more than the expansion of Oportunidades. It requires an in-depth review of economic and social policies. It is vital to remove the stigma from generalized subsidies. Without any debate on the subject, generalized subsidies were stigmatized and replaced by targeted support, without analyzing the problems of the latter.[31]

The struggle against urban and rural poverty requires a radical change in other economic policies. For example, salaries and the exchange rate should stop being used to anchor inflation and instead, salary policies should be designed to improve workers' welfare while the exchange policy should be oriented towards increasing the competitiveness of the Mexican economy.

9. REFERENCES

Altimir, Óscar (1979), *La dimensión de la pobreza en América Latina*, Santiago de Chile, Cuadernos de la CEPAL, No. 27.

Boltvinik, Julio (1990), *Pobreza y necesidades básicas. Conceptos y métodos de medición*, Caracas, Proyecto Regional para la Superación de la Pobreza (UNDP).

————— (1998), "Condiciones de vida y niveles de ingreso en México, 1970-95," in José Antonio Ibáñez Aguirre (coord.), *Deuda externa mexicana: ética, teoría, legislación e impacto social*, Instituto de Análisis y Propuestas Sociales, IAP, Universidad Iberoamericana/Plaza y Valdés Editores, pp. 251-395.

————— (1999), "Anexo metodológico," in Julio Boltvinik and Enrique Hernández-Laos, *Pobreza y distribución del ingreso en México*, Mexico, Siglo XXI Editores, pp. 313-350.

————— (2000), "Métodos de medición de la pobreza. Una evaluación crítica", *Socialis, Revista Latinoamericana de Política Social*, No. 2, May,

---

[31] See the articles on the problems and costs of targeted problems, by Amartya Sen, Andrea Cornia and Frances Stewart and Óscar Fresneda in *Comercio Exterior*, Vol. 42, April-June 2003.

Facultad de Ciencias Sociales (UBA), Facultad de Ciencias Políticas y Relaciones Internacionales (UNR) and Facultad Latinoamericana de Ciencias Sociales (Argentina Campus), Homo Sapiens Ediciones.

——— (2003), "Welfare, Inequality and Poverty in Mexico, 1970-2000," in Kevin Middlebrook and Eduardo Zepeda (eds.), *Confronting Development: Assessing Mexico's Economic and Social Policy Challenges*, Palo Alto, California, University of Stanford Press.

——— and Araceli Damián (2001), "La pobreza ignorada. Evolución y características," *Papeles de Población*, Year 7, No. 29, July-September, pp. 21-53.

——— (2003), "Las mediciones de pobreza y los derechos sociales en México," *Papeles de Población*, 2003, Year 9, No. 35, January-March, pp. 101-136.

——— and Alejandro Marín (2003), "La canasta normativa de satisfactores esenciales de la Coplamar. Génesis y desarrollos recientes," *Comercio Exterior*, Vol. 53, No. 5, May, pp. 473-484.

ECLAC [CEPAL] (1997), *Panorama social de América Latina 1997*, Comisión Económica para América Latina y el Caribe [Economic Comission for Latin America and the Caribbean], Santiago de Chile.

——— (2001), *Panorama social de América Latina 2001*, Comisión Económica para América Latina y el Caribe [Economic Comission for Latin America and the Caribbean], Santiago de Chile.

Coplamar (1983), *Macroeconomía de las necesidades esenciales en México, situación actual y perspectivas al año 2000*, Necesidades Esenciales en México series, Mexico, Siglo XXI Editores, second edition.

Cornia, Giovanni Andrea, and Frances Stewart (2003), "Subsidios alimentarios: dos errores de focalización," *Comercio Exterior*, Vol. 53, No. 6, June, pp. 563-573.

Cortés, Fernando *et al.* (2002), *Evolución y características de la pobreza en México en la última década del siglo xx*, Sedesol, Documento de Investigación 2.

Damián, Araceli (2002), *Cargando el ajuste: los pobres y el mercado de trabajo en México*, Mexico, El Colegio de México.

——— (2003), "La pobreza de tiempo. Una revisión metodológica," *Estudios Demográficos y Urbanos*, Vol. 18, No. 1 (52), pp. 127-162.

——— (2004), "El crecimiento del empleo y las estrategias laborales de sobrevivencia para un debate", *Perfiles Latinoamericanos*, No. 25, December, pp. 59-87.

——— and Julio Boltvinik (2003), "La evolución de la pobreza en México," in *Comercio Exterior*, Vol. 53, No. 6, June-August, 2003, pp. 519-531.

Fox Quesada, Vicente (2003), *Tercer Informe de Gobierno. Anexo estadístico*, Mexico, Presidencia de la República.

Fresneda, Óscar (2003), "El sistema de selección de beneficiarios y el régimen subsidiado de salud en Colombia," *Comercio Exterior*, Vol. 53, No. 6, June, pp. 574-586.

Garza, Gustavo (2003), *La urbanización de México en el siglo XX*, Mexico, El Colegio de México.

Gutiérrez *et al.* (2003), *Evaluación de la identificación de familias beneficiarias en el medio urbano*, Mexico, Instituto Nacional de Salud Pública.

Hagenaars Aldi, J. M. (1986), *The Perception of Poverty*, North-Holland, Amsterdam.

INEGI (various years), Data bases *Encuestas Nacionales de Ingreso y Gasto de los Hogares*.

——— (2002), Data base from sample of *XII Censo Nacional de Población y Vivienda*, 2000.

Levy, Santiago (1994), "La pobreza en México," in Félix Vélez (comp.), *La pobreza en México, causas y políticas para combatirla*, Mexico, El Trimestre Económico, No. 78, Lecturas, Instituto Tecnológico Autónomo de México (ITAM)/ Fondo de Cultura Económica, pp. 15-112.

Nolan, Brian, and Christopher T. Whelan (1996), *Resource Deprivation and Poverty*, Oxford, Clarendon Press.

Sen, Amartya (2003), "La economía política de la focalización," *Comercio Exterior*, Vol. 53, No. 6, June.

Technical Committee for Measuring Poverty (2002), *Medición de la pobreza. Variantes metodológicas y estimación preliminar*, Mexico, Comité Técnico para la Medición de la Pobreza, Secretaría de Desarrollo Social, July.

10. APPENDIX

Table A.1
Mexico: Urban and Rural Equivalent Poor (QI) by State, IPMM, 2000

State	Equivalent poor	State	Equivalent poor
MCMZ[1]	5,657,049	Jalisco R	478,199
México U[2]	4,236,705	Hidalgo U	465,911
ACEM[3]	3,378,350	Sinaloa R	428,233
Federal District U	2,278,699	Tabasco U	427,595
Veracruz R	1,944,708	Durango U	394,318
Veracruz U	1,811,907	Zacatecas R	377,243
Jalisco U	1,769,847	Tlaxcala U	370,453
Puebla U	1,633,593	Querétaro U	313,327
Chiapas R	1,404,558	Zacatecas U	286,637
Oaxaca R	1,381,928	Aguascalientes U	277,947
Guanajuato U	1,340,097	Chihuahua R	273,799
Michoacán U	1,156,974	Quintana Roo U	264,049
Puebla R	1,129,659	Querétaro R	251,452
México R	1,069,336	Tamaulipas R	233,131
Guerrero R	953,714	Durango R	225,747
Chiapas U	938,373	Campeche U	214,348
Guerrero U	920,389	Nayarit U	213,625
Michoacán R	870,792	Yucatán R	210,986
Nuevo León U	845,722	Nayarit R	190,845
Oaxaca U	779,727	Sonora R	175,702
Guanajuato R	762,643	Colima U	171,805
Tamaulipas U	757,423	Morelos R	135,931
Chihuahua U	708,825	Campeche R	134,996
Hidalgo R	699,042	Nuevo León R	126,827
Coahuila U	636,834	Tlaxcala R	107,279
San Luis Potosí R	629,478	Quintana Roo R	101,913
Yucatán U	625,629	Baja California Sur U	90,518
Baja California U	588,696	Coahuila R	75,949
Morelos U	573,255	Aguascalientes R	58,651
Tabasco R	560,845	Baja California Sur R	35,272
Sinaloa U	559,940	Colima R	34,207
Sonora U	557,300	Baja California R	7,857
San Luis Potosí U	505,863		

[1] MCMZ: Mexico City Metropolitan Zone, includes Federal District and municipalities in Mexico State conurbation.

[2] Mexico U: Does not include municipalities in conurbations.

[3] ACEM: Only includes municipalities in conurbation from Mexico State to Federal District.

U: Urban. R: Rural.

Source: Own calculations based on sample from *XII General Population and Housing Census*, INEGI.

Table A.2
Mexico: Equivalent Incidence (HI) in Urban-Rural Settings
by State, IPMM, 2000
(In descending order)

State	Equivalent poor	State	Equivalent poor
Chiapas R	0.7657	Yucatán U	0.4664
Guerrero R	0.7418	Veracruz U	0.4481
Oaxaca R	0.7313	Michoacán U	0.4480
Puebla R	0.7054	Baja California Sur R	0.4402
Veracruz R	0.6871	Campeche U	0.4397
Yucatán R	0.6844	Morelos U	0.4378
Campeche R	0.6786	Tabasco U	0.4240
San Luis Potosí R	0.6717	Hidalgo U	0.4226
Quintana Roo R	0.6563	Zacatecas U	0.4008
Tabasco R	0.6417	Guanajuato U	0.3918
Michoacán R	0.6360	Baja California R	0.3832
Guanajuato R	0.6272	México U	0.3772
Hidalgo R	0.6230	San Luis Potosí U	0.3749
Durango R	0.6064	Durango U	0.3701
Zacatecas R	0.6001	Quintana Roo U	0.3697
Querétaro R	0.5990	Nayarit U	0.3665
Tlaxcala R	0.5936	Colima U	0.3653
México R	0.5932	ACEM	0.3649
Tamaulipas R	0.5884	Jalisco U	0.3392
Nayarit R	0.5844	Sinaloa U	0.3344
Morelos R	0.5834	Aguascalientes U	0.3337
Chihuahua R	0.5759	Tamaulipas U	0.3244
Colima R	0.5480	Querétaro U	0.3217
Aguascalientes R	0.5480	MCMZ	0.3194
Chiapas U	0.5422	Sonora U	0.3047
Guerrero U	0.5218	Coahuila U	0.2980
Sinaloa R	0.5199	Chihuahua U	0.2775
Coahuila R	0.5139	Federal District U	0.2696
Oaxaca U	0.5135	Baja California Sur U	0.2679
Nuevo León R	0.5019	Baja California U	0.2501
Jalisco R	0.5011	Nuevo León U	0.2378
Sonora R	0.4878		
Tlaxcala U	0.4775		
Puebla U	0.4744		

[1] MCMZ: Mexico City Metropolitan Zone, includes Federal District and municipalities in Mexico State conurbation.

[2] Mexico U: does not include municipalities in conurbation.

[3] ACEM: Only includes municipalities in conurbation from Mexico State to Federal District.

U: Urban. R: Rural.

Source: Own calculations based on sample from *XII General Population and Housing Census*, INEGI.

Table A.3
Total No. of Poor, Incidence (H), Intensity (I), Equivalent Incidence (HI) and Equivalent Poor (QI),
56 Metropolitan Zones, IPMM, 2000

Metropolitan Zone	Poor (q)	Non-poor	Total	Incidence (H)	Intensity (I)	Equivalent poverty (HI)	Equivalent poor (QI)
MCMZ	13,975,525	3,801,150	17,776,675	0.7862	0.4314	0.3391	6,028,933
Guadalajara	2,969,024	628,156	3,597,180	0.8254	0.3785	0.3124	1,123,693
Monterrey	2,311,973	912,610	3,224,583	0.7170	0.3211	0.2302	742,417
Puebla	1,593,992	286,817	1,880,809	0.8475	0.4619	0.3915	736,293
Toluca	1,190,399	212,532	1,402,931	0.8485	0.5185	0.4399	617,210
León	1,094,846	178,427	1,273,273	0.8599	0.4006	0.3445	438,643
Tijuana	910,181	315,259	1,225,440	0.7427	0.3328	0.2471	302,863
Juárez	951,615	259,353	1,210,968	0.7858	0.3480	0.2734	331,115
Torreón	814,454	188,164	1,002,618	0.8123	0.3852	0.3129	313,723
San Luis Potosí	671,963	171,728	843,691	0.7965	0.3921	0.3123	263,477
Mérida	692,724	142,814	835,538	0.8291	0.4467	0.3703	309,428
Querétaro	600,459	179,714	780,173	0.7696	0.4073	0.3135	244,557
Mexicali	519,293	208,703	727,996	0.7133	0.3179	0.2268	165,108
Culiacán	603,735	129,265	733,000	0.8236	0.4032	0.3321	243,447
Aguascalientes	595,893	128,702	724,595	0.8224	0.3877	0.3188	231,034
Acapulco	658,103	57,292	715,395	0.9199	0.5350	0.4921	352,060
Chihuahua	465,721	205,469	671,190	0.6939	0.3129	0.2171	145,717
Cuernavaca	549,085	105,190	654,275	0.8392	0.4524	0.3796	248,384
Tampico	508,902	143,898	652,800	0.7796	0.4198	0.3273	213,644
Saltillo	500,057	133,167	633,224	0.7897	0.3512	0.2774	175,638

Morelia	503,425	111,348	614,773	0.8189	0.4241	0.3473	213,482
Coatzacoalcos	536,292	76,756	613,048	0.8748	0.5229	0.4574	280,435
Hermosillo	462,911	137,104	600,015	0.7715	0.3615	0.2789	167,329
Veracruz	461,387	128,234	589,621	0.7825	0.4257	0.3331	196,392
Reynosa	417,490	103,111	520,601	0.8019	0.4049	0.3247	169,040
Tuxtla	451,035	67,132	518,167	0.8704	0.5299	0.4613	239,009
Villa Hermosa	424,239	92,905	517,144	0.8203	0.4611	0.3783	195,631
Celaya	436,260	70,996	507,256	0.8600	0.4512	0.3880	196,835
Durango	406,918	79,010	485,928	0.8374	0.4359	0.3650	177,384
Xalapa	379,726	97,883	477,609	0.7951	0.4659	0.3704	176,897
Poza Rica	396,812	44,211	441,023	0.8998	0.6008	0.5406	238,398
Irapuato	387,394	51,134	438,528	0.8834	0.4692	0.4145	181,750
Cancún	330,944	86,255	417,199	0.7933	0.4239	0.3363	140,289
Oaxaca	353,579	67,219	420,798	0.8403	0.4710	0.3958	166,536
Matamoros	338,441	74,302	412,743	0.8200	0.3879	0.3181	131,275
Mazatlán	315,514	56,839	372,353	0.8474	0.3907	0.3310	123,258
Ensenada	272,926	74,055	346,981	0.7866	0.3934	0.3095	107,382
Los Mochis	304,461	48,272	352,733	0.8631	0.3930	0.3392	119,642
Ciudad Obregón	287,153	66,364	353,517	0.8123	0.3796	0.3083	109,004
Tepic	278,161	60,337	338,498	0.8218	0.3993	0.3281	111,065
Orizaba	282,113	38,718	320,831	0.8793	0.5220	0.4590	147,260
Cuautla	292,445	27,236	319,681	0.9148	0.5226	0.4781	152,827
Nuevo Laredo	247,674	59,046	306,720	0.8075	0.3853	0.3111	95,426
Monclova	238,758	62,837	301,595	0.7917	0.3556	0.2815	84,899
Pachuca	220,165	64,875	285,040	0.7724	0.3994	0.3085	87,935
Uruapan	238,265	24,103	262,368	0.9081	0.5074	0.4608	120,889
Ciudad Victoria	209,359	51,425	260,784	0.8028	0.4204	0.3375	88,012
Puerto Vallarta	208,779	39,301	248,080	0.8416	0.4028	0.3390	84,0977

Table A.3
(end)

Metropolitan Zone	Poor (q)	Non-poor	Total	Incidence (H)	Intensity (I)	Equivalent poverty (HI)	Equivalent poor (QI)
Zacatecas	179,379	50,911	230,290	0.7789	0.4099	0.3193	73,529
Tehuacán	206,781	17,896	224,677	0.9203	0.4875	0.4486	100,796
Tlaxcala	194,631	27,654	222,285	0.8756	0.4756	0.4165	92,573
Córdoba	194,736	27,308	222,044	0.8770	0.5262	0.4614	102,461
Zamora	186,624	26,667	213,291	0.8750	0.4633	0.4053	86,456
Colima	158,760	47,685	206,445	0.7690	0.3799	0.2922	60,314
Guaymas	153,524	24,233	177,757	0.8637	0.3981	0.3438	61,111
Delicias	125,069	30,522	155,591	0.8038	0.3713	0.2985	46,440

Source: Own calculations based on sample from XII *General Population and Housing Census, 2000*, INEGI.

Table A.4
Mexico: Social Structure, Rural Zones by State, IPMM, 2000

	Indigents	Non-indigent poor	Non-poor	Total
Chiapas	95.0	4.3	0.7	100.0
Guerrero	92.4	6.9	0.7	100.0
Oaxaca	92.0	7.1	0.9	100.0
Puebla	91.2	7.9	0.9	100.0
San Luis Potosí	87.7	11.3	1.0	100.0
Yucatán	87.4	11.9	0.6	100.0
Campeche	86.8	11.8	1.4	100.0
Veracruz	86.5	11.9	1.7	100.0
Quintana Roo	84.7	10.7	4.6	100.0
Guanajuato	83.1	15.5	1.4	100.0
Michoacán	82.8	15.6	1.6	100.0
Tabasco	82.6	15.8	1.5	100.0
National Total	81.8	16.3	1.9	100.0
Zacatecas	79.9	18.1	2.0	100.0
Durango	79.5	18.3	2.3	100.0
Hidalgo	78.8	18.9	2.3	100.0
Querétaro	76.7	21.8	1.4	100.0
México	75.1	22.3	2.6	100.0
Tamaulipas	74.3	23.1	2.6	100.0
Tlaxcala	74.2	23.5	2.2	100.0
Morelos	73.1	23.8	3.1	100.0
Nayarit	72.0	26.4	1.7	100.0
Chihuahua	69.4	27.1	3.6	100.0
Aguascalientes	69.0	29.2	1.8	100.0
Colima	66.0	31.1	2.9	100.0
Jalisco	63.9	30.9	5.2	100.0
Coahuila	59.7	37.5	2.7	100.0
Sinaloa	59.3	38.1	2.5	100.0
Nuevo León	55.7	38.9	5.4	100.0
Sonora	53.3	42.4	4.3	100.0
Baja California Sur	44.6	47.4	8.0	100.0
Baja California	26.3	67.2	6.5	100.0

Source: Own calculations based on sample from *XII General Population and Housing Census*, INEGI.

Table A.5
Mexico: Social Structure, Urban Zones by State, Mexico, IPMM, 2000
(percentages)

	Indigents	Non-indigent poor	Non-poor	Total
Chiapas	62.5	28.9	8.7	100.0
Guerrero	59.6	33.3	7.1	100.0
Oaxaca	58.3	32.5	9.1	100.0
Tlaxcala	52.8	39.9	7.4	100.0
Puebla	52.4	37.0	10.7	100.0
Yucatán	50.0	38.2	11.8	100.0
Veracruz	48.3	38.4	13.3	100.0
Michoacán	47.9	41.7	10.4	100.0
Morelos	46.5	41.6	11.9	100.0
Campeche	46.3	41.0	12.7	100.0
Tabasco	45.3	39.9	14.8	100.0
Hidalgo	43.4	44.2	12.3	100.0
Zacatecas	40.3	46.0	13.6	100.0
Guanajuato	36.5	51.2	12.3	100.0
México	34.7	50.6	14.6	100.0
Quintana Roo	34.1	49.2	16.7	100.0
San Luis Potosí	33.9	50.2	15.9	100.0
National Total	33.7	49.3	17.0	100.0
Durango	33.1	53.4	13.6	100.0
Nayarit	33.0	53.0	14.0	100.0
Colima	32.9	51.9	15.2	100.0
Jalisco	31.0	54.1	14.9	100.0
Tamaulipas	26.8	53.2	20.0	100.0
Querétaro	26.6	51.8	21.6	100.0
Sinaloa	25.5	58.5	16.1	100.0
Aguascalientes	25.4	58.1	16.5	100.0
Sonora	21.5	59.4	19.1	100.0
Coahuila	19.7	60.6	19.7	100.0
Federal District	19.6	51.7	28.7	100.0
Chihuahua	17.5	60.4	22.0	100.0
Baja California Sur	16.1	61.0	23.0	100.0
Baja California	15.7	58.3	25.9	100.0
Nuevo León	11.5	61.2	27.3	100.0

Source: Own calculations based on sample from *XII General Population and Housing Census*, INEGI.

V. SENIOR CITIZENS IN AN URBAN SPACE UNDERGOING A PROCESS OF REGENERATION. THE CASE OF MEXICO CITY'S HISTORIC CENTER

Clara E. Salazar*
Catherine Paquette**

1. INTRODUCTION

This research had two aims, the first being to approach a popula-tion group living in an urban space undergoing profound trans-formations and to observe how these are perceived by its inhabi-tants and how they affect their everyday lives. The second was to take the opportunity to contribute, from an interdisciplinary per-spective, to knowledge of the form and living conditions of an increasingly important sector of the population in Mexican cities: senior citizens. Although socio-demography has produced impor-tant research on the status (health, economic and social vulner-ability) of senior citizens, these studies do not usually consider the way they experience the city in their everyday activities. On the contrary, the contributions of urban studies on spaces undergo-ing transformation focus on the analysis of government policies and business or on the impact of urban actions on specific dimen-sions such as residential changes or the presence of new economic activities, without linking them to aspects of everyday life. The connection between the two dimensions mentioned contributes

* Professor-Researcher at the Center for Demographic, Urban and Environ-mental Studies (CEDUA) at El Colegio de México.
** Researcher at the French Institute of Research for Development (IRD, for-merly ORSTOM).

to knowledge of the practices and situations in senior citizens' lives as well as the effect of urban policies on the latter.

This paper presents some of the research results on the way senior citizens inhabiting Mexico City´s Historic Center use some of the conditions provided by this space to their advantage. These include the possibilities of low-rent accommodation, numerous urban facilities, such as low-cost shops, churches, squares and museums that can be reached on foot, access to jobs near their place of residence and several activities provided by a range of organizations to entertain senior citizens during their free time. These features are particularly important in the current context of Mexico City's Historic Center, which, like most of the Historic Centers in Latin American metropolises, is characterized by two distinct circumstances. On the one hand, it is inhabited by a sizable population of senior citizens, although they have lost many of their residents in recent decades, and are regarded as a vulnerable population (Historic Center Trust, 2000). On the other hand, it is currently being revitalized in order to promote tourist, financial and modern commercial activity, which in turn has transformed the places through which local inhabitants walk every day and constitute their living space.

We are particularly interested in linking some of the living conditions of senior citizens living in the Historic Center to the attributes of these spaces and the changes they are experiencing as a result of urban revitalization policies. We begin with the hypothesis that the Historic Center offers various socio-spatial conditions that may be used by senior citizens as a resource for mitigating the precariousness implied by access to limited social resources, income and the loss of mobility, and the fact that these conditions may be being altered by the revitalization of their living space.

Among the questions we ask are the following: What are the characteristics of senior citizens living in the Historic Center? What are their living spaces like and how are they involved in the changes being experienced by the Historic Center? How are these changes perceived and experienced by senior citizens? What consequences do these transformations have for the population in question? Does the Historic center constitute a resource for senior citizens?

In order to answer these questions, we interviewed senior citizens who participated in groups organized to support them. We also carried out a survey between May and July of 2003 (described below) on ninety senior citizens living in three sectors of the Historic Center, two of which have recently been renovated.

The results of this research are presented as follows. After a brief explanation of the concepts used and the methodological strategy employed, we provide a description of the actions employed to revitalize the Historic Center in order to show the spatial context inhabited by senior citizens. This is followed, immediately afterwards, by a description of the vulnerable conditions in which the senior citizens interviewed live, for which we offer a brief socio-demographic characterization, focussing particularly on their financial situation, the type of household to which they belong and their conditions of inhabitability, linking some of these aspects to the transformations that are taking place in the urban sphere. The fourth section analyzes the extent to which the Historic Center constitutes a symbolic and/or material resource for this population group. This is followed by some of the results on senior citizens' perception of the changes that are taking place in their living space. We should point out that, although we selected senior citizens who inhabit three sectors at various stages of urban transformation, the living conditions and perceptions of senior citizens did not always reflect marked differences by sector. We therefore performed a general analysis for all senior citizens and only distinguished them by sector when this was warranted by the results. Finally, we ended with the theme of the initial impacts of renovation on the everyday lives of the senior citizens interviewed.

2. THEORETICAL AND METHODOLOGICAL ASPECTS

a) Living Space: A Concept for Dealing With Every Aspect of Everyday Life

In order to achieve an in-depth approach to the everyday life of citizens inhabiting the Historic Center and, at the same time, to

distinguish the initial impact of the renovation of the place where they live, we decided to work on the basis of the concept of "living space" defined in several works on social geography as the *set of places in relation to an individual at a given point in his existence.* This concept enriches the characterization of an individual insofar as it not only links him to his place of residence but also to the set of places he frequents at a given moment. Thus, an individual's living space is the product of a set of factors of the moment, but also the heritage of the individual's past, his personal characteristics and family or professional influences.

The concept of *living space* has also been developed by French-speaking demographers to acquire a better understanding of the phenomena of spatial mobility, in order to go beyond the concept of migration. The origin of the concept contains a reflection on the shortcomings of the traditional, conventional approach to migration as a change of residence and therefore of a definition of migration based on a single criterion of residence. Although this study did not focus on the residential mobility of senior citizens, we felt it was useful to use the concept of living space "because it covers the portion of space where the individual performs his activities." This notion not only includes the place which he goes through and where he lives, but "all the other places to which he is linked" (Courgeau, 1988).

As one can see, the definition of *living space* can be very broad and may include all the places on which an individual has information. For this reason, we have decided to restrict the concept to *the specific areas of everyday life* where, "for each individual, the sphere of everyday life blends in with the area of spatial practices" (Di Méo, 1998). Thus, the principal components of the living space we explored in this study were the place of residence and the surrounding area, in other words, where senior citizens engaged in their everyday activities. As mentioned at the beginning, in the case of Mexico City's Historic Center, this space is undergoing changes in its urban shapes and as a social content. In addition to being an area of circulation, consumption, recreation and even work, it is also the subject of public actions, private intervention and the expression of social problems, such as lack of safety and crime, which are perceived and felt by senior citizens.

As a result of the above, we have linked three scales: the Historic Center as a territorial context of reference for the living space of local senior citizens; their place of residence, in other words, their dwelling, and an intermediate space between the two in the immediate surroundings of the dwelling, defined as the areas where senior citizens can walk about (not only for work, but also for shopping and recreational activities, etc.).

b) The Group Interviews, the Survey and the Contexts Inhabited by the Selected Senior Citizens

Since the main aim of the research was to find out about the living space of senior citizens and their transformations, we began by conducting a series of group interviews with adults that belong to three organizations devoted to supporting senior citizens in the Historic Center.[1] The groups interviewed consisted of five to eight elderly people and the interviews focused on the spatial and social practices of senior citizens in the Historic Center and their perception of this space (on the basis of map-drawing) and of its transformations due to the restoration work.

Subsequently, on the basis of the results of collective interviews, we took a survey of ninety senior citizens living in Mexico City's Historic Center. In addition to the questions in the group interviews, we gathered information on the places of residence of senior citizens, their socio-demographic characteristics, their residential history, the activities they engage in on an everyday basis and the networks of relationships to which they belong.

In order to find out about the living space of senior citizens, we selected those that were autonomous, in other words, those who were not physically unable to answer the questionnaire or move around on foot. In order to link their everyday practices to the transformations being experienced by this urban space, we show senior citizens from three sectors of the Historic Center (see Map 1). Two of them have been the object of major public renovation works in recent years, while the third has not experienced

[1] La Regional de Mujeres and two groups linked to the parish churches of Santo Domingo and Belisario Domínguez.

Map 1

Mexico City's Historic Center: Public/Private investment and Sectors for Senior Citizens

Antoine Varin-Lépinay/IRD, 2004

■ Buildings purchased by Carlos Slim (until May 2003). Source: Sedeco.
● Buildings purchased or remodeled by other investors in 2001-2002. Source: Sedeco.
◉ Alarm mechanism installed by GDF.
☐ Perimeter of intervention by Historic Center Trust.

☐ Survey Sectors   ⋯⋯ Perimeter A   ----- Perimeter B

urban renovation programs in the recent past The first two areas correspond to the basic geostatistical areas, AGEBs 074-8 and 075-2. The first is located in the Alameda sector located on the B Perimeter of the Historic Center, where there have been profound changes over the past two years, such as the construction of the Sheraton and Fiesta Inn hotels, the Centro Comercial Alameda, the renovation of the Alameda park and the establishment of tourist police. This sector is also the site of a major urban scheme, the Plaza Juárez Project, which will include dwellings, businesses, public areas and be the new site of the Foreign Affairs Secretariat, currently located in Tlatelolco. This AGEB will be inhabited by 138 senior citizens.

The 075-2 AGEB is located in the area between Tacuba and Cuba streets (between Eje Central and Del Carmen), which, according to the 2000 census, is inhabited by 189 senior citizens that account for 7% of its total population. This sector is partially included in the area that has seen most of the renovation work carried out by the Historic Center Trust between 2002 and 2003 (it even includes streets that were being renovated at the time of the survey), such as cleaning facades, the renovation of basic infrastructure and thoroughfares and the installation of urban infrastructure (Map 1).

The last sector corresponds to La Merced zone (AGEB 091-1), located in the far southeast of Perimeter A of the Historic Center. Of the AGEBs selected, this is the one furthest from the area where renovation work has been carried out, where the facades of the buildings have most severely deteriorated and where the presence of street vendors is most dense. According to the 2000 Census, this sector has a population of 5,690, 4% of whom (230) are aged 65 and over. In each AGEB, 30 senior citizens were interviewed, who had been selected on the basis of the data base of senior citizens that have benefited from the Senior Citizen Service Program, run by the Health Secretariat of the Federal District Government (GDF).

3. MEXICO CITY'S HISTORIC CENTER,
A PLACE UNDERGOING PROFOUND TRANSFORMATIONS

Over the past two decades, as has happened in several Latin American metropolises, Mexico City has witnessed a significant increase in public actions designed to restore its Historic Center. The main actions during the 1980s in Mexico City were largely identified with the restoration of buildings acknowledged as part of the historic heritage. The 1990s saw a major change in the concept of the recovery of this space, in which protection and appraisal of national heritage was relegated to the background and replaced by an emphasis on the restoration of urban space (Tomas, 2000). The policies for renovating centers that emerged at that time pursued an "integral" form of restoration that not only considered the traditional fields of town planning, but also the social, identity-based, cultural and economic aspects of downtown life, and attempted to include all the social actors involved in the problem (Rojas, 2002). In Mexico City, this type of restoration policy was carried out during the 1990s through various programs (such as *Échame una manita*, in the early 1990s) and culminated with the elaboration, in the year 2000, of a *Program for the Integral Development of the Historic Center* (Historic Center Trust, 2000).

Nevertheless, throughout the 1990s, numerous instances of specific investment failed to significantly improve urban surroundings, meaning that the urban setting continued to deteriorate. This dynamic included the growing invasion of public space by street vendors and other workers in the public thoroughfare, and the transformation of residential buildings into warehouses for storing the products distributed in fixed establishments which also doubled as overnight deposits for articles sold on the streets. Redlight districts, particularly in the north and east of the Historic Center, were also created or consolidated.

The year 2001 saw a new twist in the GDF's policy for restoring the Historic Center. From then onwards, the dynamics of restoring the Historic Center have undergone major changes. There has been an enormous amount of investment by the private business sector, which had failed to be consolidated in the 1990s. This marked presence of globalized capital is largely represented

by businessman Carlos Slim, who heads the new board of advisers for restoring the Historic Center as well as a foundation to promote its recovery and a real estate firm that purchases property in this sector.[2]

At the same time, joint investment by the private and public sectors (formalized by a collaboration agreement signed on August 2001 between the GDF, federal government and the private sector) is now exclusively focussed on a specific sector comprising 34 blocks and corresponding to the heart of the Historic Center (see Map 1), contrasting with what used to happen before, when restoration work covered the entire Historic Center. Thus, this area of 34 blocks is concentrating public investment in the improvement of basic and road infrastructure, urban image and safety on the streets. The aim is obviously to create a favorable environment for investment in tourist projects as well as middle-class dwellings and modern commercial and tertiary activities that will increase the value of the area (Historic Center Trust, 2003). In many respects, this new dynamic of restoring the Historic Center resembles what has been called "urban regeneration" (a process that is becoming increasingly important in the megalopolises) and described as "the fulfilled expression of emerging neo-liberalism" (Smith, 2003).

This last policy has already had visible effects on the land and the thirty-odd blocks that have been restored have been recognized by citizens in general as a fully restored urban area. In addition to the actions undertaken to improve the city's image, the streets are being transformed into major commercial areas with a large police force, where panic buttons and video cameras have been installed. Moreover, street vendors were evicted after the streets were renovated, leaving only a few unpaid workers (such as bootblacks) authorized by the GDF in the public area. In addition, new shops have been built, often belonging to international chains of stores targeting a young clientele, and fashionable small boutiques, cafés and restaurants have sprung up which are advertised locally. Although there has been no change in the type of residents so far, which forms part of the process known as

[2] See the article entitled "El Centro Histórico: propiedad privada," in *Proceso* magazine, October 5, 2003.

gentrification (Hiernaux-Nicolas, 2003), the restored portion of the Historic Center is undoubtedly undergoing enormous changes. Within this context, the impact of these transformations on the everyday lives of residents, particularly those who are most vulnerable, emerges as a key issue.

4. SENIOR CITIZENS IN THE HISTORIC CENTER: A VULNERABLE POPULATION

According to the 2000 Population and Housing Census, the Federal District has a total population of approximately 9 million inhabitants (8,605,239), 5.9% of whom are ages 65 or over. The *delegaciones* or boroughs with the highest percentage of senior citizens are Miguel Hidalgo (9.4%) and Cuauhtémoc (8.3%), where Mexico City's Historic Center is located. According to the marginalization index drawn up by the GDF Head Offices of Planning and Territorial Development, the territorial units[3] where Perimeter A of the Historic Center is located are mainly characterized by high and very high levels of marginalization: the senior citizens interviewed who live in the AGEBS selected, which we have called "Alameda" and "Tacuba/Cuba," are located at medium levels of marginalization, whereas those located in the La Merced area are characterized by a high level of marginalization (see Map 1).

Of the 90 senior citizens interviewed in the three sectors, 77% are aged between 65 and 79 while the rest are aged 80 or more; two thirds are women and a third are men. The degree of marginalization mentioned earlier coincides with the fact that the interviewees' financial status is complex. In the analysis of our sample, we found that 40% of senior citizens have monthly incomes of up to 1,999 pesos, while another 30% have incomes of between 2,000 and 3,000 pesos, 17% have incomes of between 3,000 and 5,000 pesos and only 10% have incomes of over 5,000 pesos a month. Senior citizens' incomes comprise various sources: the more formal resources come from subsidies, pensions and paid

[3] The territorial units in which the Historic Center is located are: 15-008-1, 15-009-1, 15-010-1 and 15-011-1.

work, while the more informal ones come from friends and relatives.

If we analyze the importance of these sources in the composition of their income (Table 1), we find a heavy dependence on the local government sector. The GDF Food Pension for Senior Citizens Over Seventy[4] constitutes a far more important financial contribution than that obtained from the family or any paid activity. This is not just because the pension constitutes a major part of the total income of the senior citizens interviewed, but also because it offers them a fixed income that translates into economic stability. According to our figures, this pension accounts for nearly half the total monthly income of a third of senior citizens, 25 to 49% of the total income of the next third and less than 25% of the total monthly income of the last third.

Within this context, family support in the form of cash is less important than the government's support: fewer than 4% of senior citizens receive financial support from their families, constituting 75% or more of their monthly income, while for 75% of senior citizens assistance from their families constitutes less than 25% of their total monthly income.[5] It is important to note that several of the senior citizens interviewed mentioned that the assistance they received from family members was not necessarily systematic: some of their children gave them money when "they remembered" or when "they could," while the amount they gave them depended on the conditions of their providers at the time. This type of financial support may be interrupted by job uncertainty or even by the provider's emotional state. Job loss or a quarrel with a senior citizen may lead to temporary distancing between the provider and receiver and the suspension of financial assistance for a set period. It is worth noting that the financial income considered merely includes money and excludes other forms of family support such as company or food. Although the incorporation of the latter would change the absence of family assistance depicted here, the situation described supports the view of the

[4] This is a monthly subsidy.

[5] It is worth noting that we have so far been unable to assess the value of non-monetary support. In some cases, rent may well be paid by one of the offspring or relatives of the senior citizen, which could be included in financial support.

Table 1
Share of Total Monthly Income, According to the Way it is Obtained

	Food pension (Senior Citizens' Grant)		Family support		Pensions		Paid work	
	Absolute	%	Absolute	%	Absolute	%	Absolute	%
No income from this source	7	7.8	53	58.9	47	52.2	69	76.7
Less than 25%	27	30.0	15	16.7	2	2.2	4	4.4
From 25% to 49%	30	33.3	11	12.2	11	12.2	9	10
From 50% to 74%	13	14.4	9	10.0	23	25.6	5	5.6
Over 75%	13	14.4	2	2.2	7	7.8	3	3.3
Total	90	100.0	90	100.0	90	100.0	90	100.0

dual nature of informal, financial support from relatives. At times, it may create a sensation of esteem and appreciation of the senior citizen, whereas at other times it may produce a feeling of instability, in which kinship is no guarantee in old age (Montes de Oca, 2002). This statement was borne out by the interviews we conducted with one of the groups that support senior citizens, called "Community Kitchen Inaugurated by the Women's Regional Organization." The interviewees noted that one of the main problems affecting senior citizens in the area is their abandonment by their families, and although they often still live with their relatives, they obtain very little financial assistance for personal expenses, which makes them feel misunderstood, with none of their own resources, and drives them into a state of depression.

The share of pensions in senior citizens' income is more dramatic than that registered in the family sphere. Although 75% of the senior citizens interviewed were engaged in paid employment during their active lives, a third of them do not receive any form of pension today. Pensions accounted for over 75% of the total monthly income of 9% of pensioners, and 25% of the total monthly income of 38% of senior citizens.

Within this context of financial instability, due to non-fixed incomes, it is hardly surprising that paid work constitutes a factor that complements the total monthly income of the senior citizens interviewed, even some of the oldest ones. Nearly a third of them were engaged in some form of paid employment (27 out of 90), with more men than women obtaining an income from this source (half the men worked). There was also a preponderance of self-employed workers (60%) together with a low proportion of other types of workers. As for the jobs involved, all the senior citizens were employed by the service and commercial sector, in occupations ranging from teachers, painters, concierges, cooks to various types of assistants and sales persons. Half of these activities were carried out in their own homes (14 out of 27 senior citizens work at home) while the remainder were distributed among fixed establishments and the public thoroughfare. It is interesting to note that five out of six senior citizens that work do so in the same neighborhood where they live, those that work outside the Historic Center being an exception. An analysis by sector of

senior citizens' workplaces shows that the Tacuba/Cuba zone has a higher proportion of working senior citizens than other sectors, although in general those who were working in the public thoroughfare at the time of the interview did so in temporary stalls in the streets adjacent to their residence.

An analysis of the type of household to which the senior citizens interviewed belonged (Table 2) showed that 21% lived on their own, 32% lived with someone else, usually a spouse or one of their offspring, while the remainder formed part of households with three or more members.

Households with three or more members usually comprised individuals with second — or third — degree blood links (such as nieces, sisters or aunts) and non-relatives. The formation of this type of households may be seen as a strategy for coping with the lack of financial resources or the deterioration of one's health, which assumes a form of reciprocity that does not always exist. When senior citizens realize they are losing mobility, they sometimes resort to nieces or other relatives for company or support in order to carry out their everyday activities, such as picking up their pensions or buying food and medicine. At other times, they share their dwelling with relatives from the same generation and a first degree of blood links. In the first case, they usually share their financial resources, although a number of senior citizens complained of the lack of respect and tolerance shown towards them by children. The second case is characterized by a greater degree of equity, with expenses and chores being shared by individuals of the same age depending on their financial possibilities and state of health.

As we observed in general in the dwellings (Table 3), senior citizens' living conditions are precarious. Although 71% of them live in apartment blocks, 22% live on rooftops or in tenement buildings, the insides of which are in a state of disrepair. Only 30% can be regarded as being in good condition, meaning that the remaining 70% are in a state of moderate to extreme disrepair. The state of deterioration of these buildings can partly be explained by the high proportion of adults that do not pay rent or pay low rents: 36 of the 90 senior citizens (40%) do not pay rent and only 10 of them own the dwellings they inhabit. Moreover, 9 senior

Table 2
Number of Persons Accompanying Senior Citizen
and Household Composition

Companions	Composition	Absolute	%
(Lives alone)		19	21.1
1		29	32.2
	Spouse and/or offspring	16	
	Other relative	8	
	Non-relative	5	
2		16	17.7
	Spouse and/or offspring	6	
	Spouse and/or offspring and other relative	7	
	Other relative	3	
3		11	12.2
	Spouse and/or offspring	2	
	Spouse and/or offspring and other relative	5	
	Spouse and/or offspring and non-relative	1	
	Other relative	2	
	Non-relative	1	
4		7	7.7
	Spouse and/or offspring and other relative	4	
	Spouse and/or offspring, other relative and non-relative	1	
	Other relative	1	
	Non-relative	1	
5		6	6.6
	Spouse and/or offspring and other relative	5	
	Other relative	1	
6		1	1.1
	Spouse and/or offspring and other relative	1	
7		1	1.1
	Spouse and/or offspring and other relative	1	

Source: Senior Citizens' Survey.

citizens pay rents of 1,500 pesos a month while another 18 pay rents of between 500 and 1,000 pesos a month; these 27 senior citizens account for another 30% of the interviewees. The lack of rent payment and the existence of rents regarded as low (although there is wide range of rents) also explains why senior citizens remain in the same dwellings for long periods of time.

Table 3
Ownership of Dwelling and Amount of Rent

	Absolute	%
Rented accommodation	61	67.7
Does not pay rent	7	
Up to 500 pesos	9	
501 to 1,000 pesos	18	
1,001 to 1,500 pesos	7	
1,501 to 2,000 pesos	10	
Over 2,000 pesos	10	
Own property but still paying for it	2	2.2
Fully owned	10	11.1
Lent by a relative	7	7.7
Takes care of someone else's property	8	8.8
Other	2	2.2
Total	90	100.0

The surveys analyzed report very little residential mobility: only 15% of the senior citizens interviewed said that they had spent fewer than 10 years of residence in the dwelling where they were interviewed, 50% said they had spent over 30 years in the same dwelling, while the remaining 35% said that they had spent between 10 and 30 years there. Given the high proportion of senior citizens that rent (69% of the interviewees), one might have expected greater residential mobility. The lack of residential mobility observed on the basis of the analysis of the surveys is contradicted, however, by other findings from the group interviews we conducted and comments by educators from the Health Secretariat that visit the homes of senior citizens who receive benefits from the Senior Citizens' Care Program. These sources of information indicate that certain senior citizens experience an enormous amount of residential mobility; the educators from the GDF Health Secretariat stated that senior citizens' residential mobility was one of the problems they faced in following up the latter: "when we go to look for them, we sometimes find that they do not live there anymore," they explained. These recent residential changes may be driven by the instability of senior citizens' income: some of the female senior citizens who lived alone and took

part in the group interviews said that they had changed residence when they had found a cheaper room and/or when they managed to share a larger space with another female senior citizen.

5. The Historic Center: A Material and Symbolic Resource for Senior Citizens

Although the living conditions provided by an area in a state of deterioration like the Historic Center are extremely precarious, an analysis of the open questions shows that living in the Historic Center also constitutes a valuable material and symbolic resource for senior citizens.

The Historic Center constitutes a material resource in several respects. Obtaining low rents enables senior citizens to inhabit an area with all the areas of everyday consumption that they use: work, shopping, squares, parks, gardens and the dozens of parish churches that are primarily responsible for the programs to support this sector of the population. They also have the advantage that the size and state of the streets enable them to walk everywhere feeling both safe and within easy reach of the places they need to go to. An analysis of the maps drawn during the group interviews with senior citizens show that the places where they can walk are limited by main roads which they cannot cross because they are dangerous: Eje Central, Eje I Oriente or Anillo de Circunvalación, Eje 1 Norte or Rayón, and they added that they found it useful not to have to use buses or microbuses because they fall down when they try to get on or when the buses drive off.

As we mentioned earlier, despite their age, many senior citizens are obliged to engage in a paid activity that enables them to obtain the resources they need for survival. The Historic Center undoubtedly enables them to work for a few hours or more as street vendors or to accept small jobs in their local neighborhood, which in turn provides a certain margin of physical safety and emotional stability, given that they are people with reduced mobility.

As far as shopping is concerned, it is important to note that since they do not have high levels of consumption, most senior

citizens obtain everything they need at lower prices than elsewhere in the city. They are more likely to frequent traditional markets such as La Lagunilla or San Juan, which are within easy walking distance, and to a lesser extent, the markets known as La Merced and Sonora, which are slightly more difficult to reach since they have to cross a main road or take the Metro. They can also walk to the places where they pay their electricity, water and phone bills, since all these utilities have offices located in the Historic Center, on Venustiano Carranza, Guerrero and República de Uruguay respectively.

At the same time, they have access to organizations that support senior citizens, many of which are linked to parish churches. By the year 2000, there were at least nine organizations to provide assistance to senior citizens (Historic Center Trust, 2000). A study of senior citizens in the La Merced sector revealed the importance of certain organizations. The Health Center in La Merced is much more than a place to receive medical care: senior citizens spend much of their day there and their social lives are closely linked to the center (Cantón y Mena, 1998). When we established contact with the organizations that provide support for senior citizens, we realized that they, too, are important spheres of socialization and everyday support. For example, the popular kitchen in the Regional Women's Center, on Argentina street, offers special rates for senior citizens through food donations and also enables them to participate in manual activities. Other organizations, such as the Santo Domingo and Caritas organizations, provide access to the center's cultural events and organize outings to other parts of the city, such as Chapultepec and Xochimilco or nearby spots such as Cuernavaca and the pyramids at Teotihuacan.

The Historic Center also constitutes a resource as regards the public spaces and places it offers. Despite senior citizens' physical limitations, a third of them enjoy strolling through places such as the Cathedral, the Palace of Fine Arts, the Alameda and the Zócalo and to a lesser extent, visit museums, parks and plazas, and attend free theater performances at weekends.

As a symbolic resource, the Historic Center is an area that is easily appropriated by part of the population that is also in a state of decay. The interviewees expressed their attachment to the place,

which is linked to the fact that most of them have spent most of their lives there: 32% of the interviewees said they had spent over 30 years living in the Historic Center, another 19% said they had lived there for between 15 and 29 years, while just 15% said that they had inhabited that part of the city for less than 10 years. The vast majority said that they would not like to live elsewhere in the city (fewer than 10% of the interviewees expressed a desire to move house). Although the interviewees sometimes spend the weekend with their offspring who live in different parts of the city, who have sometimes asked them to live with them, they explained that in the center they can move about on foot, whereas elsewhere they would have to wait for other people to take them around. They also pointed out that they are unfamiliar with other places and that they would not be able to reach the parish churches or markets on foot. The center allows them to be more independent, because it is a space with which they are familiar and to which they have a strong sense of attachment, which tends to be closely linked to the place where they live. Although the majority fel: that the neighborhood where they lived was the one in the worst state of deterioration in the city, two thirds of them also said that the place where they lived was the best place to live in the Historic Center and that they did not wish to change their place of residence. There, they already know their neighbors and although they do not always have close links with them, they do not feel unsafe. They feel that the time they have lived there and the fact that they are senior citizens who are easily identified by the locals, protects them from crime. They regard themselves as part of the landscape they walk through every day and feel safe that they will not be affected or attacked by criminals: "We know who they are and they know who we are," and "They even help us cross the street," remarked some of the senior citizens.

The high esteem in which senior citizens are held in the Historic Center is also linked to the area's historical and cultural heritage. In answer to the open question on the three things they liked most about the Historic Center, the interviewees mentioned specific places and monuments. The broad range of answers they gave reflected considerable knowledge of local buildings, spanning the colonial era to more recent constructions such as the Palace of Fine

Arts. The high value placed on the city's heritage is not surpris-
ing, since it is present in all the city's inhabitants (De Alba, 2002).
For the interviewees, however, heritage is more than an abstract
notion or social construction: the accurate, affective knowledge
they have of their cultural heritage was clearly reflected in the
collective or individual interviews as an appraisal of their living
space based on a specific everyday experience (both past and
present). In fact, living in an area declared a World Heritage Site
gave them a degree of status that contrasted strongly with the
status they were denied in everyday life which consisted of "mul-
tiple losses" (Cantón y Mena, 1998).

6. PERCEPTION OF TRANSFORMATIONS AND PROBLEMS OF THE HISTORIC CENTER AND THEIR INITIAL IMPACT ON THE RESTORATION OF EVERYDAY LIFE

Virtually all the senior citizens interviewed said that they were
unaware of the programs to restore the Historic Center during
the 1990s, perhaps because the changes they produced were less
evident than those achieved more recently. Conversely, they were
generally aware of the latest restoration efforts: 70% said that they
had heard about these actions or had seen the improvements in
the streets. Their awareness of these actions is partly due to the
fact that they have been broadcast on radio and television, but is
not only due to a widespread political discourse. There is a close
link between the degree of everyday mobility of senior citizens
and their knowledge of the restoration work; individuals with
greater mobility were more aware of the actions being undertaken.
If we examine the frequency with which the renovated streets were
mentioned, we find that they correspond exactly to those where
works were being carried out, which, in order of importance, in-
clude 16 de Septiembre, 5 de Mayo, Madero, Venustiano Carranza,
Tacuba and Donceles.

There are apparently no significant differences in the degree
of knowledge about the restoration work or the perception of
changes between adults living in the three different sectors. An
analysis of recent improvements of public spaces shows that adults

living in the La Merced area, where no recent restoration work has been carried out, did not hold different views from those who inhabited the Alameda and Tacuba areas, which have undergone the greatest transformation. Half the interviewees felt that the Historic Center was in better condition than it had been five years earlier, a quarter felt that it was worse while the remainder felt that it was the same and that nothing had changed.

Generally speaking, the interviewees had failed to appropriate the gains obtained through the improvement of public space. Those that recognized that these actions had been successful did not spontaneously mention that the new attributes of urban space had had a positive impact on their everyday day. The senior citizens interviewed found it difficult to identify specific improvements, such as pavements. However, when pressed about how they experienced these changes, they said that apart from the disturbances caused by the works, mentioned in the previous section, they regarded the recent actions as positive. They specified that the improvements to the streets and the relocation of street vendors out of the area had allowed them to walk more easily and not trip and that since they walk slowly, they need this space to be able to move safely.

It is worth noting that the senior citizens did not perceive any risk associated with the changes to the Historic Center. This point was dealt with directly in the group interviews. Questions were explicitly and repeatedly asked about whether they thought the urban reforms would increase their rents or whether they thought that the implementation of programs to restore old buildings would lead to evictions. Answers were negative, with interviewees refusing to speculate about this possibility.

The lack of perception of negative or positive impacts on the processes of urban regeneration is undoubtedly linked to the fact that there have been no major changes of this nature so far. Several questions in the interview were designed to detect these impacts in various ways. They had to do with moving house and the reasons why, rent increases and the surroundings of senior citizens and the occasional departures from the Historic Center by friends or neighbors. The answers obtained clearly showed that there have not yet been any significant changes in these areas.

When asked about the main problems of the Historic Center, street vendors were mentioned by 30%, crime by 24% and garbage by 16%. However, these problems did not suffice for them to devalue the area; they did not reject the Historic Center in itself but rather the use made of it by certain groups: street vendors were accused of leaving large amounts of rubbish, established shops were blamed for turning buildings into warehouses, while jewelers in particular were criticized for converting buildings without respecting them in any way. Thus, the interviewees directly linked some of the problems in the Historic Center to the way private owners altered the buildings that constitute what they regard as part of national heritage: this confirms the importance this space has for them as heritage.

Views on street vendors were ambivalent; two-thirds of the interviewees said that relocating street vendors to other parts of the city did not work, while 20% said that they disapproved of eviction. When the latter were asked about the possibility of relocating street vendors to other types of paid work, they supported work in the public thoroughfare as a source of income for many households. As for the lack of law and order and crime, as mentioned earlier, the interviewees did not feel seriously threatened. They said that these problems occurred throughout the city and that the main victims of crime in the Historic Center were visitors.

In contrast to the unwanted transformation of the Historic Center, senior citizens felt that "the only viable solution for this space was to repopulate it with a middle class that would look after it." The possibility of a young population coming downtown to inhabit buildings now used as warehouses was regarded as positive and as a means of revitalizing the Historic Center, and linked to the reduction of crime and an increase in law and order. Thus, they did not regard the arrival of new residents as a threat, nor were they worried about a possible increase in rents due to a change in the residential make-up.

As for what one might call a process of "commercial gentrification" (the emergence of new shops targeting a younger, wealthy public), this was not perceived as having an impact on the everyday life of senior citizens either. This may be linked to the fact that their consumer habits are concentrated virtually exclusively in

traditional markets (except for purchases with their GDF Senior Citizen cards, which force them to buy in supermarkets) and, as mentioned earlier, those shops where they have traditionally made their purchases have been maintained as part of the local infrastructure and continue to constitute spheres of everyday interaction that have not changed.

The greatest impact that emerged from the surveys and interviews concerns the fact that restoration work has prevented senior citizens from engaging in economic activities in the streets near their home (sale). Some senior citizens mentioned the fact that due to the road works, they had had to stop selling and had temporarily lost their means of income. Other said that they had moved to other streets but that this created instability since they could only do so when they found somewhere to put up their stalls.

7. FINAL CONSIDERATIONS

Despite the transformations undergone by the most highly valued sector of the Historic Center, the impact on the living space of a population regarded as vulnerable, such as senior citizens, is unclear. The effects, whether positive or negative, of the process of urban restoration on the dynamics of their everyday lives are limited, and do not appear to have affected this specific population so far. This is undoubtedly due to the extremely recent (not to say contemporary) nature of the restoration being undertaken.

Although the knowledge obtained from the surveys and group interviews on the impact of the process of urban restoration was difficult to gather, this was not the case of the knowledge of the close link between senior citizens and the series of material and symbolic resources provided by the Historic Center. The risks of an urban process aimed at modernizing a traditional space are obvious: the current trends in the restoration of the Historic Center as reflected in Mexico City may gradually restrict access to the material and symbolic resources of a population that has appropriated them despite its vulnerable conditions.

A major reflection derived from this work concerns the need to consolidate financial assistance, such as the Senior Citizen Care Program, for the population group in question, and to undertake studies on the surroundings and living areas of this population in order to maintain the conditions that will enable this group to remain in this specific area. This type of considerations is crucial in the context of an urban project such as the one involving the Historic Center, but also in the global framework of cities: senior citizens constitute an increasingly important group, which must be taken into account.

8. REFERENCES

Cantón y Mena, R. (1998), "...No por viejo, sino por pobre." Representaciones y prácticas en torno a las pérdidas materiales, sociales y de salud que se presentan durante el proceso de envejecimiento (casos de la Merced, D.F.), Mexico, CIESAS.

Coulomb, René (2000), "El Centro Histórico de la Ciudad de México," in Gustavo Garza (ed.), La Ciudad de México en el fin del segundo milenio, Mexico, El Colegio de México, pp. 530-537.

Courgeau, Daniel (1988), Méthodes de mesure de la mobilité spatiale, Paris, INED.

De Alba, Martha (2002), "Les représentations socio-spatiales de la ville de Mexico. Expérience urbaine, images collectives et médiatiques d'une métropole géante," doctoral dissertation in social psychology, Paris, École des Hautes Études en Sciences Sociales (EHESS).

Di Méo, Guy (1998), "De l'espace aux territoires," L'Information géographique, No. 3, pp. 99-110.

Hiernaux-Nicolas, Daniel (2003), "La réappropriation des quartiers de Mexico par les classes moyennes: vers une gentrification?," in C. Bidou (ed.), Retours en ville, Paris, Éditions Descartes, pp. 205-239.

[Historic Center Trust] (2000), Programa para el desarrollo integral del Centro Histórico de la Ciudad de México, Fideicomiso del Centro Histórico de la Ciudad de México.

——— (2003), Programa integral para el rescate del Centro Histórico, Fideicomiso del Centro Histórico de la Ciudad de México.

Montes de Oca, Verónica (2002), Participación, organización y significado de las redes de apoyo comunitario entre hombres y mujeres adultas mayores:

la experiencia de la colonia Aragón de la delegación Gustavo A. Madero,
Santiago de Chile, Celade, December 9-12.

Rojas, Eduardo (2002), *La preservación del patrimonio histórico urbano en
América Latina y el Caribe. Una tarea para todos los actores sociales*, Wash-
ington, IDB.

Smith, Neil (2003), "La gentrification généralisée: d'une anomalie locale
à la 'régénération' urbaine comme stratégie urbaine globale," in C.
Bidou (ed.), *Retours en ville*, Paris, Éditions Descartes, pp. 45-72.

Tomas, Françoise (2000), "Centros históricos de América latina: emergen-
cia de una nueva política urbana", *L'Ordinaire latino-américain*,
No. 181, pp. 9-22.

VI. GEOGRAPHY AND ENVIRONMENT: FROM NATURAL RESOURCES TO NATURAL CAPITAL

*Boris Graizbord**

1. INTRODUCTION

In this study, I review the literature on geographical space and summarize some of the limitations of regional policy in light of an issue that appears to be essential to any approach involving regional analysis: the environment. The literature on regional development used to explain the welfare of regions on the basis of the stock of "natural endowments." Nowadays these conditions are understood as a particular form of capital (Kn "natural capital") that not only includes the stock of resources but something more complex — in the systemic sense of the term — such as "environmental services" do not necessarily represent the mere sum of existing resources. In other words, I attempt to introduce the issue of environment and sustainable development into regional and urban analysis and I have used a number of boxes to remind readers of basic analytical principles.

This presentation is divided into six sections: this *introduction*, in which I define space from the point of view of regional economy; *the local and the global*, in which I establish the spectrum between these extremes and their definition; *the regional*, in which I explain the analytical debate on regional development; *regional systems and sustainable development*, in which I outline the problem

* LEAD-Mexico/Centro de Estudios Demográficos, Urbanos y Ambientales (CEDUA), El Colegio de México.

faced by regional analysis due to the introduction of the para-
digm of sustainable development; *natural resources or natural capi-
tal,* in which I highlight conceptual and methodological differences
in the use of these categories, and finally, a section on *conclusions,*
in which I propose a methodology for evaluating urban-regional
policy within the context of environmental transition.

As Higgins and Savoie point out (1997: 3), it is impossible to
understand societies and their economies without analyzing the
interdependence and overlapping between space, economic struc-
ture and society. Countries and national economies are in fact sets
of spaces (regions), each of which has its own economic, social,
political and power structures. Consequently, explanations of their
economic, social and political performance vary largely as a re-
sult of the extent to which these spaces (regions) are integrated as
national economic, social, political and administrative systems.
When these do not perform satisfactorily as a whole, intervention
is required at these regional and local levels, not only at the macro
and micro level of the economy.

In this respect, the field of regional economy, which includes
regional analysis, development, policy and planning, proves to
be an integrating or catalyzing factor for social sciences in gen-
eral. This was suggested by Isard in 1956 when he proposed his
Methods for Regional Analysis, which constituted the first text within
this trend.

According to Higgins and Savoie (*op. cit.*: 5-6,) space has tra-
ditionally been seen from four perspectives:

> *1)* The first regards *(geographical) space as homogeneous,* whether ex-
> plicitly or implicitly, but it realizes that there may be a set of spaces
> or geographical areas showing a stock of different physical and hu-
> man resources, which creates opportunities for geographical spe-
> cialization based on absolute or comparative advantages. The theory
> of international or inter-regional trade is drawn from this (see
> Krugman and Obstfeld, 1995).
>
> *2)* The second fails to consider the friction of distance, since *it
> assumes an instantaneous, cost-free mobility of all the factors involved in
> production,* yet realizes that the difference in the endowment of fac-
> tors or resources between regions and specialization as the basis of
> regional exchange would entail a cost for covering the "distance"

separating these spaces. It is therefore necessary, despite the fact that this affects the economy of analysis, to take into account transport costs and the limited mobility of factors. These considerations appear in the theory of rent from rural (Von Thünen, 1966) and urban land (Alonso, 1964; Mills, 1967; etc.).

3) According to the third perspective, *the non-homogeneous distribution of resources* requires making decisions about *what type* of activity is carried out, *how and where*. These decisions are determined by proximity to the market and resources as well as production and transport costs (Weber, 1909). Nowadays, access to information and technological development are also included in the determinants of population distribution and the location of productive activity (Norton, 2000). This has led to the theory of location (Krugman, 1996), including the Central Place Theory (Christaller, 1966; Lösch, 1954), and the Rank Size Rule (Richardson, 1973; Henderson, 1974) and the hierarchy of urban systems (Berry, 1970).

4) *Politico-administrative limits and borders* define spatial units such as nation states, states, provinces, municipalities and districts. According to the fourth perspective, these barriers affect decisions concerning trade, monetary, fiscal, price, wage, salary and land use policies. These differences have led to the analysis of policies in subnational or supranational spaces (such as the European Union) although a great deal remains to be done in the specific analysis of cultural, social and political (even environmental) differences at various scales, ranging from the *local* to the *global*.

2. LOCAL AND GLOBAL

These extreme scales represent analytical approaches to Regional Economics or two aspects of the development or evolution of the "new economic geography" (Fujita, Krugman and Venables, 1999: 3). Firstly, it is a methodological issue within the discipline, related to the definition of "place;" secondly, it is the result of the explicit consideration of changes in technology and economic growth possible as a result of the expansion of the world capitalist system (Wallerstein, 1974). These processes have transformed the market and modified the relationship between man and nature, in other words, the value of natural resources and their economic use by society.

On the local scale, Harvey (1996: 207-209) points out that different societies have produced particular ideas about space and time depending on their economic, social and political organization and specific ecological circumstances. And although both concepts are regarded as social constructions, a great deal of confusion remains on the matter. Thus it is accepted that time and space are constituted on the basis of social relations and practices, although it is often said that social relations and practices occur within a pre-constructed spatial-temporal framework, as though the latter were a continent of the former. In fact, it is unclear whether time and space can be treated as though they were separate qualities in the analysis of our being or in the attempts to explain how the world in general operates. In formal aspects, however, both time and space are dealt with separately as explanatory but also as dependent variables (Giddens, 1990; Crosby, 1997). According to Harvey, the concepts of space and time are crucial to almost everything we think and do, the way we see the world that surrounds us and the way we theorize about it. Harvey attempts to find answers on the basis of an extensive, impressive review of the literature by disciplines such as history, geography and anthropology. These last two disciplines, however, have some limitations for regional analysis. This can be summarized by the fact that anthropologists have carried out their studies in particular places on particular human societies and groups yet in doing so, they have failed to place sufficient emphasis on the physical surroundings that support and interact with this social group in particular, nor have they been interested in comparing or finding similarities between one group/place and another. For their part, geographers are aware of the physical environment, but underestimate the social and cultural structures and the political and administrative framework that characterize the social group and define their interactions or relations with the environment.[1]

---

[1] This last issue, involving interaction with the environment, affects the basic principles of the two main branches of geography, physical and human, and attempts to link them. See, for example, Gregory (2000), a recent text on physical geography that systematically deals with human activity and its reciprocal impact on the biophysical and bio-geochemical elements of ecosystems.

For Harvey (*op. cit.*: 208-209), the concepts of space and time provide the referent for establishing our location and defining our status and position in relation to what happens around us and in the rest of the world. This means that it is impossible, according to Harvey, to discuss space and time without using the term "site" or "place." There are, he continues, dozens of words (such as environment, locality, locale, neighborhood, region and territory) that describe the generic qualities of a place. Other terms (such as city, town, village, megalopolis) designate particular types of places and still others (household, nucleus, community and nation) evoke powerful connotations of place, making it difficult to discuss one without the other. But *place* also has broad metaphorical meanings: "the place of art in social life," "our place in society", "man's place in the universe", which psychologically makes us feel that we belong to something and that we are acknowledged by others. Conversely, it can also express norms to locate people, events and things in an "appropriate" place or subvert these norms by defining new places: "in the margin," "on the border", from which one can think and act...
According to Harvey, this profusion of meanings and ambiguity (*op. cit.*: 118) can prove useful in explaining the processes of "socio-ecological" change that affect: *1)* the environment in which we live (air, water, soil and landscapes), *2)* the ecosystem that supports life in general (and the environmental services it provides) and *3)* the amount and quality of the stock of natural endowments (both renewable and non-renewable) that permit the development of human activity.
At the other extreme is the global scale on which human life takes place on earth. Indeed, global changes affect local matters on a spatial-temporal continuum. Thus, the "socio-ecological" link identified by Harvey has elicited analytical interest in global processes. Regardless of the economic, ideological-cultural (Sklair, 1991: Chap. 5) or psychological impacts it may have on individuals' quality of life and lifestyle in their immediate surroundings, globalization puts global environmental resources and services at risk. This raises the question of whether the scale achieved by human activities and productive processes is consistent with the decision to make human existence on earth sustainable or with

the need to ensure it without producing unacceptable conse-
quences (Heal, 2000: 169).[2] These processes are expressed, it is
worth noting, on different scales through different variables.[3]

3. REGIONAL ISSUES

In order to explore the changes in economic geography on the
regional scale, it is worth summarizing the factors from "real life"
which, according to Higgins and Savoie (*op. cit.*: 7-10), *have not
been systematically considered* by either neoclassical economics or
the various Marxist schools:

> *1) Any society or social group lives in a particular place.* Cultures are
> defined in terms of space, a fact that has not been explicitly recog-
> nized by regional economists.
> *2) These spaces are always geographically smaller than the space of
> the national state.* No country can be regarded as homogeneous
> enough to be studied as a single culture or social complex.
> *3)* In most countries, *interest groups coexist.* They differ from each
> other, and sometimes enter into conflict and occupy different social
> and political spaces.
> *4) The social and economic interests* of social groups and particu-
> lar spaces are closely linked to the predominance of economic val-
> ues and therefore to the structure of the economy. Thus, when people
> live in a place and are engaged in the same activity or sector, com-
> mon interests emerge.
> *5)* People develop greater *loyalty towards the "place"* than towards
> the activity or sector in which they are engaged. Knowledge of how
> they should behave in these surroundings creates a sense of belong-
> ing in most people that live there. Consequently, there can be no in-

---

[2] Note that this question is different from that raised in *The Limits of Growth*
in 1972: What would happen if population growth continued in an uncontrolled
fashion? Although this somewhat resembles other questions that were asked, such
as what would the environmental consequences be if economic development con-
tinued at its present rate? What can be done to ensure a human economy that will
provide enough for everyone and also fit into the physical limits of the planet?,
the question was defined in relation to scale, but also to intra- and inter-genera-
tional equity when they said "enough for everyone" (Meadows *et al.*, 1992: 19).

[3] For an example on the basis of the metropolitan scale, see Graizbord, Aguilar
and Rowland (2003).

stantaneous or cost-free mobility or mobility without an emotional burden, even if transport is free or appropriate social or economic infrastructure exists elsewhere. This fact should serve to assess the impact of certain policies, such as those of "work to the workers" or "workers to work" concerning the welfare of a particular population.

6) Most people do not think of *welfare* in terms of the nation state. Their nationalistic pride changes if they live in a backward place (region) [environment], they or their relatives do not have work and they live in crowded conditions, poverty and have inadequate or non-existent public municipal and social education and health services. The main criterion, then, should be to orient public services towards much smaller spaces (spheres) than the nation-state.

7) As a result of *failure in the functioning of the market or flaws in public policy,* the market does not operate in the way the theory says it should. An increase in national income will not necessarily guarantee the rapid solution of the economic and social problems of a particular group, sector or region. Thus, the criterion should be ad hoc policies with appropriate measures for each particular case.

8) The *harmony of interests* in a national economy or society is neither automatic or unlimited. If a group or sector of the economy enjoys prosperity, it may increase its consumption, but if the supply is inefficient and highly protected, as happened during periods of industrialization due to import substitution, then there will be sectors or groups that oppose this protectionist regime and seek to liberalize the economy in a way that will not necessarily benefit all.

9) These conflicts translate into or have a *spatial referent.* By virtue of the differences in competitive capacity, certain sectors or regions will be better prepared than others to cope with challenges and take advantage of opportunities. Thus there will be sectors, regions and social groups that will either be winners or losers.

10) There will also be *some overlapping between the structure of the national economy and regional development.* Changes in the occupational and sectoral structure in terms of regional development do not reach all regions or all sectors at the same time. The current fluidity in the location of the world's economic activity leads to faster and unexpected changes inside a country, which affect regional spaces in more different ways than economic sectors. The same is true of the spread of innovations, since it is impossible to explain what is happening in a country without having an idea of what goes on in its regions. An example of this is the dynamics proposed in Geyer and Kontuly's (1993) "differentiated urbanization" model.

11) A regional equity policy cannot replace a policy for national economic efficiency, since the two are complementary. Indeed:

a) Countries with a high per capita income tend to display few, small regional differences, whereas those with a low per capita income display sharp disparities between regions.

b) Countries with acute inter-regional differences tend to have high inflation and unfavorable unemployment rates, while those with smaller gaps maintain a favorable combination of inflation and development.

c) Regions with slow growth have greater fluctuations in their economies with shorter periods of growth and longer periods of depression, unlike regions with high growth which maintain stability with long periods of growth.

d) Regional convergence is achieved with growth rates sustained for long periods.

12) There is no evidence of a general tendency towards *equilibrium* in a market economy in terms of regional balance or in the sense of full employment without inflation. Nor is "accumulative causation" (Myrdal, 1959) which leads economies away from equilibrium by virtue of a disturbance or alteration, empirically evident, either in terms of regional convergence or divergence or any tendency towards equilibrium. What happens instead is a sequence of movements towards or from the point of equilibrium. Indeed, cyclical economic theories depend on this type of alterations, as noted by Krugman (1999: 46-49) and Berry (1991).[4]

---

[4] After asking whether there are enough reasons to accept a theory of cycles (of long duration), Berry (1991: 128) states that, "technically, there are waves of long duration and cycles because the process is endogenous: the essence of a cycle — he explains — is the internal dynamic that gives rise to repetitions." He then goes on to report on the extensive empirical evidence of cyclical recurrence in economic growth, but also of other political and even climatic phenomena (*ibid:* 168-172) which, he speculates, are surprisingly linked. See Graizbord (1995) for an account of metropolitan cycles.

Equilibrium

Equilibrium, a term borrowed from physics, is used to describe a situation in which economic agents or their aggregates such as markets, for example, have no pressure or incentive to alter their economic behavior. In other words, when applied to markets, equilibrium denotes a situation in which the buyers and sellers in the aggregate are satisfied by the combination of prices and amounts bought and sold and therefore are under no pressure to modify their actual behavior... [which usually never actually happens!] (Pearce, 1992: 129-130).

This summary of the experience of evaluating regional policy by Higgins and Savoie is provided by Fujita, Krugman and Venables (*op. cit.*: 9) on the basis of "two useful [and I would add 'permanent'] questions:"

1) When is a spatial concentration of economic activity sustainable? In other words, under what conditions could the advantages obtained from the economies of agglomeration be sufficient to maintain this concentration? and
    2) When, in the absence of spatial concentration, is equilibrium unstable? In other words, under what conditions do slight differences between localities produce a tendency towards greater differences in time, in such a way that the symmetrical equilibrium between two identical localities is destroyed?

These are two analytical questions on spatial economic dynamics: the breaking point and the point at which equilibrium is maintained. In other words, the question about regional development is answered by the possible balance between *centripetal* forces that promote a spatial concentration of economic activity and *centrifugal forces* that oppose this concentration, although the former asks whether a situation constitutes an equilibrium and the latter asks whether this equilibrium is stable. The authors expand the meaning of equilibrium using two examples *(op. cit.*: 9):

1) If we assume a world comprising just two regions, in which the entire manufacturing industry is located in just one of them, in which a worker decides to migrate to the other region and find that his real salary improves, this will mean that the concentration of manufacturing does not constitute a point of equilibrium.

2) If the manufacturing industry is equally divided between the two regions, the movement of a small number of workers from one region to another, which increases or decreases relative salaries in the destination, will mean that the initial symmetrical situation is unstable in the face of minor disturbances.

4. REGIONAL SYSTEMS AND SUSTAINABLE DEVELOPMENT

The discussion on the differences or inequalities in economic development between countries or regions within the framework of the globalized economy is raised in the "Endogenous Growth" or "New Theory of Growth Model" in which technological innovation is endogenously determined by decisions taken by the public and private sectors within the economy and is not exogenous to the system, as assumed in conventional theory. In other words, if investment in the public and private sectors in human capital and innovation is optimal (or at least adequate), then it is possible for an economy to achieve a constant, sustained rate of growth in both production and consumption (Barbier, 1999: 126).

The original question is why do economic growth rates in poor countries as a whole fail to converge with those of rich countries in the long term? The answer is, quite simply, "Poor countries do not achieve high growth rates because they do not manage to generate or use the new technology to take advantage of greater economic opportunities" (Barbier, *op. cit.*: 126): "the main feature distinguishing a set geographical area [city, region or country] from another is the quality of its public institutions." Those with the most competent and effective mechanisms for supporting collective interests, particularly those concerning the production of new ideas, will be the most successful. Thus the difficulty of poor countries in achieving economic take-off can be attributed to "failure of politicians" and weak institutions. Indeed, the literature reports that with relatively low levels of initial physical and human capi-

tal, national efforts are less effective at reducing poverty and responding to economic growth (Datt and Ravillon, quoted in Pernia and Quising, 2003: 14).

This is not quite the whole story, however: "in many countries with poor economies, the exploitation and degradation of natural resources — fertile lands, woods, forests, bodies of water and fisheries — contribute to this instability and institutional disturbance. The shortage of resources may cause social conflicts and affect the institutional and political environment required to produce and use new ideas and absorb useful knowledge from the rest of the world" (Barbier, *op. cit.*: 128) or of traditional communities, I would add! These means that shortage does necessarily limit economic growth although it can directly affect innovative potential. However, endogenous growth theories have not concerned themselves with the contribution of natural resources to economic growth or with the role of innovations in overcoming the shortage of resources. Some economists, though, such as Stiglitz (1974) for example, or environmental economists such as Neher (1990), have explored the effects of scarce resources on economic growth. For example, they use neoclassical growth models such as $Q = KLRe^{rt}$, in other words, aggregate product Q as a function of the stock of physical capital K, labor L and resource input R, the exponent r being the constant rate of technological progress during a set period t. The results of these analyses are optimistic and conclusive (even with high population growth and a limited supply of natural resources): resources can effectively increase in such a way that a sufficient assignment of human capital to innovations ensures that in the long term the exhaustion of resources can be indefinitely postponed, while there is the possibility of achieving an endogenous rate of growth that will enable a level of consumption to be sustained and even indefinitely increased.

According to Barbier (*op. cit.*: 132) however, we can consider two scenarios in the case of countries or regions that maintain a high rate of exploitation of their resources:

> 1) One in which the long-term rate of innovation exceeds any adverse effect of shortage of resources, meaning that net innovation proves positive and

2) another in which, as a result of the shortage of resources, long-term effects may affect additional innovations, in other words, disturb technical and social innovation to such an extent that it is nullified (which could, although not necessarily, mean the collapse of the economy).

The national and regional economies caught up in this second scenario would rank below those that were not faced with a shortage of resources or else those that manage to overcome the barriers to innovation.

Resources and Scarcity

Generally speaking, a resource is something that is directly or indirectly capable of meeting a human need. For economists, there are three categories: capital, labor and natural resources. Capital refers to the type of resource produced not to be directly consumed but with the purpose of creating or achieving a more efficient production process. Labor includes the productive capacity that mankind possesses in both the physical and mental sense for carrying out its activities and producing goods and services. Natural resources constitute the stock of living or inert materials found in the physical environment that have an identified potential to be used by human beings (Hussen, 2000: 4).

The economy considers that resources for direct consumption undergo modifications but are used as production factors, in other words, as a means for producing objects to satisfy society's needs. This notion is strictly anthropocentric, as Hussen points out (2000: 4), which implies, from this point of view, that they are not regarded as having an intrinsic value or any other value than the economic one defined by human and therefore commercial needs. In addition, however, resources are only of interest to the economy because of their scarcity. Finally, as production factors, resources are used in combination and are or can be, according to Solow (quoted in Hussen, 2000: 5), replaceable. In other words, none of them is considered absolutely essential per se for the production of goods and services, which does not mean that they are not scarce.

This gives rise to basic questions such as what can be done to satisfy mankind's need for goods and services in a world of

scarcity. How does one maximize the set of goods and services available at a given moment? How can we justify rationing limited resources? The answer is in Hussen (2000: 6-7):
"Make decisions and define priorities: *choose.*
"Consider associated costs (opportunity costs) and therefore sacrifice something to obtain something else.
"Seek *efficiency* and reduce waste to a minimum by using the best 'technology' possible or available.
"Create rules and *social institutions* to reduce the conflict caused by the allocation and distribution of scarce resources, the market system being one of the means for achieving this."

5. Natural Resources or Natural Capital

Sometimes natural resources such as soil, water, fossil fuels and the natural environment are included in what is called "natural environment" or natural capital (Gilpin, 1996: 33). Natural environment includes: natural parks, biosphere reserves and other spaces for the protection of flora and fauna, coasts and islands, bodies of water (rivers, lakes, marshes and swamps); geological landscape forms, forests, fields or tundra, landscape features of scientific interest (such as limestone sinkholes and cavities) and ecosystems in general; zones showing botanical, geological and geo-morphological evolution; the habitat of endangered species and, finally, any feature that has not been disturbed by human activity or which has aesthetic qualities. These goods are obviously modified over long periods of time and are the result of climate changes, the variation or evolution of flora and fauna and, finally, of human action (Gilpin, 1996: 155-6).

Environmental degradation is said to be due to institutional failures (Swanson, 1996: 4). The importance of institutional development is highlighted in a seminal article by Hardin (1968) which spawned a vast amount of literature that questioned the "tragedy of the commons" or the inexorable tendency to exploit and undermine resources when individuals or firms have free access to them. According to Ostrom (2000), there is a distinction between

free access and resources for common use. The latter achieve sustainability as a result of the development of institutions that express the organization of the social group that ensures that they remain communal property or else agrees on their use on the basis of cooperative principles. At the international level, Young (1997) points out the need and options of mankind to develop intergovernmental systems that will protect global assets from free access, such as, for example, the oceans, atmosphere, poles and, generally speaking, the environmental services provided by nature.

If the aim is to sustain the production of goods and services indefinitely, then it is essential to think in terms of the concept of natural capital, in other words, to accept the idea that one should take advantage of or live off interest rather than touching capital (Gilpin, 1996: 206). This would, however, require also accepting the concept of "strong sustainability," which refuses to accept the fact that any other type of capital (whether physical, economic or human) should substitute or complement natural capital. According to Hackett (2001: 335), strong sustainability optimizes the economy on the basis of ecological and environmental capacity. The latter conditions economic activity, rather than the other way around, which in any case cannot be realistically accepted. Is there an intermediate, acceptable point, therefore, and if so, what is it?

If, as was once the case, regional development were based on "natural endowments" and wealth were based on the stock of resources, the solution would be to rationalize their use and, in this respect, profits would depend on the degree of scarcity. Conventionally, the goods and services produced that use resources that are exhausted or become scarce can be replaced.

However, in the analysis of natural resources (Neher, 1990: 84), the latter are valued as much for their ecological benefits and the amenities they produce as for their exploitation. Thus the value of the stock is considered, together with the flow of goods that it produces. The question then is how to strike a balance between the short-term benefits of the flow generated by the exploitation of the natural environment (which includes renewable and non-renewable resources) and the concomitant, lasting ecological damage to this stock. In formal terms, the social benefit (U) is a func-

tion obtained from the resources of the product in the form of ordinary consumption (C) or natural amenities (A), where $C+A = 1$ in $U = U(A, C)$.

The intermittent curve indicates the point at which the functions slope changes from negative to positive. Thus any combination to the left keeps the social benefit at a constant unitary value (Neher, 1990: figure 3.1, 84-85). To the right of dotted line A, more amenities or environmental expense would appear to prevent a level of well-being and quality of life. Thus society may agree to forego some of C while obtaining less A (natural environment). But there is also the question of supply. In other words, the atmosphere has a "natural" capacity to support a given level of consumption C and amenities A, which may be depicted as C^*, A^* in the graph, representing an optimum combination, although what actually happens is that market economies tend more towards C and enjoy less A than at this point of the C^*, A^* combination, since A has a surcharge in consumers' preferences in general (Neher, 1990: 86-87). Moreover, it is also likely that an increase in the scale of the economy (i.e. a larger economy) will also make it more acceptable, at least during the first phase, to opt for more environmental amenities.

According to this argument, a richer economy or one with increasing economies of scale $U>1$ or that has achieved a high degree of consumption (over C_0) would be more willing to sacrifice consumption (C) in order to gain environmental amenities.

At the same time, on the basis of its expectations (opportunity costs), society determines a discount rate that enables it to establish the optimum social rate for exploiting resources. It overlooks the fact, however, that the cost of extraction may increase as the resource is definitively decreased (in the case of non-renewable resources) or that its capacity for recovery over time (in the case of renewable resources) is not the same as the rate at which it is exploited. In this respect, the scale is crucial and the shortage of certain resources may become permanent, since resources cannot be replaced. This is obvious in the services provided by nature, particularly those to which there is free access: the world's climate system and the atmosphere's capacity for absorbing greenhouse gases; the natural carbon sumps; the wealth of flora and

Figure 1
Social Benefit (Utility) Defined by Consumption
and Environmental Amenities
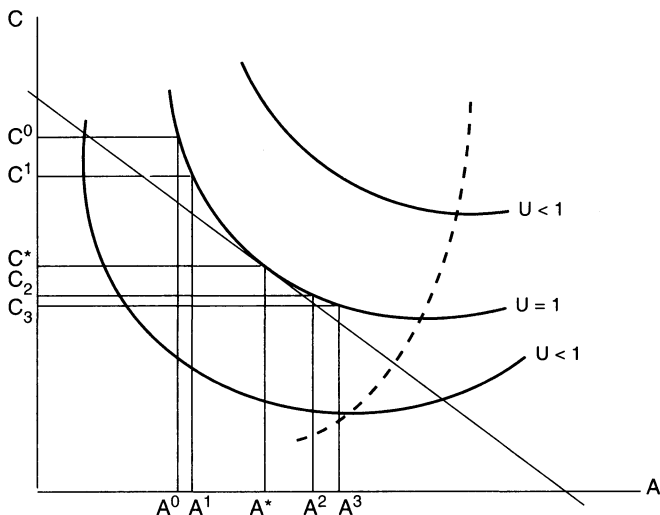
Source: Neher, 1990: 85, Figure 3.1.

fauna offered by biodiversity; the photosynthetic processes that take advantage of and transform solar energy into food and create oxygen by creating carbohydrates and the bio-geochemical processes, such as chlorophyll production which absorbs solar energy by converting it into chemical energy. Mankind and scientific development are a long way from achieving a satisfactory result and, in any case, without wishing to sound apocalyptic, time does not appear to be on our side.

Neoclassical Economics and Ecological Economics: How Should Sustainability Be Understood?

The idea that an economy can continue to function without natural capital lies behind the notion of discount rate and the effect that this could have on technical progress.

The notion of discount rate refers to people's preferences for present consumption (profit) over future consumption. Thus, people will only be prepared to substitute their present consumption (profit) for future consumption (profit) in return for a "prize" in the form of a discount rate: sacrificing one cent of present consumption requires a reward that exceeds the value of one cent of future consumption. Consequently, future consumption is discounted at a set discount rate indicating the replacement of present consumption by consumption at a later date. The question is, why are discounts given on the future? The answer is that people are short-sighted or there is uncertainty about the future. Individuals are more short-sighted and uncertain than society. Thus, choosing or determining the discount rate is crucial. The individual places less importance on the future, which is more a social and ethical issue, since his decision will affect future generations; a low discount rate favors future generations. However, according to Hartwick-Solow, this is not a serious problem, since the effect of a positive discount rate could be affected by the growth rate of technical progress and therefore it is neither immoral or wrong to use a discount rate, especially if the prize for keeping the sum or stock of different types of capital (physical, human or environmental) is used wisely.

There are, however, six possible reasons for thinking that this rule on sustainability or the optimal (efficient) inter-temporal route has a weak basis (Hussen, 2000: 185-6):

1) It assumes that the capital created by man and natural capital are interchangeable whereas in fact they are complementary...

2) Intergenerational efficiency requires that all goods and services reflect their social value. However, it is not known or else assumed that there is no difficulty in solving the distortions due to externalities...

3) Some economists argue (Perrings, 1991, quoted in Hussen, 2000: 186) that the idea of a positive discount rate is wrong and fails to consider every aspect of the welfare of future generations.

4) The approach adopted by this rule does not take scale explicitly into account, in other words, it does not regard the

size of the human economy in relation to natural ecosystems as something that should be considered.

5) The economic process is conceptualized as something separate from ecological systems, without understanding the complex interactions that exist between the two systems.

It ignores the fact that human activities may cause irreversible damage to the natural environment (and ecosystems) while realizing that there is some uncertainty about the risks that these effects can cause on life support systems and the quality of human life.

Thus, unlike what the Hartwick-Solow approach suggests about sustainability (the probability of substitution and the role of technical progress), an economy as a system will find it difficult to continue operating without natural capital. At least this is the position of the strong ecological economics approach.* And this means, on the one hand, considering intergenerational equity and, on the other, keeping natural capital constant, preserving natural resources and defending ecological conditions at any cost.

On the basis of these principles, the policy rules or criteria will be the following, as summarized by Hussen (2000: 188):

1) The rate of exploitation of natural resources cannot exceed the rate or rhythm at which they are regenerated.

2) The emission of residues (pollution) should remain at the same or a lower level than the capacity for absorption of the environment (ecosystem). However, there will be persistent emissions whose rates should be zero, since the ecosystem lacks the capacity to absorb them or else this would require enormous time spans (e.g. DDT, radioactive substances, CFC, etc.).

3) The extraction of non-renewable resources (fossil energy) should be consistent with the development of renewable substitutes. According to Hussen (2000: 1888), this is equivalent — paradoxically enough — to Hartwick's Rule of Substitution.

As one can see, economic considerations are ignored, meaning that the usefulness of this approach for guiding public policies is limited, leaving the problem of sustainability unsolved! And this raises Hussen's question: is sustainable development

a useful term or a vague, qualitatively empty concept? But this leads us to the (intra- and inter-generational) disjunctive with efficiency, meaning that the question of the trade-off between the two remains unresolved.

* Represented by Boulding and his idea of ecological limits; Georgescu-Roegen (1993) and his concept of energy as a limiting factor; and Daly (1996) and his approach involving the economy in a stationary condition.

This is not a discussion of the limits of growth (Meadows *et al.*, 1972). Its importance has been reduced by virtue of the fact that the debate now centers not on how long it will take for resources to be depleted but rather on the effects and implications of their use on regional and global pollution, which in fact varies between countries and regions. The biosphere is regarded as a candidate for conditioning economic growth, rather than the supply of mineral resources and fossil fuels. The methodology used by Meadows' team may have overestimated results and therefore reduced the effect of the message which, it should be noted, was the first to indicate the "finitude" of the earth (Meadows *et al.*, 1974) and its capacity to "accommodate" human activities in an unlimited fashion (Bowers, 1997: 180-181).[5]

As El Serafy (1991: 168-169) pointed out, capital[6] comprises earth, which is a real asset that enables goods to be produced... and which, according to Marshall (quoted in El Serafy, 1991: 169), constitutes, as Ricardo proposed, an "inherent" and "indestructible" good, even though these qualities of the earth have been modified (i.e. enriched or impoverished) by the work of numerous generations. Hence we can — as El Serafy points out (*ibid.*: 169) — extend the definition of land to nature as a production

[5] The finitude of or limits on exploitation (Turvey, 1954) and the need to regulate their use had already been recognized in the 1950s within the framework of the collapse of the fisheries, a period that also marked the start of the debate on resources for common use (Gordon, 1954). Nevertheless, it was Lotka (1925) who originally formalized the dynamics of populations.

[6] An economy's capital is its stock of actual goods that produce goods and services in the future.

factor. In the last analysis, the arguments of this author aim to convince us that an economy's income would be overestimated if national accounts[7] ignored the deterioration of the environment, whether it is conceived of as raw material for the production of goods or as a dump in which we deposit the emissions resulting from production processes.

But what is the appropriate sphere of analysis? Open systems — and regions are defined as such — are characterized as flows that cross their politico-administrative and geographical borders or limits, which are often poorly defined yet crucial if one wishes to analyze the dynamic of regional growth based on this link between economy and ecological systems or natural environment (Isard, 1972, quoted in Braat and Steetskamp, 1991: 270).

Within the context of sustainability of development, time implies inter-temporal negotiations, intergenerational equity and long-term planning and the horizon is arbitrarily defined as a suitable moment in the future or else is regarded as qualitatively infinite. Conversely, space in the range of the biosphere considers global, regional or continental, national and regional systems. The determinants of these spatial delimitations take three forms: the physical properties (natural endowments) of a system; the self-imposed limits (institutional development), and the technological level (the capacity for the complementation or substitution of factors).

Within this analytical framework proposed by Braat and Steetskapm (1991), although we can unconditionally agree to live in a "healthy" planet and pass it on to future generations, it is not easy to decide how to distribute the benefits and burdens internationally, interregionally or locally (Elster, 1992).

In order to demonstrate the difficulties faced by designing environmental policy due to the spatial and sectoral interdependence of

[7] Incorporating the costs of exploiting resources and nature in general or the benefits of protecting is not easy. According to Peskin (1991: 179), conventional national economic accountancy has flaws in the way it measures economic and social performance. It is inconsistent in the way it deals with wealth and ignores variables that could explain economic activity; it has not developed a perfect accounting system for taking into account or appropriately identifying environmental expenditure/profit. One of the reasons that interests us here is the definition of the physical-geographical units of national resources.

the various elements and factors, I include the following proposal by Braat and Steetskamp (1991: 269-288), from a set of strategies for the development of a region (conceived of as an open system):

> 1) Replace local resources (exploitation of resources) with external resources (import primary goods).[8]
> 2) Use renewable energy resources to the limit (extinction) and replace them with alternative external resources.
> 3) Provide space facilities (location) and input (water and energy) for activities that import primary goods and export intermediate or final consumption products.
> 4) Change the use of a renewable resource from one function to another; forest for obtaining wood → to obtain resin → for recreation, by offering or applying subsidies to achieve this functional transformation.
> 5) Shift from extensive to intensive uses in livestock production (and perhaps agricultural production, such as hydroponics).

These authors realize the interregional and international dependence this would entail, together with the fact that not all regions can export the same resource (or be in a condition to make changes) at the same time. They also consider that by attracting industry that will import primary goods, this industry may generate residues and therefore require processes for the transformation, recycling and disposal of these residues (*ibid.*: 286).

6. CONCLUSION: ENVIRONMENTAL TRANSITION
AND URBAN-REGIONAL POLICY

Within the global context and on the basis of comparative studies of regions and nations, it is possible to trace the link between en-

---

[8] According to Cleveland (1991: 294), the only factor or primary production good that is independent of the economic system is low entropy energy, since it is the only one that an economic system is unable to produce with its production factors: labor, capital and land (natural resources) that are interdependent, internal and intermediate, rather than external, independent or primary. Indeed, all the vital processes on the earth increase entropy, understood as disorder and therefore reproduce the available energy that can be used. This is what is known as the Second Law of Thermodynamics.

vironmental transition and the idea of "compression of space-time" (Harvey, 1996; Marcotullio *et al.*, 2003). These concepts, added to Kondratieff's "cycles of long duration" developed by Berry (1991),[9] suggest a spatial-temporal differentiation of ecological processes with different impacts for countries or regions at different stages of development or different economies (national or regional and even urban-metropolitan) according to their per capita income, as argued by Marcotullio *et al.* (2003) (Figure 2).

Environmental transition or the shift from one environmental condition to another has policy implications. It is defined as a change from a "brown" to "gray" and then "green" agenda (see Figure 3). The first includes, on the local scale and in "backward" countries and regions, aspects such as access to safe drinking water, inappropriate waste and pollution management, overcrowding and congestion, and the degradation and use of vulnerable land. The second implies, in countries and regions immersed in rapid processes of urbanization and industrialization, air pollution problems related to the emissions of certain polluting gasses such as SO_2 and suspended particles as well as water pollution from industrial effluents. Finally, on the global scale and in relation to highly developed countries with high per capita income levels and post-industrial economies, the "green" agenda represents the pollution of non-specific sources and very high consumption levels that produce CO_2 emissions and generate enormous amounts of residues and persistent chemicals (CFC). The impacts and risks are different and range from the local to the global scale[10] in which the climate change affecting the world ecosystem is expressed.

It is worth noting that there is certainty in some of the risks but uncertainty in others. According to Meadows *et al.* (1992: 127-129), there are three basic uncertainties in the context of climate change: *1)* what would the global temperature be without human interference?; *2)* what would an Earth with rising temperatures imply for the temperature, wind, currents, precipitation, ecosys-

---

[9] Especially in relation to "multiple endogenous causality" (pp. 127-132), which includes a causal link with recurrence over time.
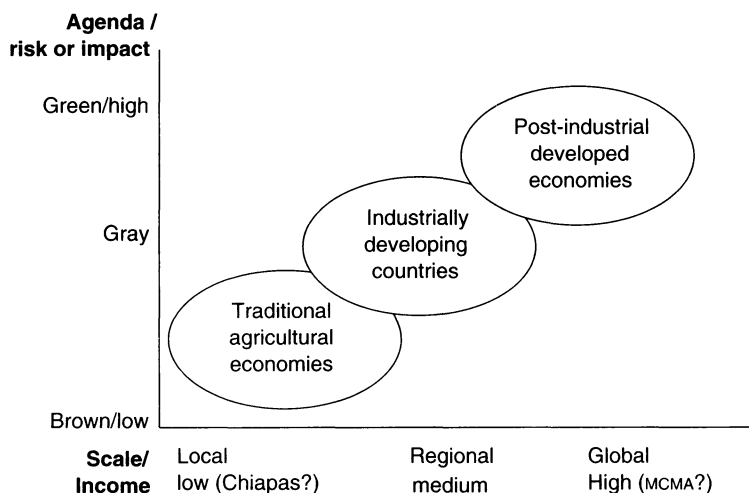
[10] Indeed, current advances are linked to the pioneering research work of Mexican Nobel prize winner Mario Molina (Molina and Rowland, 1974; Molina and Molina, 1992).

Figure 2
Experiences of Urban Environmental Transition
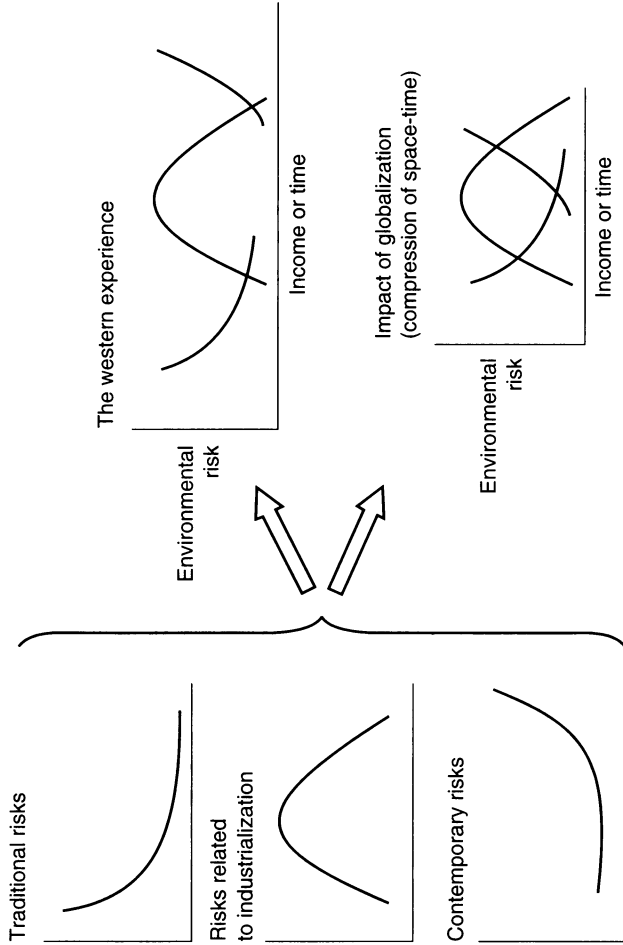
Source: Marcotullio *et al.* (2003).

Figure 3
Environmental Transition: Relation between Scale/Income and
Agenda/Risk or Impact

Source: Elaborated on the basis of Marcotullio *et al.* (2003).

tems and human economy in each specific place on the earth?, and *3)* no-one knows how the various positive and negative feedback responses interact or which of them will dominate (particularly between carbon and energy flows).

The problem at the national level is that, because of the various levels of regional development (20% poor and agricultural; 60% industrial; 20% rich and tertiary or post-industrial), environmental policy should include three agendas. This demands, among other things, more than just "thinking globally and acting locally," thinking and acting on the appropriate scale and at the same time in all of them, by virtue of the "spatial-temporal compression" that results from globalization.

From the perspective of sustainable development and regional policy, these are the economic and environmental or, in Harvey's terms, socio-ecological challenges facing the country and its regions in the future, which can already be envisaged.

7. References

Alonso, W. (1964), *Location and Land Use,* Cambridge, Mass., Harvard University Press.

Barbier, E. (1999), "Can Poor Countries Attain Endogenous Growth?," in T. Homer-Dixon, *Environment, Scarcity, and Violence,* Princeton, N.J., Princeton University Press, pp. 127-132.

Berry, B. (1970), "Latent Structure of the American Urban System," in B. Berry (ed.), *Classification of Cities,* San Francisco, Chandler.

────── (1991), *Long-wave Rhythms in Economic Development and Political Behavior,* Baltimore, The Johns Hopkins University Press.

Boulding, K. (1996), "The Economics of the Coming Spaceship Earth," in H. Jarret (ed.), *Environmental Quality in a Growing Economy,* Washington, D.C., The Johns Hopkins University Press.

Bowers, J. (1997), *Sustainability and Environmental Economics. An Alternative Text,* Harlow, Essex, Longman.

Braat, L., and I. Steetskamp (1991), "Ecological Economic Analysis for Regional Sustainable Development," in R. Costanza (ed.), *Ecological Economics,* New York, Columbia University Press, pp. 269-288.

Christaller, W. (1966), *Central Places in Southern Germany,* London, Prentice Hall.

Cleveland, C. (1991), "Natural Resource Scarcity and Economic Growth Revisited: Economic and Biophysical Perspectives," in R. Costanza (ed.), *Ecological Economics,* New York, Columbia University Press, pp. 289-317.

Crosby, A. (1997), *The Measure of Reality,* Cambridge, Cambridge University Press.

Dalys, H. (1996), *Beyond Growth: The Economics of Sustainable Development,* Boston, Mass., Beacon Press.

Elster, J. (1992), *Local Justice,* New York, Russell Sage Foundation.

Fujita, M., P. Krugman and A. Venables (1999), *The Spatial Economy,* Cambridge, Mass., The MIT Press.

Georgescu-Roegen, N. (1993), "The Entropy Law and the Economics Problem," in H. Daly and K. Townsend (eds.), *Valuing the Earth: Economics, Ecology, Ethics,* Cambridge, Mass., The MIT Press.

Geyer, M., and T. Kontuly (1993), "A Theoretical Foundation for the Concept of Differential Urbanization," *International Regional Science Review,* Vol. 15, No. 2, pp. 157-177.

Giddens, A. (1990), *The Consequences of Modernity,* Stanford, CA, Stanford University Press.

Gilpin, A. (1996), *Dictionary of Environment and Sustainable Development,* Chichester, West Sussex, Wiley.

Gordon, H. (1954), "The Economic Theory of a Common Property Re-
source," *Journal of Political Economy*, No. 62, pp. 124-142.

Graizbord, B. (1995), "Ciclos metropolitanos: Notas preliminares," in C.
Garrocho and L. J. Sobrino (coords.), *Sistemas metropolitanos. Nuevos
enfoques y prospectiva*, Zinacantepec, Mexico, El Colegio Mexiquense
and Sedesol, pp. 49-62.

———, G. Aguilar and A. Rowland (2003), "Mexico City as a World
Player: The Two Sides of the Coin," *The Annals of Regional Science*,
Vol. 37, No. 3, pp. 501-518.

Gregory, K. (2000), *The Changing Nature of Physical Geography*, London,
Arnold.

Hackett, S. (2001), *Environmental and Natural Resources Economics*, Armonk,
New York, Sharpe.

Hardin, G. (1968), "The Tragedy of the Commons," *Science* 162, pp. 1243-
1248.

Harvey, D. (1996), *Justice, Nature & The Geography of Difference*, Oxford,
Blackwell.

Heal, G. (2000), *Nature and the Marketplace*, Couelo, CA, Island Press.

Henderson, V. (1974), "The Sizes and Types of Cities," *American Economic
Review*, No. 64, pp. 640-656.

Higgins, B., and D. Savoie (1997), *Regional Development Theories & Their
Application*, New Brunswick, N.J., Transaction.

Hussen, A. (2000), *Principles of Environmental Economis: Economics, Ecol-
ogy and Public Policy*, London, Routledge.

Isard, W. (1956), *Methods of Regional Analysis*, Cambridge, Mass., The MIT
Press.

Krugman, P. (1995), *Development, Geography, and Economic Theory*,
Cambridge Mass., The MIT Press.

——— (1996), *The Self-Organizing Economy*, Oxford, Blackwell.

——— and M. Obstfeld (1995), *Economía internacional*, Mexico, McGraw-
Hill.

Lösch, A. (1954), *The Economics of Location*, New Haven, Conn., Yale Uni-
versity Press.

Lotka, A. (1925), *Elements of Physical Biology*, Baltimore, MD, Williams
and Wilkins.

Marcotullio, P. J., S. Rothenberg and Miri Nakahara (2003), "Globaliza-
tion and Urban Environmental Transitions: Comparison of New
York's and Tokyo's Experiences," *The Annals of Regional Science*,
Vol. 37, No. 3, pp. 369-390.

Meadows, D., *et al.* (1972), *The Limits of Growth*, New York, Universe Books.

——— *et al.* (1974), *Dynamics of Growth in a Finite World*, Cambridge, Mass.,
Wright-Allen.

———— et al. (1993), *Dynamics of Growth in a Finite World*, Cambridge, Mass., Wright-Allen.

Mills, E. (1967), "An Aggregative Model of Resource Allocation in a Metropolitan Area," *American Economic Review*, No. 57, pp. 197-210.

Molina, M., and L. Molina (1992), "Stratospheric Ozone," in D. Donnette and R. O'Brian (eds.), *The Science of Global Change: The Impact of Human Activities on the Environment*, Washington, D.C., American Chemical Society.

———— and F. Rowland (1974), "Stratospheric Sink for Chlorofluoromethanes: Chlorine Atom Catalyzed Destruction of Ozone," *Nature* 249, p. 810.

Myrdal, G. (1959), *Teoría económica y regiones subdesarrolladas*, Mexico, Fondo de Cultura Económica.

Neher, P. (1990), *Natural Resource Economics. Conservation and Exploitation*, Cambridge, UK, Cambridge University Press.

Norton, R. (2000), *The Geography of the New Economy*, Regional Research Institute, West Virginia University (http://www.rri.wvu.edu/Norton).

Ostrom, E. (2000), *El gobierno de los bienes communes*, Mexico, Universidad Nacional Autónoma de México and Fondo de Cultura Económica.

Pearce, D. (1992) (ed.), *The MIT Dictionary of Modern Economics*, Cambridge, Mass., The MIT Press.

Pernia, E. M., and P. F. Quising (2003), "Trade Openness and Regional Development in a Developing Country," *The Annals of Regional Science*, Vol. 37, No. 3, pp. 391-406.

Peskin, H. (1991), "Alternative Environmental and Resource Accounting Approaches," in R. Costanza (ed.), *Ecological Economics*, New York, Columbia University Press, pp. 176-193.

Richardson, H. (1973), *The Economics of Urban Size*, Lexington, Mass., D.C. Heath.

Serafy, S. El (1991), "The Environment as Capital," in R. Costanza (ed.), *Ecological Economics*, New York, Columbia University Press, pp. 168-175.

Sklair, L. (1991), *Sociology of the Global System*, Baltimore, The Johns Hopkins University Press.

Stiglitz, J. (1974), "Growth with Exhaustible Natural Resources: Efficient and Optimal Growth Path," *Review of Economic Studies*, Symposium on the Economics of Exhaustible Resources, pp. 123-138.

Swanson, T. (ed.) (1996), *The Economies of Environmental Degradation: Tragedy for the Commons?*, Cheltenham, UK, Elgar and UNEP.

Turvey, R (1954), "Optimization and Sub Optimization in Fishery Regulation," *American Economic Review*, No. 54, pp. 64-76.

Von Thünen, J. H. (1826), *Der Isolierte Staat*, trans. into English (1966) as *Von Thunen's Isolated State*, Oxford, Pergamon Press.

Wallerstein, I. (1974), *The Modern World-System*, New York, Academic Press.

Weber, A. (1909), *Über dan Standort der Industrien*, Tübingen, Germany, J. C. B. Mohr.

Young, O. (1997), "Rights, Rules and Resources in World Affairs," in O. Young (ed.), *Global Governance*, Cambridge, Mass., The MIT Press, pp. 1-23.

VII. METROPOLITAN ENVIRONMENTAL MANAGEMENT: THE CASE OF AIR POLLUTION IN THE VALLE DE MÉXICO

José Luis Lezama

1. INTRODUCTION

Environmental problems are characterized as having a broad scope, with territorial implications ranging from the local to the global and with an extensive interactive capacity at both the level of their natural existence and the social context in which they take place, which often determines them. In the specific case of the urban environment, this constitutes the highest degree of human intervention in natural ecosystems: economic processes, urbanization itself in terms of population concentration and activities, demographic growth and government intervention modify, often dramatically, the natural forms of existence in the territory in question.

This systematic human intervention has been expressed in the form of imbalances, loss of life forms, exhaustion of resources and pollution. These problems have traditionally been analyzed and addressed by government action by isolating them from the social context that produces them or on the basis of interpretations of orthodox ecology, that is, by offering strictly natural explanations for a phenomenon that is strongly influenced by social dynamics. In other words, it is the result of the systematic

* Edith Olivares and Elena Alonso participated as research assistants during various stages of this paper.

intervention of human activities undertaken within a set economic, social and politico-institutional structure.

In terms of government policies, attempts have usually been made to solve the problems derived from this complex, interactive system by creating an administrative government structure divided into sectors, closely focussed on the performance of functions, and with a vertical hierarchical organization that in practice prevents horizontal sectoral communication and tends to desegregate problems which tends to distort their integrated nature (Baker, 1989). Moreover, this structure usually targets all the physical aspects of environmental problems, ignoring the social causes that condition and explain them. The creation of national or state environmental secretariats has been regarded as an administrative advance in the integral treatment of environmental problems, although in practice they tend to operate as just another sector of the administration, unless the national or state legal framework provides them with the necessary power to be able to influence the decisions of the other sectors. These secretariats often have no control over the legislation and actions of other sectors with a powerful impact on the environment, nor do they have the right personnel for planning. There is also a lack of the necessary horizontal sectoral links required for government intervention in environmental problems.

In the Valle de México metropolis, air pollution has been one of the most serious environmental challenges faced by residents and the political authorities in recent decades, as borne out by the elaboration and implementation of four programs specifically designed to improve air quality in this area, which have reduced the amount of pollutants released into the atmosphere.

In recent years, the severity of the problem, coupled with increasing concern among both the various levels of government administration and public opinion, has led to several studies designed to shed light on pollution in the Valle de México. In addition to these factors, recent months have seen growing concern on the part of social researchers who have included social factors to explain the problem and severity of air pollution. The social perspective in the analysis of air pollution translates into the emergence of the subjective dimension as an explanatory factor, as well

as the elements of power underlying any social order. The point, then, is to distinguish the physical presence of environmental problems from their appraisal, perception and social and political construction. These elements, which play a key role in the implementation of public policies, together with the institutional structure through which government intervenes in environmental problems, constitute the most important social aspects involved in providing a solution to the problems that affect the environment.

As a result of the above, this paper seeks to analyze the institutional perspective on the problem of air pollution in the Valle de México, an aspect rarely studied in research on air pollution. The premise, noted earlier, is that the underlying solution to this problem necessarily entails government intervention, which must be both efficient and effective and moreover, in the case that concerns us here must involve a reflection on the metropolitan authorities because of the overlapping of government levels-and therefore of institutions and legislation, that occurs in the Valle de México. We therefore feel that it is not sufficient to explain the influence of social and economic processes on the environment, particularly on air quality, but that it is also essential to begin a discussion on the possibilities of public management in this sphere that would boost the institutional capacities accumulated over several decades of environmental policy in both the country and this area.

2. INTERNATIONAL EXPERIENCES OF AIR POLLUTION MANAGEMENT

The overlapping of government levels is the main factor that must be resolved before proceeding to design public policies aimed at improving air quality. In the majority of cases to be reviewed below, there is more than one politico-administrative entity involved in the pollution problem, which requires coordination between the various government levels (local, state and national).

In the analysis of international experiences of air pollution management, the first classification concerns the level of centralization in decision-making.

a) Centralized Models

This type of model is characterized by the fact that the state is the sole organization responsible for supervising air quality, which it does through organizations linked to environmental issues or the establishment of institutions specifically designed to deal with these issues, leaving local government little scope for maneuver. This type of models predominates in Latin American countries due to the centralism that has characterized state development since the mid-20th century. Two types can be distinguished:

- The dispersion of powers, in which environmental capacities are scattered among various government organizations, without a governing institution to determine the policy for improving air quality. The way environmental issues are handled, then, responds more to the interests of the government of the moment than to a definite organizational strategy. This is the case of Buenos Aires, Argentina, and the Metropolitan District in Quito, Ecuador.
- Centralized models with a partial grouping of skills, in which the state creates a special organization for managing environmental issues, which is primarily responsible for the coordination of skills and the definition of policies to be implemented. This is the case of the National Commission on the Environment in Santiago, Chile.

b) Decentralized Models

This type of model involves several government levels, as a result of which it tends to be implemented in more complex cities whose territory covers more than one politico-administrative entity. Air pollution can be managed through government institutions with considerable autonomy yet which depend on federal organizations, or through the creation of specific government organizations for metropolitan areas where there is a great deal of concern over environmental issues, which is where there is the greatest amount of decentralization.

In the first case (autonomous models of multi-level environmental organization), special organizations are established to improve air quality in metropolitan areas, which are handled independently and include local, regional and national responsibilities. Examples of this type of models are the cases of pollution management in the United States and Canada.

In the case of the United States, the pyramidal structure that distinguishes the agency responsible for environmental issues (USEPA) maintains federal coherence in the control of air pollution by taking into account the specific features of the various regions through information provided by local districts. The territorial delimitation of the latter reflects the homogeneity of their air pollution rather than its politico-administrative jurisdiction, as a result of which these districts do not necessarily coincide with the territorial division or counties. Although the functions of each of the levels of political control are well defined and delimited, the federal level (USEPA) may directly intervene in decisions at the local level. Moreover, the responsibilities of the districts are extremely limited: they are restricted, in most cases, to controlling emissions from stationary sources (industries) and only the most highly developed districts have included the possibility of controlling mobile sources.

Within the pluralistic models of multilevel environmental organization, an autonomous organization is created that governs a metropolitan zone comprising various politico-administrative units, within the framework of which air quality and other urban responsibilities are dealt with, as in the case of Tokyo, where the solution to the environmental problem has involved a radical change in the management of urban issues, based on the design of a city model comprising the municipalities that make up the megalopolis, called "Plan Tokyo 2000." This plan aims to turn Tokyo into a megalopolis with a circular structure, including the municipalities that would compose the Tokyo Metropolitan Region. Environmental issues are crucial in urban management and inserted in all proposed forms of institutionality. Consequently, the plan anticipates that each of the policies to be implemented will require an evaluation by the Tokyo Environmental Office, which is independent from the Environmental Protection Office (belonging to central government), on the grounds that the city

should be able to govern itself. However, the Environmental Protection Agency of the megalopolis should follow the basic guidelines issued for the city as a whole. As for air quality, the megalopolis' environmental office does not have an organization specifically dedicated to this problem, since the model assumes that this is an element that must be included in all policies, although some of the sections into which it is divided undertake actions aimed at controlling air quality in Tokyo, such as the environmental improvement division, the division of countermeasures for automobile pollution and the division of environmental assessment. The former promotes measures designed to promote air quality, whereas the second implements policies for reducing the polluting emissions from vehicular sources, while the third division is responsible for monitoring and measuring air pollutants.

International experiences include an enormous variety of approaches for managing air quality, the adoption of which is largely determined by the characteristics of the predominant political system in each society. As a result of the above, in order to advance towards a proposal for air quality management in the Valle de México Metropolitan Zone, it is essential to first review the evolution of the country's environmental management, as well as the legal and institutional framework in force.

3. Environmental Management in Mexico

In Mexico, environmental planning and policies for coping with specific environmental policies have evolved from a perspective that concentrated on health problems to a broader one that considers the effects of environmental problems in other spheres of social and natural life. Progress has also been made towards analysis and policy proposals with a metropolitan dimension.

The modern antecedents to environmental policy in Mexico date back to the beginning of the 20th century (the first institution created to improve the environment was the General Health Council in 1911), but it was not until 1970 that the General Environmental Hygiene Department was formed, which issued the first guidelines for a legislation for improving the environment.

The 1970s saw the creation of an entire institutional structure for government management of the environmental problem, such as the Undersecretariat of Environmental Improvement (UEI) within the Secretariat of Health and Public Welfare in 1972. Within the context of the planning fever that swept public administration during the 1970s, the Secretariat of Health and Welfare was charged with elaborating and implementing a policy to clean up the environment. In 1978, the UEI was restructured to enable it to act more effectively as regards land, water and air, as well as with regard to problems which, at that time, required urgent attention, such as solid waste, occupational hygiene, harmful fauna and toxic chemical substances. The urgent need to act on various critical areas, perceived at both the government and social level, led that same year to the creation of the Intersecretarial Commission of Environmental Improvement, whose functions included the elaboration of programs, coordinated in conjunction with various government offices, to attack and prevent environmental deterioration.

The creation of the Secretariat of Human Settlements in 1976, together with the plans for Development and Urban Development, included a significant consideration of the environmental problem as an essential part of the government's planning action. This was the framework that led to the creation of the General Office of Urban Ecology, where the environmental impact of productive processes, waste transformation and recycling were discussed. This office also designed plans for cities in the provinces and metropolitan areas and promoted Mexico's participation in the UNESCO Man and Biosphere Program (Intersecretarial Group of International Environmental Issues, 1979). The ecological improvement programs promoted by this Head Office were unprofessionally designed, and merely provided further proof that the issue of planning was simply part of a political discourse that was not intended to be implemented.

The population policy launched in 1973, guided by an anti-populationist spirit, included the environment as one of the factors related to population distribution. In this respect, environmental problems were linked to the concentration of the population in certain regions, as well as to the processes of urban-

ization and industrialization that have had an enormous, negative impact on the environment. This context saw the emergence of an alternative means of redistribution and relocation of the population as a means of reducing pressure on those ecosystems (Intersecretarial Group of International Environmental Issues, 1979).

In 1982, the Federal Environmental Protection Law was passed, whose main aim was to protect, improve, preserve and restore the environment in addition to preventing and controlling the problem of pollution, and the Regulations to Protect the Environment from Pollution Caused by Noise Emissions was published (Sedue/Undersecretariat of Ecology, 1983). That same year saw the creation of the Urban Development and Ecology Secretariat, responsible for concentrating the work on environmental issues that was scattered among various Secretariats and which it was felt should be concentrated in a single office. Among the actions undertaken by Sedue during the Miguel de la Madrid's administration was the 100 Necessary Actions program, created to solve the country's environmental imbalances, which was divided into five sections: 1) air pollution; 2) land, water and noise pollution; 3) conservation and restoration of natural resources; 4) agrochemicals, detergents and hazardous substances and materials, and 5) education and health. The section on air pollution included measures for both mobile and fixed sources. The former included the promotion of less polluting technologies applied to new cars; the improvement of gasoline, diesel and combustoil; the expansion of public transport, including the metro and electric transport; tuning the Ruta 100 buses; and even campaigns to reduce car use, a measure that was never explained or specified, simply mentioned. As for fixed sources (industries and services), these 100 actions included issues that referred to incentives to use non-polluting equipment, the territorial decentralization of polluting industries, new regulations and norms to control the polluting emissions in the Valle de México, the use of natural gas in thermoelectric stations, the relocation of foundries outside the Valle de México, the prohibition of the expansion of the refining capacity of the 18 de Marzo Refinery, air quality measurements, the continuation of environmental monitoring in the three most important metro-

politan areas in the country, etc. (Comisión Nacional de Ecología, January 1987).

During Carlos Salinas de Gortari's administration, passage of the General Law of Ecological Equilibrium and Environmental Protection involved a conceptual leap from an environmental policy that concentrated simply on pollution prevention and control to one that considered every aspect of environmental issues and placed it within a socio-economic framework. In 1989, the National Water Commission (CNA) was created . Sedue also drew up a National Program for Environmental Protection for the period from 1990 to 1994, within the framework of the National Plan of Development (NPD)'s guidelines on environmental protection.

In 1990, the environmental authorities in the Federal District Department in Mexico State and the Secretariat of Urban Development organized the most important government effort to date for dealing with the problem of air pollution in the Valle de México: the Integral Program to Combat Atmospheric Pollution (PICCA) in the México City Metropolitan Zone (MCMZ).

In 1992, Sedue was replaced by the Social Development Secretariat (Sedesol), which showed a greater and more modern will to cope with the environmental problem. With this aim in mind, it created two institutions that proved crucial to environmental management: the National Institute of Ecology (INE) and the Federal Attorney's Office for Environmental Protection. The main function of the former is to elaborate a national environmental policy while the second is responsible for ensuring compliance with the legislation, norms and environmental protection programs promoted by the corresponding authorities.

The institutionalization of environmental management in Mexico culminated in 1994 with the creation of the Secretariat of the Environment, Natural Resources and Fisheries (Semarnap), now the Secretariat of the Environment and Natural Resources (Semarnat). The philosophy behind this institution is sustainable development and, to a certain extent, it materializes an entire concept of environmental issues that dates from the Stockholm Summit of 1972 to the Rio Summit in 1992. The environmental policy proposals, the integrated way in which the environmental situation is conceived in Mexico and the institutional arrangement on

which this secretariat is based, reflect a genuine effort to deal with environmental issues from a truly modern perspective. This office incorporated the federal environmental institutions mentioned earlier, such as the INE, CNA and Profepa. All these provided an administrative political structure which, at least at the formal level, equipped this institution to undertake environmental management from an integral, comprehensive perspective.

4. THE LEGAL BASIS OF METROPOLITAN ENVIRONMENTAL PLANNING IN THE MCMZ

The legal order enshrined in the Mexican Political Constitution does not consider any form of government or authority for the conurbations in Mexico City, the Valle de México or the Central Region. Nevertheless, Articles 115 and 122 provide for the creation of commissions and the undertaking of agreements to carry out joint planning effects in urban centers that have become municipalities belonging to two or more states with geographical continuity, which opens up the possibility for intergovernmental coordination in planning or public policy actions in areas where various orders of government overlap. Article 115 empowers municipalities to carry out coordinated actions to deal with common problems with other municipal governments, as well as state and federal governments. At the same time, Article 122 authorizes the Federal District government to create metropolitan commissions so that the various levels of government that converge in the MCMZ (federal, state and municipal) coordinate efforts to deal with common problems, such as human settlements, the environment, transport, public safety, solid waste and water and drainage.

At the same time, the Federal District Government Statute authorizes the Legislative Assembly to legislate over environmental issues in the state, although the head of Government is entitled to create metropolitan commissions. The Organic Law of Public Administration of the Federal Government authorizes the authorities in this demarcation to create coordination agreements between the Federal District, municipalities within the conurbation and the federation. At the same time, the Internal Regulations of

the Federal District Public Administration charge the Head Offices of Metropolitan Coordination with designing mechanisms for the coordination and negotiation of metropolitan agreements.

The MCMZ and the Central Region have been the subject of various attempts at intergovernmental coordination to cope with the range of problems that take place there. In recent decades, the authorities have experimented with several types of metropolitan commissions, from those that attempt to coordinate government actions concerning problems of a diverse nature (population, urban development and environment) to more specific ones designed to deal with a single problem such as transport or the environment.

The metropolitan commissions for environment appear to have been the most successful, perhaps because of the scope of the environmental problem, and air pollution in particular, as well as the government's will to adopt a coordinated approach to a problem which has proved resistant to unilateral treatment by each of the government departments operating in the metropolis. This, however, does not necessarily mean that its current modus operandi is appropriate. On the contrary, the current Metropolitan Environmental Commission (CAM) lacks the necessary authority to carry out its functions; the various orders of government comprising it do not work together as CAM but rather according to the logic of their own organizations or government levels; their internal organization does not enable them to carry out the planning tasks that correspond to them, while their legal status does not make their agreements and resolutions compulsory.

5. THE INSTITUTIONAL FRAMEWORK IN FORCE FOR AIR QUALITY MANAGEMENT IN THE MCMZ

The air pollution problem in the MCMZ involves Mexico City, the municipalities in its conurbation and the various entities in the Central Region, but the area with the most severe air pollution problem is the MCMZ, where various orders of government coincide: the federal level, and those of the Federal District, Mexico State, Hidalgo State and the thirty-six municipal governments.

Each of these levels has a legal framework and an institutional infrastructure for dealing with the environmental problems within their jurisdiction. Thus, the Federal District government has the *Federal District Environmental Law*, last modified in January 2000. Operating within the administrative sphere is the Environmental Secretariat of the Mexico City Government, an organization in charge of the tasks and functions assigned by the environmental law. In Mexico State, environmental issues are regulated by the *1998 Environmental Law for Sustainable Development*, while the institution responsible for environmental planning in the state sphere is the Ecology Secretariat. At the federal level, the environmental regulatory framework is represented by the *General Law of Ecological Equilibrium and Environmental Protection*, reformed in 1996. Semarnat is the secretariat responsible for the powers dictated by this regulatory framework. Its new organic structure, derived from the Agreement through which the administrative units and decentralized organizations of Semarnat are organically assigned, was published in January 2003. Semarnat now has three undersecretariats: Planning and Environmental Policy, Environmental Protection Management and Development and Environmental Regulations, which are the central engine of management and are supported by six decentralized organizations: Federal Delegations, Regional Coordinating Offices, the National Water Commission, the National Institute of Ecology, the Federal Attorney's Office of Environmental Protection and the National Commission for Protected National Areas. There are also two decentralized organizations: the Mexican Institute of Water Technology and the National Forestry Commission.

The natural, social and administrative complexity of air pollution meant that isolated actions performed at the various levels of government that coincide in its management were inefficient. Within this context, the elaboration of various programs for coping with air pollution in Mexico City and its areas of influence led to the creation of intergovernment and intersectoral organizations that sought to deal with the complex characteristics of the environmental problem in this part of the country. Thus, the implementation of the 1979 Coordinated Program to Improve Air Quality (PCMCA) led to the creation of the first intergovernment and intersectoral insti-

tution: the Intersecretarial Commission for the Environmental Improvement of the Valle de México, answerable to the Health and Welfare Secretariat. In 1992, the implementation of the Integral Program to Combat Atmospheric Pollution (PICCA) made it necessary to create the Commission for the Prevention and Control of Environmental Control in the Valle de México Metropolitan Zone. Subsequently, in 1996, the 1995-2000 Program to Improve Air Quality in the Valle de México (Proaire) was implemented, which led to the creation of a new and more appropriate institution, the so-called Metropolitan Environmental Commission.[1]

The 1979 commission was based on a health notion of environmental issues, which is an important but ultimately limited, narrow view of the environment. The 1992 commission went beyond health issues, both from the point of view of its internal structure and its institutional components and from its definition of environmental issues, which reflected a more modern idea that includes part of the international debate of the nearly two decades

[1] The Metropolitan Environmental Commission (CAM) is an intergovernmental planning institution whose legal basis is contained in Article 115 of the Mexican Political Constitution, conceived within this framework as a mechanism for administrative coordination within the various levels of government that overlap in metropolitan problems. Its purpose is to coordinate the planning and implementation of actions in the conurbation adjacent to the Federal District in issues involving environmental protection and the preservation and restoration of the ecological equilibrium. The coordination agreement authorizes it to: 1) Establish the criteria and guidelines for integrating programs, projects and actions for pollution prevention and control and to protect the environment in general. 2) Create mechanisms to coordinate the actions of the government organizations that overlap in the conurbation. 3) Express its views on the programs and budgets of the organizations that overlap in the environmental problem. 4) Propose actions and measures to prevent environmental contingencies. 5) Encourage technological and educational research in environmental matters. 6) Propose reforms and additions to environmental legislation. 7) Define mechanisms for obtaining financing. 8) Coordinate joint actions for the conurbation area. 9) Propose ecological arrangements and their congruence with the plans in the other participating demarcations. 10) Prepare and propose metropolitan environmental plans. 11) Propose measures for the administrative simplification and deregulation of environmental matters. 12) Propose and encourage environmental policy instruments. 13) Propose the participation of the various agents involved in the problem. 14) Evaluate the fulfillment of actions. The CAM has a chairman, a post alternately filled by the Head of the Federal District Government and the Governor of Mexico State. Operative tasks are performed by the Technical Secretariat. There is an Advisory Board and working parties that support the various planning tasks involving the main problem areas.

preceding it. Nevertheless, this 1992 commission was conceptually confined to a notion of the environment reduced to pollution problems. Conversely, the 1996 commission called itself the Metropolitan Environmental Commission, thereby implying a more comprehensive notion of the environment, from both the point of view of an integral conception of environmental issues and the metropolitan dimension of policies. This was reflected in the fact that it was not solely concerned with health issues, like the former, or exclusively with pollution like the latter, but also included several problems within various settings such as air, water, residues and natural resources. However, in practice, all the commissions have been virtually exclusively concerned with the air problem on the grounds of its enormous importance in the metropolitan zone and its greater capacity to attract the attention of public opinion. At a more explanatory level of the exclusiveness of the air problem on the agendas of the three commissions that have existed, it is important to note that the commission operates on the basis of the same reductionist, partial view of the environmental problem that takes place on the level of public opinion, meaning that environmental problems are reduced to pollution problems, ignoring the fact that environmental issues are more comprehensive and include relations between the various components of the environment and between socio-economic processes and the natural world. At the same time, continuing with this reductionist process shared by commissions and public opinion, discussions on pollution are reduced to air pollution, while discussions of air pollution, in both the government and civic agenda, are reduced to ozone, ignoring the fact that toxic pollutants continue to have a worrying presence in this part of the country. Not even the CAM in force has been able to design a metropolitan environmental policy that serves as the programmatic context for the policies and programs concerning various mediums such as air, water and soil.

6. Criticism of Programs
to Combat Air Pollution in the mcmz

Since 1979, four government programs have been implemented to cope with the problem of air pollution in the Valle de México: 1) The 1979 Coordinated Program to Improve Air Quality in the Valle de México 1979-1982 (pcmca); 2) the 1990 Integral Program to Combat Atmospheric Pollution in the Mexico City Metropolitan Zone (picca); 3) the 1996 Program to Improve Air Quality in the Valle de México, 1995-2000 (Proaire), and 4) the Program to Improve Air Quality in the Valle de México, 2002-2010.

Other fundamental changes have taken place between the publication of the first and last program in both the environmental problems of the Valle de México and the economic and socio-political conditions in which they take place. In the first case, the composition of the substances released into the atmosphere has undergone significant modifications, due to changes in the fuels used by the various productive and consumption activities, the transformations of the technologies used in the latter and the changes that have occurred in the composition of the product. Conceptualizing these modifications is crucial to elaborating air policies. Nevertheless, the diagnoses of government programs have failed to reflect this changing situation, meaning that action proposals have lagged behind the evolution of the phenomena. The entire system of environmental programming from 1979 to 2002 has proved particularly insensitive to the actual dynamics of the environmental problem, meaning that while the latter is subjected to an intense process of change, policy proposals have insisted on repeating an analytical and programmatic program that arose with the 1979 program and are characterized by proposing a notion of atmospheric problems and a set of proposals for action outside the economic, social and political context in which the problems in which the authorities wish to intervene are located.

The construction of the environmental problem by the government sector has come to an analytical standstill, reflected in the inability of official programs to transcend this narrow view of environmental issues and air pollution which was made official

by the 1979 program. This view reduces the sphere of analysis and government intervention to the level of the physical and technical existence of problems, while ignoring the economic, social and political level at which these problems, which are the object of government action, are located. The main cause of this stagnation is the existence of a system of monopolistic planning at the stage of formulating and implementing policies. The findings of the scientific community do not reach government offices and when they do so, it is only insofar as they confirm government views. The institutional offices created to involve the various sectors of the community are merely invited to validate diagnoses that have already been carried out and decisions that have already been made. Civic participation at the various planning stages does not exist, and is replaced by a manipulative version of it that seeks to involve citizens in a governmental view of the problem and in an official version of the solutions. Environmental issues appear as a unilateral solution, aimed primarily at satisfying the need to legitimize public action.

The differences between the four programs have more to do with form than with content. The general conception formulated by the 1979 PCMCA continues to be held even in the most recent program, meaning that the analytical and programmatic plan put forward at the time has been turned into a sort of insurmountable analytical roof for the subsequent system of programming. The only differences in the PICCA (1990) and the two Proaire are that they take the original problem to its ultimate consequences and make the breakdown of specific goals and actions broader and more detailed. Beyond these operational differences, the most recent program revalidates a conception that favors and isolates the physical, chemical and technical dimension, while demonstrating a particular inability to reach the social and political level.

From the 1996 Proaire onwards, the discursive form has been separated from any content. The aim is to fit government planning action to the international environmentalist discourse and the emerging aspirations of an increasingly informed citizenry that is more aware of the deterioration of its quality of life due to the reduction of air quality. The government agenda fails to assimilate the fact that change in the characteristics of pollution and the

social context mentioned earlier are essentially linked to improvements in the knowledge generated and to the internalization of the environmental problem in Mexican society's scheme of preferences. Air policy became more aggressive because citizens grew more aware of the severity of the environmental damage that has increasing repercussions on the health, economy and everyday life of various sectors of the population. Nevertheless, more active, aware citizens, combined with a more aggressive air policy do not necessarily lead to more effective government programs. At best, they create the conditions for greater presence, surveillance and pressure on the part of society in the implementation of the chosen strategy. Whether or not this strategy is correct does not depend on civic will or on discursive governmental activism, but rather on an appropriate construction of atmospheric problems and the social and governmental will to achieve environmental goals and on the existence or capacity to create social and political conditions, on the part of various social agents, in order to implement programs that involve a redistribution of the public and private costs and benefits associated with combating pollution.

The 1979 PCMCA was created within a social context that was not conducive to achieving the shift from physical pollution, which undoubtedly existed at the time, to the social aspects of pollution. Four million tons of pollutants released into the atmosphere did not suffice to make environmental issues appear as a social problem or make it the object of public policies, because there was no parallel environmentalist movement with a broad presence. The findings of the scientific community did not suffice to analyze the causes or effects of pollution, the problem of lead in the atmosphere had not been sufficiently documented and studies on its effects on health had yet to reach the point of raising collective awareness. In short, there was no significant shift from physical to social risk.

On the other hand, the Health Secretariat's management of environmental issues not only reflected the public health approach to the problem but also decision-makers' lack of room for maneuver in the implementation of programs. Their approach was characterized by little scope for maneuver, scant financial and profes-

sional resources and a traditional medical bias. No links were established between environmental and economic proposals, nor were any attempts made to question the development models and their link with environmental degradation.

If we take the air pollution problem as it is conceived and combated by PICCA and compare it with PCMCA, assuming that both correspond to the general conditions of their time, we can say that the eleven years that have elapsed between the two programs reflect the substantial changes in the air pollution problem in the Valle de México, which translates into a different interpretation (one that is more scientific, political and ideological) on the part of the various sectors of society involved in it and reflect the detailed process of social construction of the environmental problem. A crucial aspect of this process was obviously both the increase in the volume and the composition of air pollution, as well as the progress achieved in the knowledge and role of the media.

In 1979, when the PCMCA was elaborated, the volume of pollutants appears to have been similar to that registered in 1994. The four million tons released in 1994 obviously corresponded to more accurate measurements, whereas those of 1979 were based on extremely rough estimates. It is also true that the composition of the two inventories is extremely different. In 1994, the amount of lead in the atmosphere was significantly lower. This does not mean, however, that the rest of the pollutants, in terms of their effects on health and the variety of toxic substances, are more favorable at either of the cut-off points established. By 1998, the concentrations of lead in the air were 99% lower than they had been a decade earlier. Sulfur dioxide and carbon monoxide have been significantly reduced, although they still constitute a risk factor in areas with heavy traffic. Moreover, ozone levels have stopped increasing as they did in the early 1990s, although efforts to reduce them have failed. Nevertheless, government and civic awareness of the scope of the problem was not as widespread in 1979 as it was in 1996 and 2002. Thus, the social component of pollution, in the case of the last air program, has lent its physical component legitimacy, which was not the case in the 1979 program or earlier.

At the same time, the period between 1979 and 2002 saw significant changes in the Valle de México at the different levels com-

prising the environmental issue in general and the air problem in particular. The MCMZ population increased significantly, as did the number of industries and service establishments; the composition of the GDP underwent transformations, inputs were modified, fuels were subjected to an intense process of reformulation, economic agents experienced a number of significant adjustments, while political agents faced changing new situations that led them to new forms of social consensus. At the end of this period, the political apparatus began to undergo changes, foremost among which was the popular election of the Head of the Government of the Federal District from 1997 onwards, and the Institutional Revolutionary Party's loss of power after seventy years. It is worth noting that since the Federal District Head of Government is the result of popular election, rather than being designated by the president, this post has been occupied by a representative of the Democratic Revolution Party, meaning that recent years have witnessed a hitherto unprecedented need for negotiation and coordination at various levels of government spheres.

This was also the period of the birth of a broad institutional infrastructure, when environmental issues were fully incorporated into official discourse and the practice of environmental planning and management became official. The Mexico City government, which began in the 1980s without an organization specifically responsible for environmental issues, first created an ecology office and then an Environment Secretariat, both of which emerged under the aegis of other national organizations, also driven by the need to deal with various national environmental problems. Yet these were also years of changes in civic awareness of environmental issues and of the creation of unprecedented knowledge on all aspects related to environmental issues, particularly the deterioration of the material and social conditions in the quality of life of many sectors of the population. Despite all these changes, programs to combat air pollution have failed in their attempts to incorporate an appropriate social approach that reflects the economic, social and political dynamics of the past two years. There is a lack of social and political forces to explain air pollution. Consequently, proposals for action do not include policy measures in this respect.

The four programs are relatively successful in exploring the physical, chemical and technical levels of pollution. The four indicate the presence of social components in the underlying causes of the problems. Nevertheless, in the first and second programs, social issues are overshadowed by the concentration of economic activities (industry, services, number of cars, etc.) and population. The third and fourth programs include, as a diagnostic element, a list of other more qualitative components that intervene as explanatory elements, such as cultural factors and the idea of urban processes. Nevertheless, these elements are incorporated more into the conceptual framework as decorative elements than for explanatory purposes, since they are not inter-linked or incorporated into proposals for action. The two Proaire incorporate more variables, some of which have an enormous explanatory capacity, yet, at the diagnostic level, they are not arranged in a hierarchical fashion, nor do they form part of a single interpretive framework. At the level of proposals for action, there is a lack of congruence between the conceptual framework and the strategies, which explains the continued emphasis on isolated measures that do not seek to modify the social, political, economic and urban structure.

7. ELEMENTS FOR AN ALTERNATIVE CONSTRUCTION OF THE ENVIRONMENTAL PROBLEM

Air policy must be constructed on the basis of two components:

1) A conceptualization that situates the air problem in its various levels of existence: *a)* as a result of geographical and natural characteristics; *b)* as part of an environmental problem with which it interacts; *c)* as an effect of land use problems and, in a broader sense, of urban structure; *d)* as a result of organizational technology and forms at the level of economic activities; *e)* as a result of the interplay between economic, social and political forces, and *f)* as a phenomenon influenced, at the macro level, by an urban and social order in which a value system coincides with an economic and political order that lends society as a whole its true content (see Scheme 1).
    2) A specific strategy for action. Public policy refers to general orientations which include objectives, goals and strategies and the

Scheme 1
Analytical Level of Governing Forces that Explain Air Quality in Mexico City
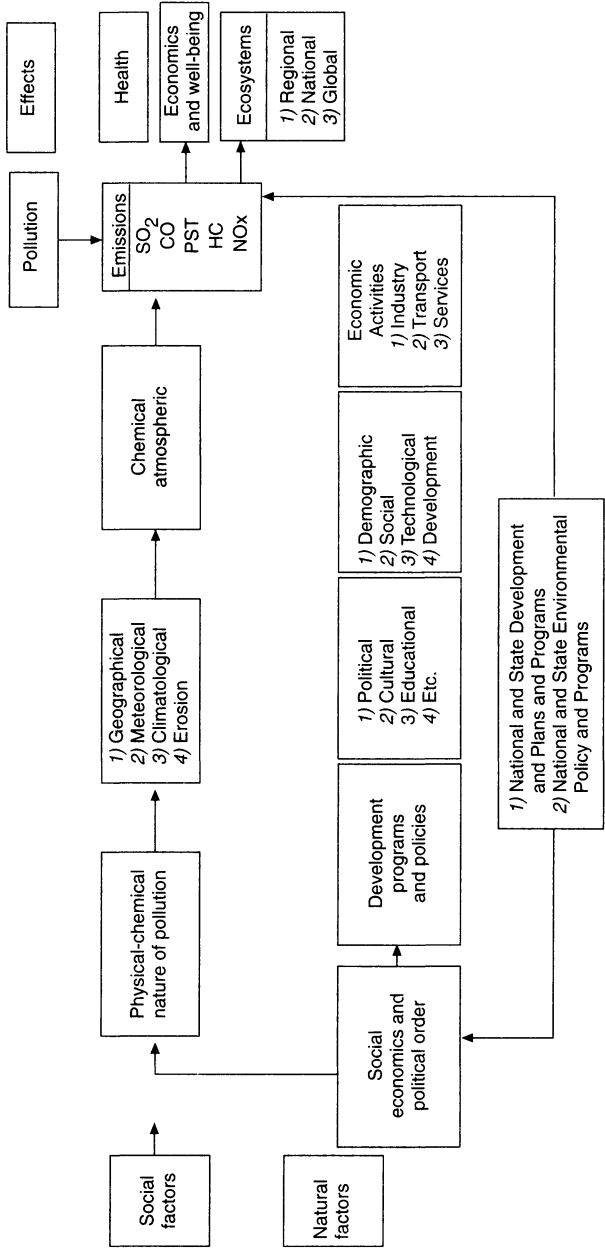
institutional framework in which the proposal is developed. The essence of this aspect is the need to establish congruence between the construction of the problem at the diagnostic level and the type of concrete proposals contained in the programs. It is also vital to elaborate a management proposal in accordance with the proposed policy, in other words, the delegation of responsibilities to various levels of government and, within each level, to the respective secretariats, in order to establish the institutional level that will lead to the implementation of specific measures at the different levels of hierarchical arrangement (see Scheme 2).

The basic aspects mentioned earlier must be borne in mind. One of them is related to the construction of the problem of air pollution undertaken in government programs, particularly aspects related to its conceptualization. When the aim is to design a public policy, the conceptual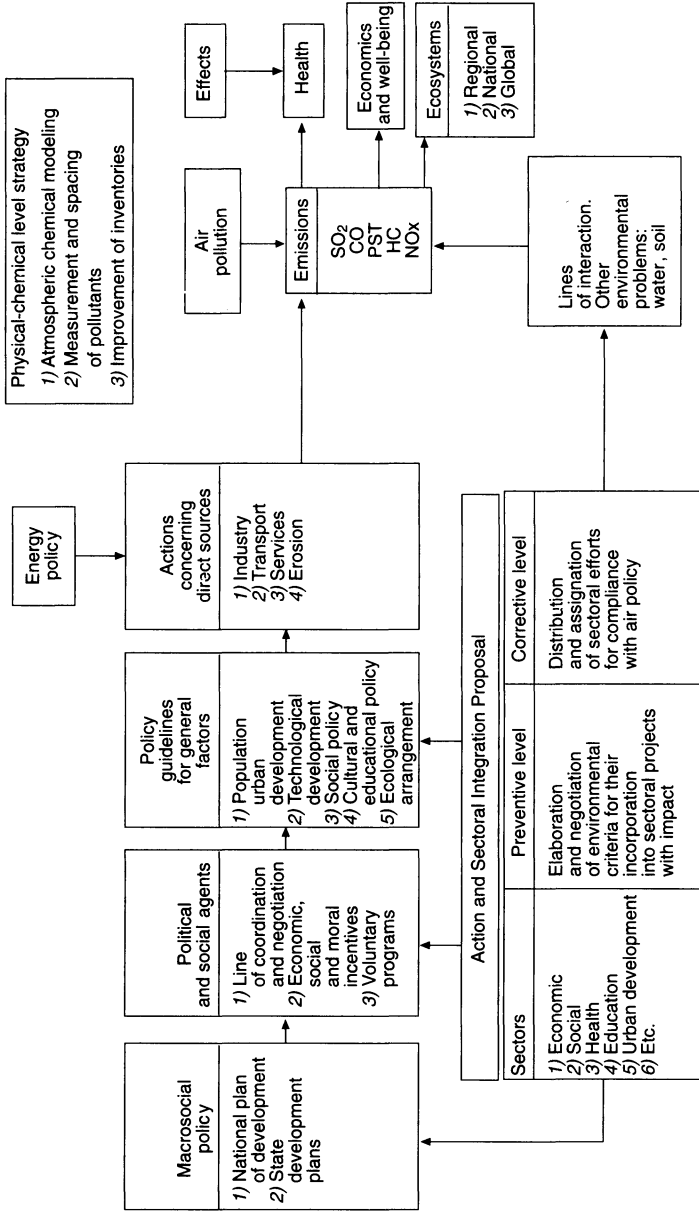 framework must incorporate the agents that personify the physical, technical, technological and economic aspects of environmental problems, the relations between producers and consumers in a set social order, and the value system on which the lives of these agents and the political exchanges in which they take part are based. In this respect, the elaboration of a policy designed to improve air quality must bear in mind the fact that environmental problems are constructed socially and politically and that the solutions also therefore require social and political construction.

The other basic aspect has to do with the necessary congruence between the construction of the problem at the government level and the action strategy proposed to deal with problems. In this respect, it is just as pointless to have a program that defines the problem of pollution simplistically while proposing complex solutions as it is to have one that defines the problem in a complex fashion and proposes simplistic solutions. The first case is true of PCMCA and the second of Proaire. The air problem must also be seen from two angles: from an analytical point of view, pollution appears as a combined product with physical, technical, economic, social and cultural factors. Between the physical and technical and socio-cultural factors, there is a degree of explanatory effectiveness in favor of the latter, insofar as we begin with the assumption that man's social organization and actions are essential modifying elements of the

Scheme 2
Programmatic Level: Government Intervention in Forces Governing Air Quality in Mexico City

Physical-chemical level strategy
1) Atmospheric chemical modeling
2) Measurement and spacing of pollutants
3) Improvement of inventories

Effects

Health

Economics and well-being

Ecosystems
1) Regional
2) National
3) Global

Air pollution

Emissions
SO_2
CO
PST
HC
NOx

Lines of interaction. Other environmental problems: water, soil

Energy policy

Actions concerning direct sources
1) Industry
2) Transport
3) Services
4) Erosion

Policy guidelines for general factors
1) Population urban development
2) Technological development
3) Social policy
4) Cultural and educational policy
5) Ecological arrangement

Political and social agents
1) Line of coordination and negotiation
2) Economic, social and moral incentives
3) Voluntary programs

Macrosocial policy
1) National plan of development
2) State development plans

Action and Sectoral Integration Proposal

Sectors	Preventive level	Corrective level
1) Economic 2) Social 3) Health 4) Education 5) Urban development 6) Etc.	Elaboration and negotiation of environmental criteria for their incorporation into sectoral projects with impact	Distribution and assignation of sectoral efforts for compliance with air policy

natural environment. Within this same analytical level, there are economic and political agents that produce or are involved in environmental problems such as pollution. These agents are the receptors and real forces that participate in policies and it is ultimately they who determine the control of the resources they spend and whose actions and reactions within a scenario characterized by dispute and negotiation determine the type of policy implemented by government authorities.

From the point of view of the second intervention in the problem of pollution, in other words, programmatic intervention, air policy requires strategies at the various levels of existence of the environmental problem. It is therefore essential to design a planning system that will arrange air policy in a hierarchical manner, according to its degree of effectiveness and its margin for maneuver, within the context of other sectoral policies with which they compete for resources and costs. Economic policy has more room for maneuver and controls more resources, meaning that it also includes environmental and air policy. Failure to consider this existing hierarchy between the various public policies leads the environmental authorities to over — or undervalue — the specific sphere and scope of environmental policy. The proposal for action that would lead to a multicausal conception of the environmental problems is one that would also assign different responsibilities to the various sectors and agents involved. All this requires congruence between the diagnosis and the strategy; the inclusion of the various agents according to their importance in the origin and solution of problems, arrangement in hierarchical order according to the degree of effectiveness in attacking problems and the dynamic between conjunctural and underlying problems; the identification and, where appropriate, creation of room for maneuver for action by both sectors and agents.

8. Towards a Comprehensive, Integral Air Policy

From the point of view of its diagnosis and the implementation of policies for its correction, the problem of air pollution should be considered from an analytical and programmatic logic that sheds

light on its main underlying causes and the most appropriate corrective strategies. Both the diagnosis and the policy proposal must begin with the integrated way in which environmental problems occur. This means that although the diagnosis and intervention focus on the problems, as in the case of air pollution, the analysis and policy proposals should be undertaken by bearing in mind the existing interactions between the three main mediums in which natural and social life takes place in ecosystems: water, air and soil.

Air pollution problems in the Valle de México exemplify the close, subtle connection between natural phenomena and human activities. The orographic and meteorological conditions, as well as the nature of the soil, the hydrous and water cycle conditions, the flora, fauna and climate constitute the natural substrate in which the process of social life takes place. Superimposed over this natural basis is human intervention, which produces a new set of interactions and complex processes. The development of economic activities, the process of urbanization, the dynamics of demography and urban development in terms of land use patterns and the relations and interactions between social and political actors, in which the relations between man and nature that take place in the city ecosystem are personified, constitute a fundamental factor in explaining each of the environmental problems in the Valle de México.

Several spheres of natural and social life are affected by the deterioration, pollution or exhaustion of the environment. Air pollution translates into diseases and deaths from respiratory infections, while production is affected by absenteeism resulting from these diseases. But the urban infrastructure and various components of the metropolitan ecosystem are also affected. Water pollution leads to morbidity and mortality from gastrointestinal diseases and its shortage particularly affects popular colonies and the poorest members of irregular settlements. At the same time, waste deposited on the soil is released into the water and air as polluting substances can also directly affect the population's health and the stability or permanence of ecosystems. One of the key factors explaining this ecosystemic view of the environmental and air problem, particularly in the MCMZ, is

the economic, social and political organization in which they take place. These are the main forces driving the deterioration of air quality and its effects on health, well-being, the economy and ecosystems.

It is vital to insist on the fact that the integration of environmental factors takes place as much at the level of the natural existence of the phenomenon as at that of its social existence. Nevertheless, pollution is a phenomenon caused by human intervention in the natural world, hence the importance for public policy design of analyzing this condition of existence of the phenomenon, in order to propose a suitable strategy for preventive and corrective intervention.

From the point of view of the analysis of air pollution, it is possible to establish a logical sequence of explanatory factors that would function as follows. The air pollution that causes damage to health, the economy and ecosystems is the result of a double causal process: 1) On the one hand, there are the factors related to environmental chemistry in which the emissions of substances from the various sources identified (industry, services, transport and natural sources), natural conditions (meteorology, orography, geographical and climatological conditions) which together determine the characteristics that are eventually assumed by the substances released into the atmosphere. This is what we have considered as natural factors here. 2) On the other hand, there are a set of social activities, such as economic activities (production and consumption) that are directly responsible for pollutant emissions. These include industry, services and transport, which, together with soil erosion, are responsible for air pollution in the MCMZ. Nevertheless, these processes in turn are influenced or determined to varying degrees by the state of technology, the organization of productive systems, the organization of the transport systems, and urban development, with its patterns of land use and road infrastructure. Behind these factors, at a more general and comprehensive level, are the macro-economic factors and urban and demographic factors, as well as cultural components. Behind these are social and political agents that personify the factors, processes and relations referred to earlier. The two sets of factors, both natural and social, are produced within the context

of a social order that is economically and politically determined. Government intervention, through indirect sectoral policies and direct programming in environmental issues, influences the nature of pollution, either by creating environmental deterioration and damage or by improving the quality of the environment, as in the case of air quality.

At the level of government intervention (programmatic level), air policy should propose various orders of actions:

1) A policy with specific objectives, goals and actions designed to attack the problem at source. This means actions at the level of industrial plant designed to establish state-of-the-art anti-pollutant technology, according to firms' capacities and economic viability, actions aimed at the organization of productive processes to attack the problem of waste in raw materials and input and establish practices for recycling and reusing materials. Various methods must also be proposed that will help improve environmental performance and be reflected in lower impact, in terms of the deterioration of the quality of the environment and the excessive use of natural resources. The transport structure should take priority within the measures that attack direct forces. An air quality improvement policy must include specific objectives, goals and actions aimed at solving the problems of the road network, modes of the transport and the fuels used by the latter.

2) At a second stage of the programming, general policy guidelines must be proposed that target the most general factors that explain pollution. These have to do with the proposal of a policy involving demography, urban development, technological development, social development and an educational and cultural policy in keeping with the needs and goals of air policy. The author of this paper also proposes negotiations with the various social, economic and political agents directly involved in air pollution.

3) As a key strategy for supporting the effective implementation of air policy, with its specific objectives, goals and actions, this author proposes the need for the sectoral integration of policies at two levels. The first level involves the elaboration and negotiation of the environmental criteria governing the action of sectors with the greatest impact on the environment. A second level, regarded as corrective, consists of the negotiation that will permit the distribution and assignation of the sectoral efforts that must be carried out

to achieve air policy objectives and goals. Under the current public administration scheme, the sectors are not forced to include environmental criteria in their actions. It is essential to promote initiatives aimed at promoting legislative changes that will lend greater sectoral influence to the public offices responsible for environmental management and which include both sanctions and incentives for polluting agents.

4) It is also necessary to propose the organization and systematization of the efforts by citizens and various sectors of society that will permit genuine social participation, both at the moment of design and in the implementation of the actions inherent in air policy.

5) Air policy also requires constant re-adaptation and innovation in energy policy, specific actions at the level of the natural existence (physical and chemical) or air problems and a readjustment of CAM that will enhance the participation of all the government levels that overlap there.

6) As an important part of air policy, authorities must also propose lines of action aimed at the prevention and correction of the environmental problems of the other mediums with which air pollution interacts, in other words, with the problems of water and soil. Policies must be integrated both inside the environmental sector to make the policies in the three mediums (water, air and soil), congruent, as well as between the various sectors responsible for the management of other areas of public administration, whose policies and programs have a major environmental impact.

In order to deal with this, the creation of a metropolitan authority responsible for environmental planning and policy is essential if this problem is to be successfully solved. Consequently, what is now the CAM should be turned into an autonomous institution that is also answerable to the secretariats responsible for the environment at the federal and state level (it is important to include Hidalgo state, since it contains a conurbation). Its autonomy will give it a margin of freedom to design policies and implement measures and even to implement the necessary sanctions and incentives for improving the quality of the environment in the metropolitan zone. It is worth noting that this institution must be responsible for the environmental problem as a whole, since, as pointed out earlier, soil, water and air issues are closely linked.

Semarnat would be the organization responsible for the control and generation of policies and guidelines at the federal level, based on the US model. Environmental secretariats would function like CAL/EPA in California, meaning that specific guidelines would be generated for the MCMZ that would take into account the severity of the problem and the particularities of the region. Local districts would also have to be established that would implement measures at the local level. The latter could be assumed by municipal governments or by groups of the latter when deemed necessary, as in the case of the central *delegaciones* or boroughs in the Federal District (see Scheme 3).

The concept of a global city exemplified by the case of Tokyo would be put forward within this organization. In the first instance, it is necessary to establish the fact that environmental policy is part of urban development policy, meaning that the management of the city and air quality cannot follow different paths. A short-medium- and long-term view is required to ensure a form of urban planning in which the management of environmental problems is part of the city's objective image. At the programmatic level, environmental problems must be directly attacked from the sources that produce pollution. In the case of air, there must be at least three working parties: one devoted exclusively to private transport, since this is the main source of pollution; another devoted to public transport, and another to industry. This institute will also act as a coordinator in the implementation of programs such as Proaire by pressuring all the actors involved in implementing measures. Thus, this institution would be directly responsible for the overall running of this program, but not for the direct implementation of each measure. Finally, there must be an agreement over the person responsible for directing or coordinating this new institution. The CAM system of changing chairman every two years is not practical, since a degree of stability as regards leadership is required to implement long-term policies. For this reason, the chairman should be chosen from the group of career civil servants, with a general coordinator elected by mutual agreement by the secretaries in the environmental area of the states.

It is hoped that this proposal will solve some of the main weaknesses currently affecting CAM, on the understanding that the MCMZ

Scheme 3
Organization Chart Proposal by MCMZ Autonomous Environmental
Federal Government Intitute

```
                    ┌─────────────────────┐
                    │ Federal Government: │
                    │     Semarnat        │
                    └─────────────────────┘
                               │
                               ▼
┌──────────────────┐  ┌──────────────────┐  ┌──────────────────┐
│ Federal District:│  │ State of Mexico: │  │  Hidalgo State:  │
│  Secretariat of  │  │   Secretariat    │  │  State Council   │
│ the Environment  │  │   of Ecology     │  │   of Ecology     │
└──────────────────┘  └──────────────────┘  └──────────────────┘
         │      ◄ - - - ►         │      ◄ - - - ►        │
         ▼                        ▼                       ▼
┌──────────────────┐  ┌──────────────────┐  ┌──────────────────┐
│  Local districts │  │  Local districts │  │  Local districts │
└──────────────────┘  └──────────────────┘  └──────────────────┘
         ◄                        │                       ◄
          ╲                       ▼                      ╱
           ╲          ┌───────────────────────┐        ╱
            ╲         │        MCMZ           │       ╱
                      │     AUTONOMOUS        │
                      │    ENVIRONMENTAL      │
                      │      INSTITUTE        │
                      └───────────────────────┘
            ╱                    │                  ╲
           ▼                     ▼                   ▼
┌────────────┐         ┌────────────┐         ┌────────────┐
│   Water    │         │    Air     │         │    Soil    │
└────────────┘         └────────────┘         └────────────┘
                         │       │
            ┌────────────────┐  ┌─────────────────────────┐
            │ Inter-         │  │ Permanent working       │
            │ institutional  │  │ parties:                │
            │ cooperation:   │  │                         │
            │ Air Quality    │  │ • Private  transport    │
            │ Improvement    │  │ • Public  transport     │
            │ Program        │  │ • Industry              │
            └────────────────┘  └─────────────────────────┘
```

problems require the creation of a permanent institution, with legal support at the metropolitan level, while, in terms of democratization, the political context should enable progress to be made in this respect, by utilizing accumulated regional, national and international experience.

9. Final Reflections

The combination of economic, demographic and urban processes, particularly since the period of industrialization that began in the 1940s, accentuated the concentration of the economy, politics and service provision in Mexico. Industrialization took place around the main urban centers, particularly in Mexico City, Monterrey and Guadalajara.

Since the 1940s, the MCMZ has seen a process of metropolitanization that has created a distinct dynamic for the economy and social and political life in general. The territorial limits of the states have been overtaken by social processes and their consequences. The notions of metropolitan area and zone reflect an order of phenomena that take place in a regional sphere that cannot be delimited by the political and administrative units existing in Mexico. Consequently, the solution of the problems that take place there requires a metropolitan dimension. At present, the exchange system and its intensity among the states comprising the Central Region requires the analysis of these very phenomena but at a level now known as megapolitan, inasmuch as it includes an intense system of exchange between the various metropolitan areas of various states, as happens in the Central Region today.

The legal order contained in the Political Constitution of Mexico does not consider any form of government or authority for the cases of conurbations such as those in Mexico City, in the Valle de México or the central region. Nevertheless, Articles 115 and 122 provide for the creation of commissions and the establishment of agreements to undertake joint planning efforts in urban centers that have become municipalities belonging to two or more states with geographical continuity, which opens up the

possibility for intergovernmental coordination in planning or public policy actions in the areas where the various orders of government overlap. Within this framework, the MCMZ, and even the central region, have been the subject of various attempts at intergovernmental coordination for dealing with the problems that take place there, as a result of which, over the past few decades, seven metropolitan commissions have been created: the Executive Metropolitan Coordination Commission, created in 1992; the Metropolitan Environmental Commission, formed in 1996; the Metropolitan Solid Waste Commission, established in 2003; the Metropolitan Public Safety and Justice Commission, instituted in 1994; the Metropolitan Commission for Transport and Roads, installed in 1998; the Metropolitan Human Settlements Commission, organized in 1995, and the Metropolitan Commission for Civil Protection, set up in 2000.

Perhaps the scope of the environmental problem, and air pollution in particular, as well as the government's will to deal in a coordinated fashion with a problem which, in practice, has resisted unilateral treatment by each of the government organizations that overlap in the metropolis, the metropolitan commission for the environment appears to have been most successful. This does not mean, however, that its current modus operandi is ideal. On the contrary, the current Metropolitan Environmental Commission (CAM) lacks the authority required to perform its functions. The various orders of government comprising it do not work in conjunction as CAM and instead follow the logic of their own states and government levels. CAM's internal organization does not equip it to undertake the planning work that corresponds to it and its legal status means that its accords and resolutions are not compulsory.

The paltry results achieved by the existing coordination mechanisms, as well as the exponential growth of the demands of the zone, call for the design of effective coordination mechanisms that will probably lead to the reshaping of the metropolitan management structures. This implies the transformation of the contractual logic of operation, which appeals to the good will of the actors in signing collaboration and joint action agreements, into a public, compulsory right for the orders of government that over-

lap in the metropolitan zone. This would be an extremely effective means of guaranteeing the integral planning of the management of metropolitan development, which would imply the redistribution of the functions of state and local government, as well as the delegation of a certain type of functions to an organization created to design, coordinate and implement strategic actions for the development of the metropolis.

In order to improve the air quality of Mexico's main metropolis, which is what particularly interests us, it is essential to consider the need for a reflection on the alternative forms of metropolitan authority, since environmental pollution is highly illustrative of a problem in which borders overlap, meaning that, in order to be dealt with and solved, it requires proposals in the political and administrative sphere that will enhance the technical measures required as well as the transformations of the social, cultural and educational spheres, essential for advancing towards the construction of a culture oriented towards a type of coexistence between man and nature that will replace today's predominantly utilitarian view. In this respect, it is worth noting that although the Metropolitan Environmental Commission is the experience of institutional coordination that has proved most successful in the metropolis to date, efforts to improve the environment, particularly air quality, are as yet insufficient. This paper proposes transforming this commission into an autonomous institute, in order to solve some of CAM's present flaws, such as the lack of legal and institutional support that would give it the authority to make decisions, establish sanctions and incentives and, in general, devise a policy to improve air quality based on short-, medium- and long-term measures; the lack of resources (both economic, human and infra-structural) that lend the policy support and sustainability and the disintegration of policies and measures for environmental resources (water, soil and air). One aspect that remains pending is the design of evaluation and follow-up mechanisms that are crucial to the elaboration of a public policy, since they enable one to correct mistakes, reinforce actions, and fine-tune objectives.

10. REFERENCES

AQMD (2004), AQMD *Adopts Updated Clean Air Plan for Southland. AQMD Calls on State, Federal Government to Step Up Smog-Fighting Efforts* [on line], Diamond Bar, California, South Coast Air Quality Management District. Available at: http://www.aqmd.gov/news1.

Asamblea Legislativa (1995), *Ley para el Fomento Económico del Estado de México* [on line], Toluca, Estado de México, Gobierno del Estado. Available at: http://www.edomexico.gob.mx/legistel/cnt/LeyEst_059.html

———— (1999), *Plan de Desarrollo del Estado de México, 1999-2005* [on line], Toluca, Estado de México, Gobierno del Estado. Available at: http://www.edomexico.gob.mx/newweb/archivo%20general/planed.htm

Asamblea de Representantes del Distrito Federal (1995a), "Crecimiento económico. Objetivos de la política económica," *Plan Nacional de Desarrollo 1995-2000*, Mexico.

———— (1995b), "Crecimiento económico. Líneas de estrategia," *Plan Nacional de Desarrollo 1995-2000*, Mexico.

———— (1998), *Programa General de Desarrollo del Gobierno del Distrito Federal 1998-2000*, Mexico.

Association of Governments (Santa Barbara County) (2001), *Clean Air Plan. Summary of Revised Pages* [on line], Santa Barbara, California, Santa Barbara County Air Pollution Control. Available at: www.sbcapcd.org/cap01/chap_1.pdf.

Baker, R. (1989), "Institutional Innovation, Development and Environmental Management: an Administrative Trap Revisited. Part II," *Public Administration and Development*, Vol. 9, pp. 159-167.

Barlow, I. M. (1991), *Metropolitan Government*, New York, Routledge.

Bay Area Air Quality Management District (2004), *Web Site*, San Francisco, California, California State Government. Available at: www.baaqmd.gov/pie/backgrnd.htm.

CEPA (1999), *Canadian Environmental Protection Act, 1999* [on line], Canada, Environmental Canada's Green Lane. Available at: www.ec.gc.ca/CEPARegistry/plans/p2.

———— (2004), *Agenda para la limpieza del aire* [on line], Canada, CEPA. Available at: www.ec.gc.ca/air/being_done_f.html.

Chávez Galindo, Ana María, and Sandra Savenberg (1995), "Nuevo horizonte de la migración en el centro de México: 1970-1990," *Estudios Demográficos y Urbanos*, Vol. 10, No. 2 (29), pp. 295-345.

Comisión Metropolitana de Transporte y Vialidad, Cometravi (1999),

Diagnóstico de las condiciones del transporte y sus implicaciones sobre la calidad del aire en la zmvm, Mexico.

Comisión Nacional de Ecología (1987), *Ecología: 100 acciones necesarias*, Mexico, Comisión Nacional de Ecología.

Comisión Nacional del Medio Ambiente (2004), *Web Site*, Santiago, Chile, Conama. Available at: http://www.conama.cl/portal.

Comisión Regional del Medio Ambiente (2004), *Web Site*, Santiago, Chile, Conama. Available at: http://www.conama.cl/portal.

Conapo (1998), *Escenarios demográficos y urbanos de la Zona Metropolitana de la Ciudad de México, 1990-2010. Síntesis*, Mexico, Consejo Nacional de Población.

———— (2002), *La situación demográfica de México, 2002*, Mexico, Consejo Nacional de Población.

Corona Cuapio, R. (1998), "La región centro de México: ¿una región funcional?," Master's Thesis on Urban Development, Mexico, El Colegio de México.

Cotler, H., and C. Sick (2000), "Suelo y medio ambiente," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

Damián, A. (2000), "Pobreza urbana," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

DDF (1978), *Reunión de expertos sobre la calidad del aire en el Valle de México*, Mexico, Departamento del Distrito Federal.

———— (1990), *Programa Integral contra la Contaminación Atmosférica de la zmcm, picca*, Mexico, Departamento del Distrito Federal.

———— and Comisión Intersecretarial de Saneamiento Ambiental (1979), *Programa Coordinado para Mejorar la Calidad del Aire en el Valle de México, 1979-1982, pmca*, Mexico, Departamento del Distrito Federal.

———— et al. (1996), *Programa para Mejorar la Calidad del Aire en el Valle de México, 1995-2000 (Proaire)*, Mexico, Departamento del Distrito Federal.

Delaunay, D. (1995), "Fracturas espaciales de un desarrollo discriminatorio," *Estudios Demográficos y Urbanos*, Vol. 10, No. 2(29), pp. 347-374.

Delgado, J. (1998), *Ciudad-región y transporte en el México central. Un largo camino de rupturas y continuidades*, Mexico, Plaza y Valdés.

Distrito Administrativo de la Calidad del Aire (aqmd) (2004), "Versión preliminar del Plan Administrativo de la Calidad del Aire para el

Distrito Propuesto para 2003" [on line], Diamond Bar, California, Air
Quality Management District. Available at: http://www.aqmd.gov/
aqmp/docs/SP%20PreviewSummary2003.pdf.

Eibenshutz, Roberto, and Alberto Rébora (coords.) (2000), *El desarrollo
urbano del Distrito Federal en el año 2000*, Mexico, GDF/Seduvi.

García, B., and O. de Oliveira (2000), "El mercado de trabajo, 1930-1998,"
in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo
milenio*, Mexico, El Colegio de México, Centro de Estudios
Demográficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

García, H. (1987), "El uso del suelo en la zona metropolitana de la Ciudad
de México," in Gustavo Garza (coord.), *Atlas de la Ciudad de México*,
Mexico, Departamento del Distrito Federal/El Colegio de México.

Garrocho, C. (1996), "Distribución espacial de la población en la Zona
Metropolitana de la Ciudad de México," *Estudios Demográficos y
Urbanos*, Vol. 11, No. 1 (31), pp. 69-100.

Garza, G. (1985), *El proceso de industrialización en la Ciudad de México, 1821-
1970*, Mexico, El Colegio de México.

——— (1992), *Desconcentración tecnológica y localización industrial en
México*, Mexico, El Colegio de México.

——— (1999), "Globalización económica, concentración metropolitana
y políticas urbanas en México," *Estudios Demográficos y Urbanos*,
Vol. 14, No. 2 (41), pp. 269-311.

——— (2000a), "Ámbitos de expansión territorial," in Gustavo Garza
(coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, El
Colegio de México, Centro de Estudios Demográficos y de Desarrollo
Urbano/Gobierno del Distrito Federal.

——— (2000b), "Servicialización de la economía metropolitana, 1960-1998,"
in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo
milenio*, Mexico, El Colegio de México, Centro de Estudios Demo-
gráficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

——— (2003), *La urbanización de México en el siglo xx*, Mexico, El Colegio
de México, Centro de Estudios Demográficos y de Desarrollo Urbano.

——— and A. Damián (1991), "Ciudad de México: etapas de crecimiento,
infraestructura y equipamiento," in Martha Schteingart (coord.),
Espacio y vivienda en la Ciudad de México, Mexico, El Colegio de México.

——— and S. Rivera (1995), "Desarrollo económico y distribución de la
población urbana en México, 1960-1990," in A. Aguilar, L. J. Castro
and E. Juárez (coords.), *El desarrollo urbano de México a fines del siglo xx*,
Monterrey, Instituto de Estudios de Nuevo León.

——— and J. Sobrino (2000), "Distribución intrametropolitana de la in-
dustria, el comercio y los servicios," in Gustavo Garza (coord.), *La*

Ciudad de México en el fin del segundo milenio, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano/ Gobierno del Distrito Federal.

GDF (1996), *Programa General de Desarrollo Urbano*, Mexico, Gobierno del Distrito Federal.

—————— (2004), *Servicio de Transportes Eléctricos, Red de Transporte de Pasajeros del Distrito Federal y Servicio de Transporte Colectivo Metro*, Mexico.

——————, Semarnat, SS and Gobierno del Estado de México (2002), *Programa para Mejorar la Calidad del Aire de la Zona Metropolitana del Valle de México, 2002-2010, Proaire 2*, Mexico, Gobierno del Distrito Federal, Secretaría del Medio Ambiente y Recursos Naturales, Secretaría de Salud and Gobierno del Estado de México.

Gobierno del Distrito Federal. Fideicomiso de Estudios Estratégicos sobre la Ciudad de México (2000), *La Ciudad de México hoy. Bases para un diagnóstico*, Mexico.

Graizbord, B., E. Nava and R. Lemus (2000), "Uso del automóvil privado en el área metropolitana de la Ciudad de México," in Gustavo Garza (comp.), *La Ciudad de México a finales del segundo milenio*, Mexico, El Colegio de México.

Grajales, G. (2000), "Uso del suelo y conformación territorial," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

Hamilton, David K. (1999), *Governing Metropolitan Areas: Response to Growth and Change*, New York, Garland.

Ibarra Vargas, V. (1998), "Las manufacturas en Nuevo León durante el periodo 1985-1993," in Manuel Ceballos (coord.), *Monterrey 400. Estudios históricos y sociales*, Monterrey, Universidad Autónoma de Nuevo León.

—————— (1991), "Conformación del espacio urbano y su relación con el transporte público. Aspectos históricos," in Martha Schteingart (coord.), *Espacio y vivienda en la Ciudad de México*, Mexico, El Colegio de México.

INEGI (1995), *XIV Censo industrial, XI Censo comercial y XI Censo de servicios*, Mexico, Instituto Nacional de Estadística, Geografía e Informática.

—————— (1996), *Conteo nacional de población y vivienda, 1995*, Mexico, Instituto Nacional de Estadística, Geografía e Informática.

—————— (2001), *XII Censo general de población y vivienda, 2000*, Mexico, Instituto Nacional de Estadística, Geografía e Informática.

Iniciativa sobre Calidad del Aire de Hamilton-Wentworth (2004), *Iniciativa sobre Calidad del Aire de Hamilton-Wentworth y Visión 2020, Canadá* [on line], Madrid, Dirección General de Urbanismo y Política de Suelo

del Ministerio de Vivienda. Available at: http://habitat.aq.upm.es/dubai/00/bp423.html.

[Intersecretarial Group of International Environmental Issues] (1979), *México: acciones y políticas en materia ambiental*, Mexico, Secretaría de Relaciones Exteriores, Gobierno de México.

Islas, V. (2000a), *Llegando tarde al compromiso: la crisis del transporte en la Ciudad de México*, Mexico, El Colegio de México.

———— (2000b), "Red vial," in Gustavo Garza (comp.), *La Ciudad de México a finales del segundo milenio*, Mexico, El Colegio de México.

Lezama, J. L. (1997), "El problema del aire en el Valle de México: crítica a la política gubernamental, 1979-1996," *Estudios Demográficos y Urbanos*, Vol. 12, No. 3 (36), pp. 427-472.

———— (2000), *Aire dividido*, Mexico, El Colegio de México.

López Portillo and Ramos, M. (1982), *El medio ambiente en México: temas, problemas y alternativas*, Mexico, Fondo de Cultura Económica.

Mazari, M., and A. Loyola (2000), "Contaminación del agua," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

Molina, L., and M. Molina (2002), *Air Quality in the Mexico Megacity. An Integrated Assessment*, Kluwer Academic Publishers.

Monterey Bay Unified Air Pollution Control District (1995), CEQA *Air Quality Guidelines* [on line], California, The California Environmental Quality Air. Available at: http://www.mbuapcd.org/index.cfm?Doc=210.

———— (2001), *Third Revision to the 1991 Air Quality Management Plan for the Monterey Bay Region* [on line], California, The California Environmental Quality Air. Available at: http://www.mbuapcd.org/index.cfm?Doc=136.

Muñoz, M. (1996), "Contexto del transporte en la Zona Metropolitana de la Ciudad de México," in Juan de Dios Pineda (coord.), *Los retos del transporte urbano*, Mexico, Japan International Cooperation Agency (JICA).

Navarro, B., and S. Bacelis (2000), "El metro como sistema de transportación masiva," in Gustavo Garza (comp.), *La Ciudad de México a finales del segundo milenio*, Mexico, El Colegio de México.

Negrete, M. E. (1999), "Desconcentración poblacional en la Región Centro de México," *Estudios Demográficos y Urbanos*, Vol. 14, No. 2 (41), pp. 313-352.

———— (2000), "Dinámica demográfica," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

OPS/OMS (2003), *Gestión de la calidad del aire. Diagnóstico preliminar*, Quito, Pan American Health Organization and World Health Organization.

O'Ryan, Raúl Enrique (1994), *Cost-Effective Policies to Improve Urban Air Quality in Santiago, Chile*, Santiago de Chile, Departamento de Ingeniería Industrial, Universidad de Chile.

Paiva, A. (1999), "Argumentos para la gestión metropolitana en Latinoamérica," *Ciudades, Planeación Urbana y Metropolitana*, No. 42, pp. 12-18.

Plan de Monitoreo Continuo del Aire para el Área del Polo Petroquímico Dock Sud (2004) [on line]. Available at: www.medioambiente.gov.ar/dock_sud/default.htm.

Plan de Monitoreo Continuo del Aire para el Área del Polo Petroquímico Dock Sud (2000) [on line], Buenos Aires, Argentina, Secretaría de Ambiente y Desarrollo Sustentable. Available at: http://www.medioambiente.gov.ar/dock_sud/default.htm.

Plan Tokyo 2000 (2000) [on line]. Available at: www.toshikei.metro.tokyo.jp/plan/pe-004.htm.

Portney, K. (1992), *Controversial Issues in Environmental Policy*, Newbury Park, Sage Publications.

Puente, S. (2000), "Riesgo y vulnerabilidad urbana," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

Rubalcava, R., and M. Schteingart (2000), "Segregación socioespacial," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio*, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

Salazar, C. (1999), *Espacio, ciudad y vida cotidiana en la Ciudad de México*, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano.

Savich, H.V., and R. Roguel (coords.) (1996), *Regional Politics: America in a Post-City Age*, Thousand Oaks, Sage.

Schteingart, M. (1990), *Espacio y vivienda en la Ciudad de México*, Mexico, El Colegio de México.

―――― et al. (1997), *Pobreza, condiciones de vida y salud en la Ciudad de México*, Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano.

Sedue (1983), *Reglamento para la protección del ambiente contra la contaminación originada por la emisión de ruidos*, Mexico, Secretaría de Desarrollo Urbano y Ecología.

―――― (1990), *Programa Nacional para la Protección del Medio Ambiente, 1990-1994*, Mexico, Secretaría de Desarrollo Urbano y Ecología.

Secretaría del Transporte (1999), *Anuario de transporte y vialidad,* Mexico, Gobierno de la Ciudad de México.

Sobrino, J. (2000), "Participación económica en el siglo xx," in Gustavo Garza (coord.), *La Ciudad de México en el fin del segundo milenio,* Mexico, El Colegio de México, Centro de Estudios Demográficos y de Desarrollo Urbano/Gobierno del Distrito Federal.

Ulriksen, P., and M. Prendez (1993), *Contaminación atmosférica en Santiago: estado actual y soluciones,* Santiago, Universidad de Chile.

Unikel, L., G. Garza and C. Ruiz Chiapetto (1976), *El desarrollo urbano en México,* Mexico, El Colegio de México.

VIII. URBAN TRANSPORT AND AIR POLLUTION IN THE MEXICO CITY METROPOLITAN AREA

Valentín Ibarra Vargas

1. INTRODUCTION

The inhabitants of Mexico City who, for one reason or another, need to travel every day, have a negative opinion of transport. Some of the most frequent complaints refer to the chaotic way in which public transport operating on the basis of concessions runs, the excess number of cars that circulate at particular times of the day, the traffic jams due to the absence of a proper road infrastructure, and the lack of traffic surveillance and control. At the same time, the severe deficiencies in people's everyday circulation hamper the urban economy and affect the population's well-being in various ways. They reduce the time available for rest and relaxation and increase the likelihood of accidents, while traffic jams raise the risk of neuropathies and armed robbery and more pollutants are produced.

Although those responsible for transport policy (in Mexico State and the Federal District) are aware of the prevailing situation (as shown by the diagnosis in the Metropolitan Commission's Study on Roads and Transport), their actions have been limited as regards the scope of the crisis faced by transport, due largely to the fact that they have to compete for a share of the budget with other sectors of the government that are also attempting to claim large amounts of the budget to serve urgent needs such as health and safety. In the case of the Federal District, this does not mean

that a trivial fraction of public funds are being used; on the contrary, the most widely publicized actions have included costly improvements to the road system, which includes various works such as the building of bridges, ring roads and the second story of part of the west ring road. A second intervention in the field of transport (less well known than "the second story") is nearing completion. It involves strategic corridors for above-ground public transport that entails less investment than the infrastructure works mentioned earlier and the expansion of the underground network. It is worth noting that these investments mainly favor part of the Mexico City Metropolitan Area (MCMA),[1] excluding what corresponds to the metropolitan municipalities in the Mexico State (although it is still hoped that a metropolitan train will be able to meet the needs of the population living in the north periphery of the MCMA).

At the same time, there are those that maintain the hypothesis that problems derived from transport in general are closely linked to the speeds and way in which the city is growing. Consequently, if the problem of urban growth is dealt with, transport-related problems will be more likely to be solved. Proving this hypothesis obviously requires a historical analysis that exceeds the limits of this paper.

Yet regardless of whether attempts are made to solve the deficiencies of urban transport by investing in its infrastructure or trying to orient the city's future growth, local governments obviously are and have been responsible for these tasks. Determining why achieving these goals seem virtually impossible today would involve evaluating the performance of the authorities that are legally authorized to intervene in transport and urban development. For example, it would be necessary to consider which government levels participate in decisions of this nature, whether they do so in a coordinated fashion and as part of the same plan of action and whether they possess the economic and legal resources to achieve their long-term objectives, etc. Once again, this is beyond the scope of this paper.

[1] The data in the official information refers to the Metropolitan Area of the Valle de México, which includes 16 *delegaciones* and 18 municipalities in the Mexico State conurbation. However, in this paper this area is always referred to as the Mexico City Metropolitan Area.

Determining the most suitable transport policy from the perspective of the functioning of the metropolis (particularly from the economic and politico-administrative point of view) for the transport needs of the majority of the population, of an urban growth that will not exacerbate the imbalance with the environment (by preserving the ecosystems in its immediate and mediate surroundings; avoiding increasing the already high levels of air, soil and water pollution and trying to reduce the use of non-renewable resources) would require a conscientious, long-term study that should be undertaken now.

Given the complexity involved in presenting a brief assessment of all the social, politico-administrative and economic implications of transport, this paper aims solely to show one of the consequences of the conditions of transport in the MCMA: the release of pollutants into the atmosphere. To this end, the transport model that has evolved will be reviewed to show why the vehicles used to transport people and goods are responsible for most of the pollution produced.

2. PASSENGER TRANSPORT

A proportion of the pollutants produced by internal combustion vehicles is associated with the way in which the transport service operates. To illustrate this, Table 1 provides a general overview of the way the population used available means of transport.

The first thing that strikes one about the table is the inconsistency between the figures for 1983 and 1994, noticing which does not require conducting a detailed examination. For example, it is difficult to believe that the Metro experienced such a sharp fall before recovering in the year 2000. Moreover, some of the firms that provide these services have published their own data, which differ from the trend shown in the table. Thus, the information for the year 2000 was reconstructed, on the one hand, using the reports published by the official organizations responsible for each mode of transport, and on the other, by the estimates drawn up (for licensed transport and taxis) on the basis of a highly aggregated distribution model.

Despite the limitations mentioned, there was a noticeable decline in the number of urban bus passengers during the last seventeen years and a slight drop in the use of the Metro during the period from 1994 to 2000. It is also clear that these losses have been offset by the increase in "collective taxis" (microbuses and vw vans), which have a small capacity for transport in relation to urban buses and the Metro. The most immediate consequence is an increase in the number of motorized public transport vehicles, which, as we shall see in the second section of this paper, operate to the detriment of environmental conditions in the atmosphere. For the moment, suffice it to explore what has been happening in each mode of transport.

The history of urban buses has been extensively documented. Both studies that date back to its origins and recent analyses have shown how this service that was once the main mode of transport has declined to such an extent that it has virtually been replaced by minibuses. This service has been managed in a variety of ways. It began as a personal activity (driver-owner), which was transformed into a unique system of private firms. In 1981, these firms were expropriated to form the state firm Autotransportes Urbanos de Pasajeros R 100 (AUPR-100) (R 100 Urban Passenger Transport), declared bankrupt in 1995, after which it was run by a trade union with the aim of privatizing the service by granting concessions for each route to private firms with sufficient financial capacity. An offshoot of this AUPR-100 Confiscation Board was a special service that became part of the public organization known as the Federal District Electric Transport Service (STE-DF), comprising 189 vehicles: 169 articulated buses and 20 "metrobuses" that provided services for the handicapped. In 2000, the network of articulated buses and buses for the handicapped transported 27.6 million and 630,000 persons respectively; in other words, they covered just over 77,000 trips daily.

Transport services were also provided by the buses belonging to the government firm "Passenger Transport Network" (RTP), the heir to the service provided by the AUPR-100 Confiscation Board. Every day, an average of 860 units operate, enabling 456,780 trips a day to be made (see Table 1). Since 1997, this trend has steadily declined, although the number of vehicles operating has remained

Table 1
MCMA: Distribution of Journeys-Person by Day by Mode of Transport, 1983, 1944 and 2000

Mode of Transport	Journeys/person by day			Share (%)		
	1983	1994	2000	1983	1994	2000
STC Metro	6,515,716	3,234,000	3,816,843	29.08	13.90	13.67
Urban contracted buses, DF	5,821,759	1,566,000	1,186,667	25.98	6.80	4.25
Private cars	4,267,815	4,042,000	5,301,171	19.04	17.40	18.98
Suburban buses	3,147,929	802,000		14.04	3.50	
Collective taxis (metropolitan)	1,838,715	12,510,000	15,691,466	8.20	54.00	56.19
Trolleybus (STE)	280,614	131,000	396,400	1.25	0.60	1.42
School bus	191,612	n. a.		0.85		
Free and taxi-rank taxis	154,802	568,000	1,073,973	0.69	2.40	3.85
Bicycle	90,929	167,000		0.41	0.70	
Tram	59,035	0		0.26		
Trucks	29,158	n. a.		0.13		
Motorcycle	15,498	18,000		0.07	0.10	
Other (RTP)		148	456,780		0.60	1.64
Total	22,413,582	23,186,000	27,923,300	100.00	100.00	100.00

n.a.: Not available.
Sources: Islas (2000), Secretaría de Transporte y Vialidad, GDF (2000 and 2001).

relatively constant since 1998. The Secretariat of Transport and Highway Administration has responded that in 10 out of the 100 routes, the average daily number of trips is indeed far lower than that for the network as a whole due to the introduction of new less polluting units, with lower fuel needs, but that the results of this effort will be reflected over the next few years. Obviously, what one should ask the Secretariat is why demand is falling in these ten routes. They may be gradually eliminated, since the number of routes has fallen constantly since 1997 (to 125, 119, 113 and 100 in 1997, 1998, 1999 and 2000 respectively), and in some of those that continue to operate, the average number of units in operation was lower in 2000 than it was in previous years, although in others it has increased. It is worth noting that at no point did the authorities state that the vehicles had been reassigned in keeping with the importance of each route, in other words, there does not appear to be a coordinated plan that would explain the momentary decline in RTP service.

It is worth adding that the city government is currently experimenting with a new dual-engine bus (which runs on diesel and compressed natural gas). In the United States, this type of engine has been widely used in school and government vehicles, and there is no reason why not only mass transport but all vehicles owned by local and federal government that circulate in the MCMA should not have incorporated this type of engine.

Finally, another group of buses operate under a concession system. The aim of privatizing certain routes has been relatively successful: some of the biddings for public contracts have been won and others declared void. Former AUPR-100 workers participated in a competition in which four firms bid for 51 routes. The process of granting concessions has been slow, meaning that there are still very few buses operating under concession (1,197), distributed among 97 routes grouped into nine firms. The advantage of providing the service under concession is that precise routes are assigned that may not be altered to suit the concessionaire. One assumes that this assignation follows a plan to which future concessionaires will have to adjust. In other words, the program to put the bus network in order is as yet in its infancy. For the time being, it only includes buses operating under concession and RTP

buses, which will also help to offset the environmental effects they currently produce.

The final balance regarding the operation of urban buses in the Federal District is negative; the trips made in all types of urban bus account for 6.16% of all trips, a sharp drop from the 50% observed in the 1970s. For this reason, if the authorities do not continue investing in RTP to cover more routes, if they fail to persuade private urban bus companies to assume responsibility for the lines previously administered by the city government and if they do not manage to convert minibuses into buses quickly enough, this will lead to the continued proliferation of less efficient modes of transport such as minibuses, taxis and private cars. It goes without saying that a similar policy should be considered by the Mexico State authorities.[2]

In 2000, collective, fixed route taxis occupied the position held by buses in 1982, with 27, 928 vehicles (including 3,904 vw vans, 22,850 minibuses and 1,174 buses) distributed among 106 routes and 1,071 subsidiary routes, which undertake 56% of the total daily trips in the MCMA (see Table 1). The environmental problem caused by minibuses and vw vans is not only due to their high number; several problems are also caused by the way they are operated. For example, the "bases," in other words, the places from which the vehicles depart and where they are repaired, are located in the middle of the public thoroughfare. This causes agglomerations, which in turn create more traffic jams and pollution.

Be that as it may, they play a key role in inter-urban mobility. The emergence of this mode of transport and its subsequent development can be explained by the deterioration of the bus service; in other words, they meet the demand for trips that the latter is unable to cover. Moreover, unlike the Metro, which has a non-metropolitan scope, "collective taxis" adapted to the growth of the urban sprawl, since they managed to reach the most remote

[2] As for the degree of efficiency of the service, some people incline towards the microbus, because of the flexibility with which it adapts to the new transport needs. Due to the fact that their cruising speed is higher than that of larger buses, users will always prefer to use microbuses, provided the fares are the same. Moreover, users are insensitive to the fact that the circulation of a large volume of microbuses produces more pollutants than a smaller number of buses with a higher capacity.

parts of the city. Finally, the Secretariat of Transport and Highway Administration of the Federal District Government decided to eliminate new concessions for microbuses and force the owners to gradually replace the old vehicles with new ones with greater capacity, in other words, with buses. The key, however, is that there should be continuity in this policy, while guidelines and controls should be stricter. Otherwise, the same disorder as there is now will simply continue, with predictable effects on passengers' comfort and pollution levels.

On the other hand, taxis are imperceptibly gaining ground as a mode of transport. The number of users is rising, due to the increase in income of a sector of the population in the MCMA, together with the deficiencies in the public transport system. Their increased presence is reflected not only in the proportion of trips they account for, but also in the continuous rise in the number of taxis, whether independent or linked to a taxi rank: the 87,499 taxis registered in 1997 rose to 102,110 in the year 2000, in other words, they rose by 16.70% during a period of three years. This should be taken into account when analyzing the release of pollutants per each mode of internal combustion transport.

At this point, it is worth mentioning electric transport, i.e. trolley buses and light trains (as noted earlier, articulated buses and buses for the handicapped belong to the same decentralized organization known as "Electric Transport Service in the Federal District"). Pollutant inventories do not expressly include these modes of transport as sources of air pollution. One can only assume that since they mainly run on electric energy, then these pollutants are included in the service sector, specifically in the sub-sector called "commercial/institutional combustion." However, if one wishes to determine the transport system's contribution to the total number of emissions released in the MCMA, one has to add an estimate of the volume of pollution produced by the generation and distribution of the electric energy consumed by electric transport. This would challenge the commonly-held view, even among the authorities concerned, that automobile transport is the only kind that pollutes. It is therefore useful to carry out a detailed examination of the situation in order to clarify any doubts about the social and environmental efficiency of electric transport in relation to other

modes of transport. If, however, we provisionally accept the fact that the transport system should rely more on the Metro, the trolley bus or the light train, then we should also consider how they are operating.

The city's current administration has undertaken a number of actions to improve the trolley bus network service, such as adopting the trolley bus station, providing new lines (by installing overhead cables) for the maintenance and vehicle parking yard, and extending one of the lines by 2.76 km. Old units have been replaced with new ones (Masa Mitsubishi Make series 9,000 and series 9,800 trolley buses made by Alstom) to modernize the fleet of vehicles, the number of which increased from 298 to 344 between 1994 and 2000. These investments were undoubtedly necessary, since otherwise the deterioration of the service observed in previous years would have further weakened the position of this mode of transport within the system.[3] The causes are obvious: the lines have been insufficiently lengthened (from 359.6 km in 1994 to 422.14 km in 2000),[4] while the mean time per trip has remained virtually constant.

In short, the population believes that trolley buses provide the worst service of all forms of public transport (see Islas, 2000). This means that it has become increasingly unable to compete with other modes of transport. Consequently, the increase in the demand for transport service, due simply to population growth, is being channeled into modes of transport other than the trolley bus.

The light train has a single line measuring 12.5 km, which once belonged to the last streetcar that circulated in the Federal District. It begins at Tasqueña station, which links up with the last station of Line 2 of the Metro and ends in the center of the Xochimilco *delegación* or borough. Like the streetcar, the light train reduced its share of trips by 3.85% between 1999 and 2000. This has been attributed to the fact that the time of the journey be-

---

[3] The period 1994-1998 experienced a sharp decline in the number of passengers, representing a loss of 41.6% (from 108,417,058 to 63,347,620). Conversely, between 1998 and 2000 it experienced a slight increase, albeit an insufficient one, since it barely exceeded 1998 figures (see Secretaría de Transporte y Vialidad, GDF, 2001).

[4] See Secretaría de Transporte y Vialidad, GDF (2000 y 2001).

tween Xochimilco and Tasqueña was extended due to maintenance work on both the light train and the Metro. Its share of the total number of trips is insignificant, but the experience may have served to deter further attempts to expand it. The *Anuario de transporte y vialidad de la Ciudad de México* (Secretaría de Transporte y Vialidad, GDF, 2000 and 2001) makes no mention of the fact that drivers are forced to increase traveling time by having to stop at numerous crossroads. All these small delays make the light train less competitive, which in turn means that its share of modal distribution is increasingly small.

The situation of official public transport is less dramatic in the case of the Metro. In other words, its importance has gradually declined, except during the past year, when it experienced a slight rise in the number of passengers it attracted, although it failed to recover from the losses it experienced between 1995 and 1999. In order to provide a more detailed account of the changes undergone, the period has been divided into parts (see Table 2). Thus, during the period from 1995 to 1998, when the length of the network remained unchanged (177.66 km), the volume of passengers fell, particularly on working days. Shortly afterwards, on December 15, 1999, the stretch of Line B linking Villa de Aragón to Buena Vista was opened although, as one can see from Table 2, this failed to have any effect on 1999, since the number of passengers it attracted was 5.27% less than in 1998. The following year, on November 30,2000, the stretch from Buena Vista to Ciudad Azteca of Line B was opened, although in this case the number of passengers rose significantly between 1999 and 2000. The effect of further investment in the Metro, which began to take place in 2000, may have had more results in subsequent years.

The factor that led to the reduction in the number of passengers between 1995 and 1998 is probably linked to the demographic phenomenon already identified in other studies and to the distribution of activities in the MCMA, in other words, land use. One should recall, first of all, that the Metro network does not exceed the limits of the Federal District. Secondly, as far as population distribution is concerned, the Federal District is losing population in absolute terms in its central boroughs, whereas in the metropolitan municipalities in Mexico State it is growing at above the

Table 2
Federal District: Passengers Transported by STC-Metro,
by Day of Week

	Day of week			
	Working days	Saturdays	Sundays and Holidays	Total
	Passengers transported (thousands)			
1995 (1)	1,162,304	175,646	136,019	1,473,969
1996 (2)	1,116,111	173,861	135,493	1,425,465
1997 (3)	1,063,480	167,391	130,675	1,361,546
1998 (4)	1,052,416	165,181	126,439	1,344,036
1999 (5)	1,003,276	148,524	121,452	1,273,252
2000 (6)	1,088,817	166,934	137,397	1,393,148
	Increase during period (%)			
(1)-(4)	−9.45	−5.96	-7.04	−8.81
(4)-(5)	−4.67	−10.08	-3.94	−5.27
(5)-(6)	8.52	12.4	13.13	9.42
(1)-(6)	−3.92	−4.96	1.01	−5.48

Source: Secretaría de Transportes y Vialidad, GDF (2000).

national mean. Thirdly, the downtown area is changing its economic profile and becoming increasingly specialized in the high level service sector (particularly finances). This is why most of the eleven Metro lines have experienced a drop in the number of passengers transported during the period from 1995 to 2000. The exception is Line 8, which has experienced a steady rise in its number of passengers; this is probably due to the growth of industry in the boroughs in the east part of the city and to the population growth in municipalities in the east of the MCMA.

In short, due to the authorities' neglect of their operation and the quality of electric transport service (trolley bus and light train) and to the stagnation of investment in the Metro and the insufficient number of large-capacity public transport vehicles, public passenger transport is finding it increasingly difficult to meet the new needs for personal trips in the MCMA. These needs are new insofar as the city's expansion may be determined by intra-urban migration and the relocation of the various economic activities,

which should be empirically proved. In other words, the main origins and destinations identified ten years ago may have changed. If this is the case, the Federal District and Mexico State authorities (both state and municipal) should review their passenger transport policy. Otherwise, if they continue to adopt a laissez-faire policy, they will indirectly be promoting the use of private cars and collective automobile vehicles with lower operating efficiency (energy consumption/trips-person-day) and higher pollution rates than mass transport.

3. FREIGHT TRANSPORT

As mentioned earlier, uncertainty over urban transport data has hampered analysis. This problem is exacerbated if one attempts to determine what is happening in freight transport. What should be an information series that the authorities could easily compile is apparently not. With this proviso in mind, let us examine each of the forms of freight transport.

The information available makes it difficult to distinguish between "hired freight transport" and "general freight transport." Table 7 shows how the number of hired freight vehicles significantly declined between 1994 and 1998 (from 18,031 to 5,001). Later on, however, the same source (Secretaría de Transporte y Vialidad, GDF, 2000: 40) stated that in 1997, freight sites were authorized with a total of 430 vehicles. In this case, one has to assume that the item "hired freight trucks" includes other freight trucks, in addition to those authorized to operate at the "ranks."[5] This lack of clarity also occurs in the time series referring to similar information (Secretaría de Transporte y Vialidad, GDF, 2001). According to the Head Office of Public Registration of Transport, in the year 2000 there were 18,040 "general freight transport vehicles," whereas a

[5] In general, the term "rank" designates a place where a group of cars or freight trucks authorized to transport people or goods park. The owners of these vehicles form a sort of association that enables them to request permission to operate a rank. Freight truck ranks are usually located in places where there is a great demand for their services as in the case of the Central de Abastos (Wholesale Fruit and Vegetable Market) and the Central de Carga Pantaco (Pantaco Freight Site). Ranks are also located in other public markets and a number of malls.

little further on in the same document, according to the General Transport Office, that same year public freight transport operated with 339 ranks and 1,837 vehicles. The two offices apparently generated information on the same period using a different form of classification. In this case, in the broader category, called "general freight transport," in the years 1992, 1994 and 2000, 18,374, 18,031 and 18,040 vehicles would have operated, whereas the "public transport" category operated with 95 ranks and 430 vehicles in 1997 and with 399 ranks and 1,837 vehicles in 2000. If the most inclusive category is taken into account (general freight transport), it shows that the supply of this service has stagnated;[6] however, if one considers the freight vehicles in ranks, then the increase between 1997 and 2000 was extremely significant (256% in ranks and 327% in vehicles).

It is difficult to foresee what will happen in this sub-sector, given the uneven trends just mentioned. However, since this type of transport is associated with MCMA's increased specialization in the tertiary sector (services and trade), in the future they are likely to reflect the growth in the tertiary sector. This link is borne out by the distribution of rank vehicles by *delegación:* the Cuauhtémoc, Venustiano Carranza, Benito Juárez, Iztapalapa and Miguel Hidalgo *delegaciones*, where most of the commercial and service activities are concentrated, have the ranks with most vehicles.

Between 1992 and 1998, private freight service trucks reduced their share of the total fleet of vehicles (from 8.21 to 6.69%; see Table 7), not because the number of vehicles increased (it rose by 21.4%) but due mainly to the rapid growth of private cars (53%). Subsequently, in 2000, the fleet increased to 328,222 units, comprising 326,540 "mercantile service transport" vehicles and 1,682 "private transport" vehicles,[7] in other words, it rose by 25.03%,

[6] One should also consider the fact that the lack of sufficient control over this type of transport makes it difficult to compile timely, complete information.

[7] On August 23,1999, the *Rules for Freight Transport Service in the Federal District* were published, establishing the following modalities: *public service* (the kind offered by ranks); *mercantile service* (offered by companies or individuals through a permit from the authorities); *private service* (owned by firms that transport their own merchandise); *private service* (owned by firms that meet their own transport needs and undertake public or private welfare activities). It is worth noting that until 2000, at least, this classification had not been used to compile the information on freight transport.

far less than private cars did over the same period. At the same
time, the current fleet of vehicles must be relatively new, since
firms with large centers for the distribution and storage of manu-
factured goods need their merchandise to be efficiently trans-
ported. Nor should one forget the fact that MCMA constitutes the
most concentrated market in the country, meaning that it attracts
an enormous range of tertiary activities.

Freight trucks primarily transport building materials but, once
again, the information on the type of vehicles used is incomplete.
At the same time, according to Table 7, their share of the total
volume of vehicles rose considerably in the year 1998, but in 2000
the Head of Offices for the Public Registration of Transport re-
corded 1 313 goods trucks, in other words, the total had declined
to the same level as in 1994. One should bear in mind the fact that
due to their technical characteristics (mean speed, weight, size,
etc.) the fact that these vehicles operate in the city's streets in-
creases the number of traffic jams, which in turn affects the envi-
ronment. When these vehicles load or unload at peak times, they
cause enormous traffic jams. This suggests that the rules govern-
ing the distribution of various materials are simply not respecte l,
nor are any efforts made to ensure compliance.

Despite the limitations of available information, it is possible
to track the quantitative changes undergone by the fleet of freight
vehicles. The same cannot be said of the firms responsible for goods
transport. Little is known about these firms except for those that
own the merchandise they transport as well as the vehicles they
operate. Some firms in competitive markets, such as the food in-
dustry, control the entire distribution process of their products,
meaning that the physical transport of the latter is just one link in
a logistic chain planned on the basis of an overall strategy. Al-
though several variables intervene in this process, it depends
mainly on the type of product (i.e. whether it is perishable or re-
quires special care) and the location of the sales points. In other
words, the process of delivering products goes beyond the prac-
tices established by a typical freight transport firm that offers ser-
vices to third parties.

What is known is the place where the largest concentrations
of transport firms are found inside the city. There is a high con-

centration of vehicles for transporting perishable goods in storage and distribution centers such as the Central de Abastos, located in the Iztapalapa *delegación*. Likewise, in industrial zones such as Vallejo, in the Azcapotzalco *delegación*, the flow of raw materials or semi-processed products that reach the area and the flow of intermediate or end products sent out for local, regional or national distribution requires a large fleet of freight trucks. These two *delegaciones* were the origin or destination of 28.3% of the trips to the freight centers, out of a total of 16 *delegaciones* and 15 municipalities in the Mexico State conurbation (*Highway Organization for Freight Transport*, quoted in Islas, 2000).

It is worth noting that freight vehicle circulation is not only intra-urban, since large volumes of products that require transportation are either sent to or from other cities in Mexico. MCMA's routes are obviously the highways that link the city with the rest of the country, but these have a different degree of importance and their circulation problems are therefore also different. According to the same sources cited earlier, the six highway access routes, namely the highways from Cuernavaca, Puebla, Toluca (via Naucalpan), Toluca (via Constituyentes), Querétaro and Pachuca have the following percentage distribution of trips respectively: 6.84, 35.94, 3.33, 11.76, 32.11 and 10.02. As one can see, the highways from Puebla and Querétaro account for nearly 70% of all trips. Querétaro is the route that links Mexico City to the northeast of the country via Monterrey, and the Mexico-United States border, while the highway and federal road to Puebla in the east lead to the port of Veracruz.

4. Traffic Jams

The highways via which freight trucks enter or leave the city are linked to major avenues or streets in the city which are also the corridors along which public and private transport operates. If both flows coincide during peak hours, these interconnections between highways and intra-urban roads are likely to experience traffic jams unless the highway infrastructure has been designed to cope with these large flows of traffic. Vehicles carrying freight from outside

the city coming in from roads in the east (Mexico-Puebla and Texcoco) tend to use the Eje 8 Sur and the Calzada Ignacio Zaragoza. Those from the North (Mexico-Querétaro) circulate along Eje 1 Poniente, Circuito Interior, Av. Mario Colín, Av. Tlalnepantla and Av. Vallejo. Vehicles that come in from the west (Mexico-Toluca) use Av. Constituyentes, Periférico, Circuito Interior and Av. Revolución. Vehicles coming in from the North East (Mexico-Pachuca) drive along the Eje 3 Oriente and Circuito Interior (see Cometravi). Some of these are primary roads with controlled access, but during peak hours, when vehicles transporting persons coincide with freight trucks, the mean speed can be 10 kilometers an hour.

Another variable used to alleviate traffic jams is one transport specialists call "traffic management," in other words, all the measures to control vehicular traffic (prohibiting left turns, sign posting, synchronized traffic lights, special lanes for certain modes of transport at certain times of the day, etc.). Nevertheless, public transport users or those who drive to work every day are fully aware that traffic administration is virtually non-existent.

Some elements of judgement that can be used to select measures designed to speed up traffic have been provided by studies such as the one carried out by Cometravi (Metropolitan Commission for Transport and Highway Administration). It found, for example, that the peak time for the access roads mentioned earlier corresponds to the period between 7:15 and 9:30. At the same time, journeys to school and the workplace are responsible for most of the traffic flow during the morning rush hour, with most schools starting at between 7 and 9 a.m. Conversely, journeys in the opposite direction from school to home or from work to home are distributed throughout the day from 1 to 9 p.m. Obviously, more detailed data are required to undertake practical actions and reduce traffic jams, but the authorities do not seem to have any intention of beginning to do so (information on the most congested crossroads has been available for a long time, but they continue to be conflictive).

Current highway infrastructure and traffic control are far from ideal, not only in the road access but throughout the MCMA. This is exacerbated by the fact that further highway conflicts are created

by new human settlements and "real estate developments," some authorized, others not, in which the guidelines required to at least maintain the fluidity of existing traffic are rarely followed. At the same time, the infrastructure works designed to eliminate the most obvious "bottlenecks" have usually been built after a considerable delay, meaning that the solutions are extremely short term, despite the immense amount of funds assigned for these work. The construction of "ejes viales"[8] served to eliminate severe traffic jams. It was also decided that public transport vehicles (buses and trolley buses) would drive along a special lane in the opposite direction to the rest of the traffic, which undoubtedly helped reduce the traffic flow. But actions of this scope, whose positive effect have already been surpassed, have not been taken again.

In short, the increase in the number of private vehicles in circulation used for transporting people and goods, the lack of investment in mass public transport, the delay in the construction and adaptation of road works and the non-application of suitable traffic measures has produced the following consequences: the duration of traffic jams has increased, the average speed of surface vehicles has been reduced, the length of time taken to reach work has increased, as have the number of traffic incidents; more fuel is consumed and the population is exposed for more time to a greater volume of air pollutants produced mainly by the transport system itself.

Solving the problem of passenger and goods transport is equivalent to reducing the polluting effects of the latter. The solutions proposed range from creating a new normative framework, violation of which would entail severe penalties for the owners and users of urban transport, while efforts would be made to ensure compliance; the construction of an appropriate new road infrastructure; proper planning of public transport, to ensure that it meets the demand for journeys, by establishing exclusive, long distance corridors that cross the city from north to south and from east to west; establishing different timetables for goods transport; staggering timetables for the population's various activities; prohibiting the

[8] By the end of the 1970s, these was still no orthogonal design of primary routes. For this reason, it was decided to build "ejes viales" based on the adaptation of major avenues that did not originally follow a grid pattern.

circulation of private cars with just one passenger, etc. The problem should obviously be solved in an integral fashion, taking all these measures into account. Above all, though, the authorities should consider how the pattern of land use is changing, and the growth of the urban sprawl, in other words, the planning of this sector should be long-term, but with actions that begin now.

5. METROPOLITAN TRANSPORT PLANNING

Transport management in both the Federal District and Mexico State has undergone significant changes. In the late 1970s, the Head of Traffic and Transport Engineering was the Federal District Organization responsible for this, its equivalent in Mexico State being the Head Office of Police and Traffic. Shortly afterwards, the Secretariat of Urban Development and Public Works (SUDPW) and the Auris Institute assumed responsibility for both states. In the 1980s, the General Coordinating Office of Transport and the Head Office of Urban Auto Transport was responsible for traffic in the Federal District, while the SDUOP and the Transport Commission of Mexico State (Cotrem) were responsible for this area in Mexico State. At present, the Secretariat of Transport and Highway Administration in the Federal District (Setravi) and the Secretariat of Communications and Transport in Mexico State are responsible for dealing with urban transport with the aim of meeting users' needs and constructing the highway infrastructure required to transport people and goods. As one can gather, the constant changes in administrative aspects have been the main feature of public transport management in the two states, to the detriment of metropolitan transport policy.

Despite this apparent institutional instability, there has been no shortage of transport planning in the Federal District and Mexico State. In the Federal District, guiding plans, strategic plans and integral transport programs have been designed, some of which have been submitted in several versions. They have also had varying scope; some attempt to regulate transport throughout the metropolitan area, others are restricted to a particular mode of transport and one (drawn up by Cometravi in coordination with

the Metropolitan Environmental Commission), without actually being a program, incorporated environmental aspects (see Blancas Ramírez, 2003). At the same time, the authorities concerned in Mexico State have drawn up several plans, although far fewer. The last one dates from 1991, although the municipalities in the Mexico City conurbation are included in the 2001 Program for the Integral Development of Public Transport *(op. cit.)*.

At the same time, there has been no metropolitan planning organization since the Commission for the Conurbation in the Center of the Country was abolished twenty years ago. It was not until the creation of the Mixed Transport Advisory Commission, in which federal government and the two federative states participated, that there was another organization responsible for dealing with transport problems in the metropolis. Thus, the Council of Transport in the Metropolitan Area (Cotam) was created, which was transformed into what is now known as Cometravi in 1994. This commission published a study on transport and air pollution in 1998, which reflected a serious, comprehensive research effort that highlighted the importance of transport as a producer of pollutants. Among its many achievements are "the metropolitan plaque" and the definition of an integral strategy for transport and air quality in the metropolitan area in the Valley of Mexico (vmma) (see Table 3).

Moreover, one of the objectives of this Commission was to design and implement the Guiding Plan for Transport and Highway Administration of the mcma, for which a document entitled "Definition of an Integral Strategy for Transport and Air Quality in the vmma" was drawn up in 1996. Despite the fact that the document's diagnosis and policies are extremely general, it is important because of its link with the vmma Air Quality Program, 2002-2010 (Proaire). Unfortunately, the working parties that formed part of Cometravi did not follow up what they had planned and there is now a lack of interest on the part of all its members in continuing with the metropolitan planning process. Nevertheless, the current Work Program of the Technical Secretariat (the head of the technical staff of Cometravi) plans to reactivate all the tasks that have been postponed through the participation of all the plenaries and working parties, but it is difficult to know whether this will happen, since in

Table 3
Objectives, Working Parties and Achievements of Cometravi

Objectives	Working parties	Achievements
1. To establish mechanisms to study and solve problems related to transport and highways in a coordinated, complementary way. 2. To improve transport and highway infrastructure services. 3. To encourage the standardization of legal frameworks, the design and application of the Program governing transport and highways in the metropolitan areas. 4. To contribute the information required for the design and application of the Transport and Highway Guidelines Program.	1. Legal aspects. 2. Technical norms. 3. Operation of services. 4. Tariffs and financial aspects. 5. Supervision and surveillance. 6. Infrastructure. 7. Energy saving and environmental protection. 8. Freight transport. 9. Transport and Highway Guidelines Program. 10. Accident prevention. 11. Mass electric transport.	• Metropolitan Number Plates Program for regularizing penetration services. To date, 15,222 plates have been delivered of a total of 32,900 agreed on by the Federal District and Mexico State. • Agreement for surrounding areas, between the SCT, Mexico State and Federal District. • Bases for standardizing legal framework called "Standardized Transport law for Federal District and Mexico State and proposal for Freight Transport Regulations." • Definition of integral MCMA Transport and Air Quality Strategy. • Technical verdict on over-ground train. • Agreement concerning Preventive Medicine and Certification Standards for Public Passenger Transport Service Operators. • Transfer of highway stretches to local control. • Studies and agreements on highway infrastructure in West and Northeast Areas. • Technical and financial verdict on new stretch of raised train. • World Bank, BIRF and GEF credit programs.

Source: Umaña (2001).

March 2004 the presidency changed and was installed in the Federal District Government (see Umaña, 2001).

As a corollary of what has been said in this section, one can speculate about the factors that have hampered the implementation of local, sectoral and metropolitan plans. This may have to do with the planning process itself, the shortage of financial and legal resources, which make it impossible to achieve all the goals set, and the difficulties of negotiating with all the social groups that intervene directly in transport.

These obstacles may also be due to what happens in the upper echelons of power, in the restricted circle of the institution responsible for improving the efficiency of the transport system. In this case, one should insist on reviewing the procedures used by the public or private organizations that produced transport service to achieve their own goals (which could be to improve the coverage and efficiency of the service, obtain suitable profits, be able to influence the assignation of the budget, etc.). In the Federal District, the government is responsible for running the STC-Metro and the Electric Transport Service, whereas city buses have been run by the Alianza Camionera (until 1981), Ruta 100, under the management of the Federal District Department, the AUPR-100 Confiscation Board and the decentralized organization known as the Red de Transporte Público (Passenger Transport Network-RTP). Moreover, a small number of buses (articulated buses and special ones for the handicapped) are the responsibility of the Electric Transport Service. Given this mix of interests in the transport sector, it is only worth identifying which of them could be operating as an obstacle to planning in the Federal District alone. Lacking sufficient empirical evidence, but on the basis of the behavior of the representatives of each of these public organizations in closed or open forums, one can perceive the degree of competition that exists between them, either because of the budget or because of the control over the routes covered by each mode of transport. In other words, each organization is more concerned with pursuing its own interests than with achieving coordination with the other organizations. There is also a struggle between those responsible for planning and the transport operators, which may make any plan or program partially ineffective.

The remaining modes of transport (some of the city buses, minibuses, VW vans and taxis) are operated by the private sector under a concession and permit system. In Mexico State, transport service may be provided by firms or individuals. This diversity of service providers partly explains the difficulties involved in sorting out the transport system and in ensuring compliance with current legislation,[9] and therefore of coordinating their actions with the aim of complying with any of the planning objectives.

Finally, attempts to create a metropolitan policy for passenger and goods transport have encountered difficulties due to the differences in overall urban policy which, taken separately, apply to the two states. The lack of a general, coordinated plan (not only involving transport) has contributed to the chaos on the streets, the lack of safety in transport, disorderly urban growth and the exacerbation of environmental problems.

6. URBAN TRANSPORT AND AIR POLLUTION

a) Transport Pollution

Regardless of the source of information or the data they are used to examine, all the figures indicate that the main cause of air pollution in the world's main metropolises is urban transport with internal combustion. In the MCMA, it is quite clear that mobile sources significantly contribute to air pollution (see Table 4 and Table 5). In particular, mobile sources in the MCMA produce 51.1% of particles smaller than 10 micrometers (PM_{10}), 76% of particles smaller than 2.5 micrometers ($PM_{2.5}$), 99.2% of carbon monoxide (CO) and 81.2% of nitrogen oxides (NOx).[10]

---

[9] This brief analysis of the main features of transport management fails to include the issue of fares, which in the past was the source of bitter arguments between the service providers and government. Nor did it deal with issues related to the function of referee sometimes played by government to mediate in the struggles between bus or microbus concessionaires to take over a route. It simply attempts to show the antagonism between social actors that may remain latent for a time before erupting into a violent conflict.

[10] Mobile sources may be highway and non-highway sources. This last classification includes planes, trains, launches and boats, among others. Conversely,

Over time, the emissions level of the various pollutants monitored for mobile sources has varied, depending on the distribution of the modes of transport, the age of the vehicle fleet, the transport network, the highway infrastructure, the type of fuel, the severity of traffic jams and the anti-polluting measures, among other factors. Thus, according to Table 6, in the mobile source sector, the pollutants that increased between 1996 and 2000 are carbon monoxide (CO) and nitrogen oxides (NOx). In addition, however, they have performed erratically, since carbon monoxide (CO) fell in 1998, only to increase again in 2000, whereas nitrogen oxide (NOx) rose in 2000 in comparison with 1996 but fell in relation to 1998. PM_{10} particles and sulfur bioxide (SO_2) showed a downward trend. It is worth pointing out that these changes may be partly associated with the methodology used each year to estimate the pollution factors. Nevertheless, it should also be noted that the vehicle verification program is applied increasingly rigorously and the vehicle fleet has been modernized, enabling certain types of pollutants to be reduced. Given these possibilities, it is therefore worth showing the changes undergone by transport and attempting to associate them with their possible effects on air pollution.

The structure of passenger transport has increasingly inclined towards internal combustion. The index of motorization (number of non-collective motor vehicles per thousand inhabitants) between 1940 and 1990 has changed extraordinarily swiftly. In 1940 it was 27.3; twenty years later, it had virtually doubled to 51. Over the next twenty years, this rate increased, reaching 126.7 by 1980, and eventually approximately 168 in 1990 (see Islas, 2000). It is worth adding that in 1999, according to information from INEGI, the index rose to 308. In other words, the MCMA achieved a rate that was only slightly below the 400 index registered by Western Europe in 1990, and just over half the United States rate for 1990 (see Freund and Martin, 1993). There are several reasons for this increase in motor vehicles, the most optimistic being that it is merely a result of economic progress.

---

mobile highway sources are vehicles that drive along highways, avenues and streets and are propelled by a combustion process, where the chemical energy of the fuel is transformed into mechanical energy (Secretaría del Medio Ambiente, GDF et al., 2000).

Table 4

MCMA: Inventory of Annual Emissions, by Type of Pollutant, by Sector 2000 (ton/year)

Sector	PM_{10}	$PM_{2.5}$	SO_2	CO	NOx	COT	CH_4	COV	NH_3
Specific sources	2,809	572	10,288	10,004	24,717	22,794	181	22,010	216
Area sources	509	492	45	6,633	10,636	418,586	168,549	197,803	12,969
Mobile sources	5,287	4,589	4,348	2,018,788	157,239	210,816	11,593	194,517	2,261
Vegetation and soil	1,736	380	n.app.	n.app.	955	15,552	n.app.	15,552	n.app.
Total	*10,341*	*6,033*	*14,681*	*2,035,425*	*193,547*	*667,748*	*180,323*	*429,882*	*15,446*

n.app.: Not applicable.
Source: Secretaría del Medio Ambiente, GDF et al., *Inventario de emisiones en la Zona Metropolitana del Valle de México, 2000.*

Table 5

MCMA: Distribution of Inventory of Annual Emissions, by Type of Pollutant, by Sector, 2000 (percentage)

Sector	PM_{10}	$PM_{2.5}$	SO_2	CO	NOx	COT	CH_4	COV	NH_3
Specific sources	27.2	9.5	70.1	0.5	12.8	3.4	0.1	5.1	1.4
Area sources	4.9	8.2	0.3	0.3	5.5	62.7	93.5	46.0	84
Mobile sources	51.1	76.0	29.6	99.2	81.2	31.6	6.4	45.3	14.6
Vegetation and soil	16.8	6.3	n.app.	n.app.	0.5	2.3	n.app.	3.6	n.app.
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

n.app.: Not applicable.
Source: Secretaría del Medio Ambiente, GDF et al., *Inventario de emisiones en la Zona Metropolitana del Valle de México, 2000.*

Table 6
MCMA: Inventory of Emissions by Type of Pollutant, by Sector, 1996,
1998, 2000 (ton/year)

Sector	Year	CO	NOx	PM_{10}	SO_2
Specific sources	1996	9,503	28,667	5,701	15,632
	1998	9,213	26,988	3,093	12,442
	2000	10,004	24,717	2,809	10,288
Area sources	1996	4,526	11,006	352	3,989
	1998	25,960	9,866	1,678	5,354
	2000	6,633	10,636	509	45
Mobile sources	1996	1,934,669	124,493	8,033	5,762
	1998	1,733,663	165,838	7,133	4,670
	2000	2,018,788	157,239	5,287	4,348
Vegetation and soil	1996	n.app.	1,279	n.a	n.app.
	1998	n.app.	3,193	7,985	n.app.
	2000	n.app.	955	1,736	n.app.

n.app.: Not applicable.
n.a.: Not available.
Sources: Comisión Ambiental Metropolitana (1996); Secretaría del Medio
Ambiente (GDF) and Secretaría del Medio Ambiente y Recursos Naturales del
Gobierno Federal (1988); Secretaría del Medio Ambiente, GDF et al. (2000).

Nevertheless, and without ignoring this important factor, in the MCMA, unlike cities such as Paris and London where emphasis has been placed on mass electric transport, the continuous deterioration of public transport has contributed to the fact that private cars have become a necessity, which is met once the minimum limit of the family budget that enables one to purchase a car is achieved. Palpable proof of this trend is the reaction elicited by the measure known as "one day without a car." More private cars were put on the road and, contrary to the effects this measure sought to achieve, the greater number of cars, some of which were in poor mechanical condition, led to an increase in pollutants. Two studies on the effect of the "Don't Drive Today" (DDT) program state that its effect on the acquisition of a second car has been insignificant. These studies, however, are partial (the models constructed for this purpose do not include all the variables that may come into play to prove that the program mentioned had only a slight effect on the decision to purchase an additional car)

and seem inconclusive (see Estavillo, 1998, and Ruiz Ávila, 1998). Thus, Ruiz Ávila states that, "The phenomenon of purchasing another car because of the Don't Drive Today (DDT) program has not been very widespread. Only a small proportion of the interviewees admitted that their families had bought one (14%)" (p. 253). At the same time, Estavillo states that "the survey results corroborate the fact [that] the majority of car owners said that they had not felt obliged by the DDT program to make the decision to buy a car. During the original stage of the DDT, this remark applied to approximately 70% of drivers, whereas during the current stage of the modified DDT, it applied to approximately 80% of drivers" (p. 235). It is worth noting, on the one hand, that the information was obtained at a particular point in time, the day of the survey, and if the results were generalized to the entire car-owning popu-lation, it would mean that on the day of the survey the following year, the number of vehicles in circulation would have increased by at least 14%, which is not insignificant.[11] At the same time, the second quote suggests that the decision to acquire an additional vehicle occurred at the time when the DDT program was changed. In other words, the consequences of the program were not re-stricted to a particular year, but rather changes in families' socio-economic status increased the possibility of purchasing an extra car, given the conditions of public passenger transport.

Another way of proving the increasing predominance of cars as a means of transport is to observe the rate at which sales of new cars have risen in the Federal District: between 1996 and 2000, they increased by 153%. It should be pointed out, however, that in the MCMA there are more vehicles in circulation than those regis-tered in the Federal District, since in addition to those registered in Mexican State, there are an indefinite number corresponding to vehicles registered in other states and vehicles temporarily circu-lating in the MCMA. In any case, the structure of the passenger trans-port system in the Federal District that can be constructed on the basis of the official car register reflects the predominance of auto-mobile vehicles. Thus, in 1998, private cars accounted for 88% of

[11] If a certain number of vehicles was incorporated into the used car market, one can assume that the last link in the change of used car dealers must have acquired new cars to replace those they got rid of.

the entire vehicle fleet (see Table 7).[12] If the data are consistent throughout the six years shown in Table 3, then there was a marked increase in private cars between 1992 and 1996 (74.03%), only surpassed by the relative increase in motorcycles (248%) and trucks for transporting building materials (412%).

At the same time, the Secretariat of the Environment of the Federal District Government has had to use data on the vehicle fleet with the greatest amount of detail, including the models for each type of vehicle. The information from Table 5, used to estimate emission factors, differs from the information published by the Secretariat of Transport and Highway Administration (Setravi) on the vehicle fleet. In this case, the number of vehicles contained in Table 8 is lower than that for Table 7.[13] This difference may be influencing the estimates of the emissions inventory, but it should also be recognized that the methodology for calculating emission factors has been gradually improved. Therefore, in the future, one would expect the data from inventories to be closer to reality.

b) Fuels

It is obviously important to obtain precise figures on the vehicle fleet, but even more so to determine the characteristics of the fleet (model, dimensions, etc.) since from the perspective of air pollutants released by mobile sources, it is essential to determine the amount of each kind of fuel consumed by each type of transport (see Table 9) and to estimate the number of kilometers driven by each type of vehicle each year. This information can be used to calculate, on the basis of different models, the emission factors corresponding to total hydrocarbons (THC) and their decomposition into methane (CH_4), volatile organic compounds (VOC), and total organic

[12] If we include the MCMA, then this proportion is obviously lower, since in the municipalities in the Mexico State conurbation the distribution of the vehicle fleet in favor of private cars is less marked. According to the last population census (see INEGI, 2001), 38.8% of families in the Federal District had cars, whereas in Mexico State only 29.1% of families had this privilege.

[13] In addition to the differences found in the information published by various official sources, the 1998 emissions inventory shows a larger total vehicle fleet than that in the 2000 inventory and one that is very similar to the 1996 inventory (3,157,874 in 1986, 3,260,919 in 1998 and 3,165,210 in 2000).

Table 7
Vehicles Registered in the Federal District

Type of vehicle	Number of vehicles			Percentage distribution by type of vehicle		
	1992	1994	1998	1992	1994	1998
Motor vehicles						
Private cars	2,258,121	2,256,573	3,455,228	85.76	86.61	88.03
Taxis and collective taxis	101,173	109,931	116,725	3.84	4.22	2.97
Passenger buses	7,299	9,234	9,236	0.28	0.35	0.24
Private buses	3,884	3,380	5,683	0.15	0.13	0.14
Motorcycles	24,385	29,021	60,713	0.93	1.11	1.55
Diplomatic vehicles	2,181	1,745	1,730	0.08	0.07	0.04
Demonstration vehicles			816			0.02
Old cars			243			0.01
Private freight trucks	216,214	176,126	262,514	8.21	6.76	6.69
Hired freight trucks	18,374	18,031	5,001	0.70	0.69	0.13
Goods trucks	1,438	1,311	7,364	0.05	0.05	0.19
Total	*2,633,069*	*2,605,352*	*3,925,253*	*100.00*	*100.00*	*100.00*
Electric vehicles						
STC Metro (cars)	2,424	2,487	2,559	89.81	89.46	87.67
Trolley buses	269	284	344	9.97	10.22	11.78
Light train	6	9	16	0.22	0.32	0.55
Total	*2,699*	*2,780*	*2,919*	*100.00*	*100.00*	*100.00*

Sources: Elaborated by author on the basis of various charts presented by Islas (2000). The 1998 data were obtained from the *Anuario de transporte y vialidad de la Ciudad de México, 1998-1999,* Secretaría de Transporte y Vialidad, GDF (2000).

Table 8
Distribution of Vehicle Fleet Circulating in the MCMA, 2000

Type of vehicle	Federal District	Mexico State	MCMA
Private cars	1,649,371	657,951	2,307,322
Taxis	103,694	11,992	115,686
Combis	2,661	15,581	18,242
Microbuses	17,981	11,320	29,301
Pick ups	64,648	77,539	142,187
3-ton vehicles	280,181	32,590	312,771
Buses	49,077	13,830	62,907
Autobuses	21,866	3,553	25,419
Vehicles > 3 tons	20,086	21,057	41,143
Motorcycles	78,347	10,019	88,366
LP gas freight trucks	15,236	5,605	20,841
GNC vehicles	999	26	1,025
Total	2,304,147	861,063	3,165,210

Source: Secretaría del Medio Ambiente, GDF et al. (2000).

compounds (TOC), carbon monoxide (CO); nitrogen oxides (NOx), particles smaller than 10 micras (PM_{10}); particles smaller than 2.5 micras ($PM_{2.5}$), ammoniac (NH_3) and sulfur bioxide (SO_2). These factors are then used to construct the contribution of mobile sources to the generation of pollutants (see Table 7).

On the basis of Table 9, it is worth pointing out the following: the amount of private cars totals 2,305,474 and make just over 297,000 journeys every day, for which they consume nearly 13,000 cubic meters of gasoline a day;[14] whereas 161 155 internal combustion vehicles assigned for public transport (including taxis) consume approximately 4,750 cubic meters of gasoline to transport 11 million people. It may seem pointless to calculate an indicator such as passenger/cubic meter of gasoline, but it is useful to show

[14] In 1998, 6,471,760 cubic meters of gasoline, 1,609,913 cubic meters of diesel and 53,129 cubic meters of LP gas were sold. The number of km driven by each type of vehicle was estimated, showing that the proportion of km driven by private cars was 73% while the proportion driven by public transport was 27% (Secretaría del Medio Ambiente, GDF et al., 2000).

Table 9
Vehicle Fleet Circulating in MCMA by Type of Vehicle according to Type of Fuel, 2000

Type of vehicle	Gasoline	Diesel	GLP	GNC	Total
Private cars	2,305,474	266	1,582	–	2,307,322
Taxis	115,684	–	2	–	115,686
Combis	18,242	–	–	–	18,242
Microbuses	27,079	617	1,306	299	29,301
Pick ups	140,747	548	892	–	142,187
Vehicles < 3 tons	298,581	14,190	–	–	312,771
Tractotrucks	180	62,700	27	–	62,907
Buses	150	25,239	30	–	25,419
Vehicles > 3 tons	34,287	6,856	–	–	41,143
Motorcycles	88,366	–	–	–	88,366
LP gas freight trucks	–	–	20,841	–	20,841
GNC vehicles	–	–	–	1,025	1,025
Total vehicles	3,028,790	110,416	24,680	1,324	3,165,210
Vehicle distribution by fuel	84%	13%	3%	n.r.	100%
Fuel consumed (m³)	6,472,051	1,049,756			

n.r. = Not representative.
Source: Secretaría del Medio Ambiente, GDF et al. (2000).

the difference regarding the efficiency in energy consumption: private cars and public transport registered 484 and 2,315 journeys/person/day per cubic meter of gasoline respectively, in other words, two liters of gasoline are required to undertake a journey/person/day on average in private cars, whereas only 0.43 liters are needed for a journey/person/day in public transport.

If one observes how the consumption of fuel (not only gasoline) translates into the production of pollutants (see Table 10 and Table 11), one can also determine the contribution of each type of vehicles to the emission of each type of pollutants. By way of an illustration, private cars, for example, most of which are propelled by gasoline, and public transport motor vehicles generate 822,645 and 447,804 tons a year respectively; in other words, every private car and public transport vehicle produces 356 and 2,778 kilos of CO a year respectively. This result bears out the well-known fact that public transport in Mexico City is highly polluting. However, if we standardize this fact in relation to journeys/person, in other words, as regards how much each journey contributes by type of transport to CO pollution, we find 194 grams for private cars and 204 grams for public motor transport vehicles, in other words, an insignificant difference. It should be added, however, that if taxis are excluded, the amount of pollution for journey in public transport would be much lower than for private cars, since the number of journeys in collective transport would be approximately 10 million daily, the number of vehicles would be 45,471 and the volume of CO would be 232,417 tons a year. In other words, the pollution ratio per collective transport vehicle is 5,111 kilos a year (nearly twice the amount calculated for all public transport), but when the journeys are divided by the daily volume of pollution (636 tons) the result is 64 grams, far below (i.e. only a third) of the 194 grams of CO produced by each journey in a private car.

In short, public transport (excluding the Metro, light train and trolley bus) is more efficient than private cars from the point of view of energy consumption. Likewise, collective transport (public transport excluding taxis) is far more recommendable in this respect due to the fact that the amount of pollutants (at least of CO) it contributes by journey/person is much lower than the quantity released by private cars.

Table 10
Emissions by Mobile Sources in the MCMA, 2000
(ton/year)

Type of vehicle	PM_{10}	$PM_{2.5}$	SO_2	CO	NOx	COT	CH_4	COV	NH_3
Private cars	963	721	2,432	822,645	52,029	85,058	4,427	78,185	1,555
Taxis	245	183	587	215,387	16,091	25,126	1,431	23,096	318
Combis	33	25	126	67,832	3,084	6,571	264	6,040	20
Microbuses	111	94	29	184,435	8,504	17,469	954	16,108	18
Pick ups	118	93	234	129,259	9,945	12,955	780	12,233	108
3-ton vehicles	558	485	514	419,384	29,915	37,084	2,465	34,165	182
Tractotrucks	2,058	1,893	159	18,955	22,199	7,855	330	7,193	3
Buses	949	873	75	10,150	9,256	3,303	133	3,026	1
Vehicles > 3 ton	213	193	108	117,151	4,118	7,430	416	6,917	20
Motorcycles	26	20	64	28,324	255	5,935	225	5,682	36
LP gas freight trucks	13	9	20	5,248	1,797	1,976	119	1,822	n.s.
GNC vehicles	n.s.	n.s.	n.s.	18	46	54	49	50	n.s.
Total vehicles	5,287	4,589	4,348	2,018,788	157,239	210,816	11,593	194,517	2,261

n.s.: Not significant.
Source: Secretaría del Medio Ambiente, GDF et al. (2000).

This numerical exercise can be extended to the other pollutants, although the results would not be very different. It is likely that, given the similarity between private cars' contribution to the generation of pollutants NOx, COI, CH_4, cov with CO (see Table 11), results would be similar, although its position might be slightly less in the case of PM_{10} and $PM_{2.5}$, since the proportion provided by microbuses, for example in relation to private cars, is lower than the proportion of CO they contribute. Finally, one would expect a more extreme position for SO_2 and NH_3, since the quotient for the proportions of these two pollutants corresponding to the private car and microbus (0.67%, 755.93% and 0.80%/68.77%) is much lower than that of CO (9.14%/40.75%).

c) Age of Vehicle Fleet

One aspect that exacerbates the consequences of the excessive number of vehicles in circulation is their age, due to the technological factor, since the older they are, the less capacity they have to control the emission of pollutants. It should be pointed out that the vehicles' age was taken into account in the data on pollutants published in the various *Inventories* mentioned earlier. However, it is worth pointing out this aspect since the larger the proportion of new cars in the fleet, the fewer environmental consequences there will be.[15] Private cars in particular are worryingly old, since between 1992 and 1994 the mean age rose from 10.9 to 12.9, despite the fact that the proportion of newer models has noticeably increased (see Table 12). It should be recalled that the "Don't Drive Today" program excluded cars with catalytic converters, which benefited the owners of 1993 models or later, which elicited two types of response from the population: *1)* the sector of the population with higher incomes which decided to purchase a new car, as borne out by the higher proportion of more recent models in 1994 (see Table 12), and *2)* the sector of the population with medium incomes which decided to purchase an extra used car, which

[15] One only has to consult the emission factor tables in the inventories to observe the enormous gap between emission factors by type of vehicle; for example, for CO, the factors corresponding to private car models before 1983 and 1999 and 2000 models: 76.4 for the former and 3.2 for the latter.

Table 11
Percentage Contribution of Mobile Sources in MCMA, 2000

Type of vehicle	PM$_{10}$	PM$_{2.5}$	SO$_2$	CO	NOx	COT	CH$_4$	COV	NH$_3$
Private cars	18.21	15.71	55.93	40.75	33.09	40.35	38.19	40.19	68.77
Taxis	4.63	3.99	13.50	10.67	10.23	11.92	12.34	11.87	14.06
Combis	0.62	0.54	2.90	3.36	1.96	3.12	2.28	3.11	0.88
Microbuses	2.10	2.05	0.67	9.14	5.41	8.28	8.23	8.28	0.80
Pick ups	2.23	2.03	5.38	6.40	6.32	6.15	6.73	6.29	4.78
Vehicles < 3 ton	10.55	10.57	11.82	20.78	19.03	17.58	21.25	17.55	8.07
Tractotrucks	38.94	41.24	3.66	0.94	14.12	3.73	2.85	3.70	0.13
Buses	17.95	19.02	1.72	0.50	5.89	1.57	1.15	1.56	0.04
Vehicles > 3 ton	4.03	4.21	2.48	5.80	2.62	3.51	3.59	3.56	0.88
Motorcycles	0.49	0.44	1.47	1.40	0.16	2.82	1.94	2.92	1.59
LP gas freight trucks	0.25	0.20	0.46	0.26	1.14	0.94	1.03	0.94	n.s.
GNC vehicles	n.s.	n.s.	n.s.	n.s.	0.03	0.03	0.42	0.03	n.s.
Total vehicles	100	100	100	100	100	100	100	100	100

n.s.: Not significant.
Source: Secretaría del Medio Ambiente, GDF et al. (2000).

Table 12
Private Cars Registered in the Federal District
by Year of Manufacture

Model	Model information up to 1992		Information up to 1992	
	Amount	Distribution (%)	Amount	Distribution (%)
1930-1950	5,659	0.25	11,519	0.44
1951-1960	21,369	0.95	22,799	0.88
1961-1970	134,941	5.98	151,824	5.85
1971-1980	629,215	27.86	719,170	27.71
1981-1990	1,301,708	57.65	1,161,312	44.74
1991-1994	165,229	7.32	529,086	20.38
Total	2,258,121	100.00	2,595,710	100.00
Mean age	10.9		12.9	

Source: Elaborated by author on the basis of Table 11.2 presented by Islas (2000).

may explain the existence of a higher number of older models in 1994 than in 1992, although this may also be due to the differences in information. A propos of this, as mentioned earlier, some of those who owned old models before automobiles with catalyzers were allowed to circulate everyday, subsequently decided to replace them with new cars, which was relatively easy since there were several potential buyers wishing to buy a second car in order to be able to circulate every day. Moreover, demand probably far outstripped supply, meaning that used cars from other states were probably also purchased. The proliferation of car markets, which dates precisely from this period, confirms the hypothesis of the creation of an enormous used car market. It should be added that the change in the age structure and the mean age of the entire vehicle fleet (excluding motorcycles) between 1992 and 1994 was very similar to what happened with private cars.

In subsequent years, other circumstances that conditioned the behavior of potential car buyers varied, with the price of cars (particularly what are known as "subcompact" cars) and car credit purchases becoming more affordable. The market was regular-

ized while the initial impact of the DDT program decreased when another age structure for automobile vehicles began to be created.

Federal District authorities that have attempted to influence the modernization of the fleet felt and often mentioned the need for an "old crock removal" program. However, what has been implemented to date is a long way from the planned goals.[16] Everything would seem to suggest that it is individuals' decisions that are influencing the renovation of private cars, spurred too by what public transport policy has failed to achieve.

Let us see what has been happening recently. Like Table 12, Table 13 shows a reduction in the average age of private cars during the brief period between 1998 and 2000. In both years, the age of the cars was lower than it had been in 1994, which suggests that the mean age of cars has gradually fallen. Nevertheless, two distinct moments can be identified during the period from 1994 to 2000: 1) between 1994 and 1998, the mean age of cars fell due to the fact that some of the oldest cars were removed from the vehicle fleet (in 1994, models over 13 years old accounted for 34.88% of the total and 31.68% of the total in 1998) rather than to the incorporation of a significant proportion of new cars (in 1994, the four most recent models accounted for 20.38% of the total fleet as opposed to 18.88% in 1998); 2) conversely, during the period from 1998 to 2000, the relative rejuvenation of the fleet was due to the rapid growth of the number of new cars (the latest model from 1997 to 2000 accounted for 5.6%, 8.4%, 8.6% and 11.8% respectively of the total number of vehicles that year).

This also seems to suggest the start of the modernization of the car fleet, a process that could speed up if the RTP bus equipment is indeed modernized and microbuses are replaced by buses with a greater capacity and old taxis are replaced by more efficient taxis from the environmental and energy point of view.

---

[16] The 2002-2008 Federal District Environmental Program proposes a strategy designed to improve the environmental conditions of transport. To this end, attempts are being made to "renew the taxi fleet, by incorporating new vehicles with a high fuel yield and low polluting emissions and reduce the distance driven by unit through the organization of taxi ranks an city zones." It should be added that the authorities have set a goal of replacing 80,000 taxis during the current administration. Likewise, the Passenger Transport Network (RTP) has pledged to "gradually modernize buses."

Table 13
Private Cars Registered in the MCMA, According to Year of
Manufacture*

Model	Model information up to 1992		Information up to 1992	
	Amount	Distribution (%)	Amount	Distribution (%)
1976 and earlier	237,660	10.15	172,581	7.48
1977-1980	190,663	8.14	148,356	6.43
1981-1985	335,135	14.31	268,569	11.64
1986-1990	403,097	17.22	302,726	13.12
1991-1995	784,542	33.50	548,807	23.79
1996-1998	390,636	16.68	342,640	14.85
1999-2000			523,643	22.69
Total	2,341,733	100	2,307,322	100
Mean age		10.9		9.6

* This table presents the updated information from Table 12, but since the
spatial reference and lower interval are not clearly established, it was decided to
include them separately.
Source: Elaborated by author on the basis of Chart 11.2 presented by Islas
(2000).

In itself, the distribution of the car fleet by age only illustrates
part of the problem. As mentioned earlier, the emission factor of
each pollutant fluctuates depending on the vehicles' age: the link
between the amount of vehicles per type and the kind of fuel they
use (Table 9) was described and the importance of each type of
fuel in the generation of pollutants was also analyzed (see Tables
10 and 11).

For obvious reasons, as time goes by, the proportion of auto-
mobiles with catalytic converters will increase. It is worth men-
tioning that 1993 models and earlier with a converter in good con-
dition are allowed to circulate every day. This can be observed in
recently published figures (see Table 16); in 1998, the number of
vehicles given the "zero sticker" (a sticker authorizing cars to cir-
culate without restrictions) rose to 1,046,203, a 24.2% increase over
the previous year.

Table 14
Distribution of Vehicle Fleet by Age and Type of Fuel

	Gasoline		Diesel	
Model	%	% Accumulated	%	% Accumulated
Earlier than 1976	6.93	6.93	15.41	15.41
1977-1980	6.15	13.08	12.76	28.17
1981-1985	11.73	24.81	16.09	44.26
1986-1990	14.44	39.25	12.11	56.37
1991	5.35	44.60	5.68	62.05
1992	6.29	50.89	5.44	67.49
1993	5.93	56.82	5.89	73.38
1994	6.02	62.84	4.94	78.32
1995	3.86	66.70	2.54	80.86
1996	2.69	69.39	1.20	82.06
1997	4.26	73.65	3.88	85.94
1998	6.87	80.52	3.54	89.48
1999	7.67	88.19	4.31	93.79
2000	11.81	100.00	6.21	100.00
Total	100.00		100.00	

Source: Secretaría del Medio Ambiente, GDF et al. (2000).

Table 15
Contribution to Pollution by Diesel Vehicles, by Model (%)

Model	Vehicles	COT	NOx
1993 and earlier	73.3	82.9	80.8
1994-1997	12.6	9.2	10.0
1998-2000	11.1	7.9	9.2

Source: Secretaría del Medio Ambiente, GDF et al. (2000).

Table 16
Results of Vehicle Verification Program, 1997 and 1998

Type of sticker	Year	Vehicles passed	Vehicles not passed	Total
Zero	1997	842,462	0	842,462
	1998	1,046,203	0	1,046,203
One	1997	626,583	0	626,583
	1998	529,823	0	529,823
Two	1997	1,821,063	801,819	2,622,882
	1998	1,565,295	529,178	2,094,473
Total	1997	3,290,108	801,819	4,091,927
	1998	3,141,321	529,178	3,670,499

Source: Secretaría del Medio Ambiente, GDF et al. (2000).

It is worth noting that the number of internal combustion vehicles for either private use or public transport is continuing to rise swiftly. Thus, for example, between 1994 and 1998, as Table 1 shows, the total number of automobile vehicles rose by 50.7% whereas the number of private cars increased by 53.1%. This suggests that despite the fact that the anti-pollution device is being increasingly widely used, this does not reduce the volume of pollutants expelled by automobile vehicles. This can be seen by comparing the emission inventories of two relatively recent years (see Table 17).

Total suspended particles (TSP), SO_2 and HC emissions produced by private cars have been significantly reduced as have CO emissions, albeit to a lesser extent. In short, as one can see, the total number of tons per year of the various air pollutants released by cars rose 9.05% between 1994 and 1997. Another revealing fact is that although the total amount of emissions produced by all kinds of mobile sources was lower in 1997, private cars' share of this total has risen from 44.5% to 53.4%, nearly 10% more during a period of three years.

One data that seems suspicious at the very least refers to microbuses, since according to Table 7 the volume of emissions produced has been reduced in each type of pollutant. However, a closer examination of Table 1 shows that the amount of vehicles considered "collective taxis," including independent and those

Table 17

Emissions Inventory 1994, 1997

(tons/year)

Type of source	TSP		SO₂		CO		NOx		HC		Total	
	1994	1997	1994	1997	1994	1997	1994	1997	1994	1997	1994	1997
Private cars	10,321	87	6,061	2,474	1,044,008	1,327,858	31,913	40,151	253,866	97,510	1,346,169	1,468,080
Microbuses	397	29	827	396	224,078	177,252	9,396	3,683	66,473	19,018	301,171	200,378
Combis	42		650		134,954		4,918		35,109		175,673	
Taxis	613	17	3,073	481	529,530	258,156	15,982	7,806	126,575	18,957	675,773	285,417
Buses												
Urban state buses	1,900	60	366	13	5,655	1,458	6,751	1,232	2,337	472	17,009	3,235
Suburban and long-distance	120	96	102	21	57,333	2,340	2,486	1,978	2,055	757	62,096	5,192
Municipal	2,075		400		1,778		2,591		782		7,626	0
Private		283		62		6,978		5,896		2,258		15,477
Pick-up	1,049		354		73,419		2,675		19,374		96,871	
Light freight trucks	360	107	37	1,459	271,321	653,318	5,868	13,575	46,100	70,096	323,686	738,555
Heavy freight trucks	1,902	535	266	246	4,736	13,774	7,204	11,639	2,079	4,457	16,187	30,651
Total	18,779	1,214	12,136	5,152	2,346,812	2,441,134	89,784	85,960	554,750	213,525	3,022,261	2,746,985

N.B. The classification of sources does not coincide for both years, which is why the "Combi" and "Pick-up" classification only appears in 1994 and "Private Buses" are only registered for 1997. This means that the two years are not fully comparable, except in the case of private cars. Figures for 1994 also included the emissions produced by locomotives and airplanes, which are excluded from this table, since the point is to highlight the specific problems of Mexico City transport.

Sources: *Air Quality Improvement Program in the Valle de México, 1995-2000*, Departamento del Distrito Federal *et al.* (1996) and Villegas (2000).

attached to taxi ranks and those known as "fixed route taxis" (microbuses, buses and vans), rose from 109,931 to 116,725 between 1994 and 1998, in other words, 6.2%. It is worth noting that the composition of "fixed route" public transport basically includes microbuses, since the number of passenger buses has considerably declined. In the case of microbuses, it is essential to know their date of manufacture. However, in the latest *Anuario de Transporte y Vialidad de la Ciudad de México, 1998-1999* (Secretaría de Transporte y Vialidad, GDF, 2000), the information on the age of the car fleet assigned to public transport is presented in a highly aggregated fashion. For example, in 1998, of the 116,725 taxis and collective taxis (see Table 1), the authorities only had information on the models of 103,886 of these, accounting for 89%; 78,849 are more recent that 1990 (67.6%); 24,880 (21.31%) are later than 1980 but earlier than 1990, while 157 (0.13%) are models from before 1980. In short, if one adds the vehicles for which there is no available information, those prior to the 1990 model and a quarter of the models which are from after 1990 and before 1993, this means that 57,594 lack catalytic converters, in other words, 49.3% of the total, which is virtually half. This is obviously extremely serious, since according to technical studies undertaken to determine the effectiveness of converters, their use "eliminates, on average, nine tenths of the carbon monoxide and hydrocarbon emissions and more than halves the nitrogen oxide emissions" (see Islas, 2000).

7. A Final Reflection

This analysis, with all the limitations on information already mentioned, shows how the current transport scheme that prevail in the MCMA has influenced the emission of pollutants. This is why the current transport program (see Gobierno del Distrito Federal, 2002) for Mexico City proposes the following strategies: changing the modal distribution (with greater participation by mass transport); replacing the public transport vehicle fleet with less polluting vehicles that are more efficient from an energy point of view; redesigning routes to improve service and avoid the unnecessary overlapping of different modes of transport, establishing stricter

regulations for passenger and good transport and ensuring compliance; incorporating more traffic management measures. Within this planning framework, there are strategies aimed at expanding the road network and guaranteeing their efficient use, which should reduce traffic jams as well as the emission of pollutants. This set of strategies also mentions the need to plan the future growth of the urban sprawl.

These strategies have translated into actions that have been implemented (renewal and modernization of a small part of the vehicle fleet of public passenger transport, the construction of cycle paths, stricter measures for reviewing the pollution emissions of private vehicles, the construction of second stories, the renovation of the city center, forbidding the creation of new settlements in areas of conservation and ecological protection in the Federal District, etc.) and others which are apparently scheduled to begin soon (strategic corridors for public passenger transport).[17] However, neither the specific actions implemented in the area of transport or the urban development measures have had a noticeable effect on the reduction of air pollution. The main reason why pollution levels remain high is the continuous increase in the index of motorization. In other words, according to the mean rate of growth of vehicle sales experienced by the Federal District and Mexico State between 1996 and 2000 (25% and 29% respectively), the tendency observed in the MCMA is to reinforce a transport system based on the predominance of cars.

Although the technology used in vehicles and the use of less polluting contaminants enables individual vehicles to operate more efficiently from the point of view of energy and the environment, the rate at which the number of vehicles in circulation has increased offsets these advantages.

At the same time, this paper ignored the volume of pollutants emitted by area sources that are associated with the use of automobile vehicles (terminals and bases of intra-city and city buses and microbuses, automobile painting workshops, traffic sign paint-

[18] A number of transformations of the urban structure (due to the behavior of families which do not appear to follow any urban policy) which sooner or later will have an effect on the flow of persons and goods as regards direction and scope are beginning to emerge.

ing work, petrol storage and distribution, petrol stations, application of asphalt, etc.) since this would require the detailed assignation of these emissions to each type of vehicle, a task that has not yet been included in emission inventories. Moreover, although the paper only examined the urban sphere of the MCMA, it failed to refer to the environmental effect of motor vehicles, including all their components, as well as the production and transport of the fuel they use (for example, to what extent are cars responsible for the enormous oil spills that have caused severe ecological damage? How is sustainable development affected by using non-renewable materials to produce vehicles?) Obviously, these and other questions will have to be answered through further research to evaluate every aspect of environmental impact caused by using vehicles powered by fossil fuels. Moreover, greater knowledge of the causal relations between transport and fuel would facilitate the design of transport and urban development policies within the framework of sustainable development.

8. References

Blancas Ramírez, Silvia (2003), "Ausencia de una política de transporte en la zona metropolitana del Valle de México," Master's Thesis in Urban Studies, Mexico, El Colegio de México.

Cometravi (1997), *Definición de políticas para el transporte urbano de carga en la Zona Metropolitana del Valle de México*, Mexico, Cometravi.

———— (1998), *Estudio integral del transporte y calidad del aire en la ZMVM*, Mexico, Comisión Metropolitana de Transporte.

Comisión Ambiental Metropolitana (1996), *Inventario de emisiones a la atmósfera en la ZMVM*, México.

DDF et al. (1996), *Programa para Mejorar la Calidad del Aire en el Valle de México*, 1995-2000, México, Departamento del Distrito Federal/ Gobierno del Estado de México/Secretaría del Medio Ambiente, Recursos Naturales y Pesca/Secretaría de Salud.

Estavillo F., María Elena (1998), "Situación actual y perspectivas del Programa Hoy No Circula," in *Conserva*, Mexico, Consejo de Estudios para la Restauración y Valoración Ambiental, pp. 227-236.

Freund, Meter, and George Martin (1993), *The Ecology of the Automobile*, Canada, Black Rose Books Ltd.

Gobierno del Distrito Federal (2002), "Programa Integral de Transporte y Vialidad, 2001-2006," *Gaceta Oficial del Distrito Federal*, Mexico.

INEGI (2001), *XII Censo general de población y vivienda, 2000*, Mexico, Instituto Nacional de Estadística, Geografía e Informática.

Islas Rivera, Víctor (2000), *Llegando tarde al compromiso: la crisis del transporte en la Ciudad de México*, Mexico, El Colegio de México.

Ruiz Ávila, María Guadalupe Irasema (1998), "Estudios entre propietarios de autos sobre el dispositivo anticontaminante y el Programa Hoy No Circula," in *Conserva*, Consejo de Estudios para la Restauración y Valoración Ambiental, Mexico, pp. 251-256.

Secretaría del Medio Ambiente (GDF) and Secretaría del Medio Ambiente y Recursos Naturales del Gobierno Federal (1998), *Inventario de emisiones a la atmósfera de la Zona Metropolitana del Valle de México*, Mexico.

——, Secretaría del Medio Ambiente y Recursos Naturales del Gobierno Federal and Secretaría de Ecología del Gobierno del Estado de México (2000), *Inventario de emisiones en la Zona Metropolitana del Valle de México*, Mexico.

Secretaría de Transporte y Vialidad (GDF) (2000), *Anuario de transporte y vialidad de la Ciudad de México, 1998-1999*, Mexico, Setravi.

—— (2001), *Anuario de transporte y vialidad de la Ciudad de México, 2000*, Mexico, Setravi.

Umaña, Nidia (2001), "Relaciones intergubernamentales, coordinación y gestión urbana en la Zona Metropolitana de la Ciudad de México," Master's Thesis in Urban Studies, Mexico, El Colegio de México.

Villegas, Alejandro (2000), "Transportation/Mobility in the Mexico City Metropolitan Area (MCMA), paper delivered at the Second US-Mexico Workshop on Mexico City Air Pollution, January 24.

INTERVIEWS

INTERVIEW WITH VÍCTOR L. URQUIDI
ON THE STATUS OF THE POPULATION
AT THE TIME WHEN GUSTAVO CABRERA
WAS EMBARKING ON HIS CAREER
AS A DEMOGRAPHER

José Luis Lezama

Mr. Urquidi, what was the status of population studies in Mexico dur-
ing the 1960s when Gustavo Cabrera was embarking on his career as
a demographer?

I would have to go a little further back. While I was studying eco-
nomics and demography, a professor at the London School of Eco-
nomics encouraged my interest in demographic affairs. When I
came back after my degree and joined Banco de México, I had
never heard about population issues beyond informal talks on the
problem of peasants in Mexico, the rural population and the his-
tory of its growth. It was not until I joined CEPAL in 1951 to under-
take studies on the integration of Central America that I began to
become aware of the high birth and demographic growth rates
in all the countries in the region.

How did CEPAL contribute to demographic studies at that time, in both
Mexico and Latin America?

In 1952, we conducted studies to prepare for the economic inte-
gration of Central America: a common market that would include

Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica. We realized that we had an unusual demographic growth rate, so in 1956 we hired an American demographer from United Nations to conduct a study on Central America. We needed an accurate diagnosis of demographic growth and the direction in which it was heading with those high rates. Although I was unaware of this at the time, the study included Mexico. The standard of this CEPAL document, published by United Nations, is excellent. I managed to have the study validated by a resolution from the Committee for Economic Integration, comprising the ministers of economics, and used it to introduce the demographic issue into the studies we were carrying out on economics, industry, culture, transport, energy and other topics.

How did your interest in demographic issues continue after your time at CEPAL *and when did Gustavo Cabrera emerge in the field of population studies?*

During the 1960s, I grew more interested in population and family planning issues. I used to travel to the United States a lot, where I contacted other demographers, including the wife of the director of labor statistics. I became even more involved because Cosío Villegas asked me to create the Center for Economics and Demography, thereby incorporating the subject of demography into El Colegio de México. He was deeply concerned by demographic growth in Mexico and had a very clear vision of the latter. I therefore decided that the Center for Economics and Demography should invite Gustavo Cabrera, Raúl Benítez, Carmen Miró and the INET in France to organize a demography teaching and research program at El Colegio de México.

In 1963, I was responsible for a study for the Finance Secretariat on the outlook for farming in Mexico. Sixteen agricultural products were chosen to explore their supply and demand and an analysis of cattle raising was also conducted. The reason for the study was that the United States Department of Agriculture had persuaded the US government to undertake studies on this issue in various countries, since they had predicted enormous agricultural surpluses

and were keen to determine the demand for the latter in countries where they felt there was a problem of self-supply. The American embassy approached Banco de México, consulted the Finance Secretariat and the then secretary, Ortiz Mena, and asked me to help organize the study, with the approval of Fernández Hurtado, on behalf of the Banco de México. We hired people with the fund which gave us a million pesos, and when we proposed the study, we realized a number of things, the first being that there were no reliable studies of household income and spending in Mexico that would be useful for calculating the income obtained and thereby calculating the demand for maize, beans, rice, sugar, etc. The second was that there were no studies on the supply side. What was the outlook for the country beyond the fact that agricultural zones were being expanded but that little was known about yields? To make matters worse, farming statistics were appalling. So we had to hire people like Marco Antonio Durán and others from Banco de México, Fernando Rosenzweig and economist Manuel Rodríguez Cisneros, to act as the General Coordinator of the study. Before this study, which was the first reliable survey carried out in Mexico, statistics had been very partial. There was an income distribution study carried out by Ifigenia Navarrete and Ana María Flores, which did not go beyond calculating income distribution. Before our research, population scholars used to predict it in a linear fashion, without taking into account any methodology that would produce a hypothesis on the decrease of fertility, which was not actually measured very accurately, or the decline in mortality. Gustavo Cabrera and Raúl Benítez were asked to conduct this study, which they did using the United Nations methodology. When they handed us the results, there were three definite hypotheses: high growth, medium growth and low growth.

What was the status of demographic studies in Mexico and the rest of Latin America at that time?

At that time, Banco de México published a study on the outlook for agriculture in Mexico, which proved extremely useful since without it, we would have been unable to calculate elasticity. It

was a breakwater that was barely acknowledged, since these stud-
ies are not widely circulated. We submitted the results in conjunc-
tion with the Secretary of Agriculture, Julián Rodríguez Adame.
In 1965, the United Nations population division asked me to par-
ticipate in a conference in Belgrade that was being organized by
the International Union for the Scientific Study of Population. It
had its headquarters in Liège and its mission was to examine the
demographic problem at the global level and by individual coun-
tries, including social and economic considerations, such as the
labor force. I accepted the invitation to attend and suggested that
Gustavo Cabrera and a Bolivian agronomist should also go, so
that they could conduct another study that would be useful for
us. My talk focussed on the high demographic growth rates and
their increase in Mexico, Brazil, Central America, except for
Panama, Ecuador, Colombia, Bolivia and Peru. There I expressed
my views on the problem that this entailed for Latin America.
I had already written a book on the outlook for the Latin Ameri-
can economy, knowing what the educational systems were like,
in the sense that there were no training systems for work (except
something in Brazil) and that nothing was being done on family
planning in virtually any country in Latin America. I was sound-
ing the alarm about what might happen.

Latin American interest in demographic problems became
clear during the organization of the 1970 Population Conference
(which preceded the UN Demographic or Population Conference in
1974). We organized it because we were worried, myself in par-
ticular, since the issue was already being studied in other coun-
tries and although Celade was already operating, it did not hold
large-scale conferences on the issue and for CEPAL, it was not an
important issue.

*By the time of the Belgrade Conference, when the earth's population was
nearly three thousand million, what was the world's main concern in
population terms?*

There was a great deal of pressure from the United States and
from organizations dedicated to population studies because of

the case of China. There were also people like Eldrich, who had a great impact because of their alarmism before the Stockholm Conference.

What sort of concerns about population problems were there in Mexico at the time?

In 1970, there was a committee I used to attend with Gustavo, and there was a great deal of discussion among doctors because they wanted things from the public sector such as hospitals and family planning programs. Why? Because they saw what was going on: women who gave birth often and children who died early, before they were a year old. Women's health conditions were extremely precarious; they used to have one child after another, many of whom died. There were 500,000 abortions a year in Mexico, which may have been illegal.

Family planning had existed in the United Satates since the 1930s. In the 1940s, they used to have diaphragms, which were virtually the only way of controlling fertility, because the Pill had not yet been invented. This method was not popular in Mexico because it came from the United States, and was only promoted by a few doctors at the ABC because it was the hospital closest to American medicine. Very few doctors were keen on the idea, as I know, because when the "Small Families Live Better" program was launched, under Echeverría, they put us in contact with the mother and child unit of the Health Secretariat. Dr. Fragoso was aware of this but he was a devout Catholic. Doctors at the time, including those in the government and the Mexican Social Security Institute, either did not know about family planning or did not believe that there was any need for it, although they were aware of the enormous number of deaths caused by illegal abortions and childbirth.

What was El Colegio de México's contribution to that problem? What role did the then government play, which led to a change in the 1973 law?

I wrote a chapter in a book on the labor force with Eliseo (Mendoza) and (Francisco Javier) Alejo. By good fortune, that year, which happened to be election year, Eliseo and Alejo began collaborating with IEPES. I asked them to give Echeverría a copy of the book on *The Demographic Dynamics of Mexico*. I have no idea what they said to him but he took in the ideas, after his gaffe in Hermosillo in the middle of the year when he had remarked on a conference that had been held in Denmark. Speakers at the conference said that x million births would have to be prevented from then until the year 2000 and when a journalist asked Echeverría what he thought about that, he said that he disagreed and that "governing meant populating." Afterwards, Alejo in particular but Eliseo too convinced him that there was a problem with demographic growth. El Colegio de México proved that the figures the government published were very low. These figures were influenced by Echeverría and he needed a technical base to overcome this problem and launch a viable policy.

At that time, Mexico had 4% inflation and a fixed exchange rate. The peso was highly overvalued, which we explained to Echeverría. I came away from that talk with the feeling that he had not understood and was subsequently forced to devalue the peso in 1976, after he had been backed into a corner, and with no monetary reserves. At that time, the country should have promoted imports and supported import substitution, because this was being carried out on the basis of tariffs and permits. There was a great deal of corruption, with committees run by businessmen themselves and there were all sorts of tricks to restrict and control imports using a fixed exchange rate that hampered imports. So I was amazed to be told when I went to the presidential residence in Los Pinos in early 1972, "That we are about to get this population thing off the ground, we need the El Colegio compilation, you are the only ones who have studied this issue." So they asked us to collaborate in the first state, called "Responsible Parenthood," using the slogan, "Small Families Live Better." We started to design a support program and used to meet every fortnight at El Colegio with the Mexican Population Association, which was my idea. We launched all that with the help of Jorge Martínez, who represented the doctors, and then we began to give talks with

demographers and explain the program to doctors, social workers and male nurses chosen by the health division. We gave lectures on demographic issues such as the population policies in place in other countries and the way birth rates are controlled, and the factors that determine it. A survey was undertaken at the time by someone whose name I forget that showed that women with higher educational attainment wanted fewer children and that those with lower educational attainment had six or more offspring.

What I did not know at the time was that there was going to be a conference in Bucharest. But I think that Echeverría knew that Jiménez Cantú (who was a devout Catholic and did not want to have anything to do with us) was going to the conference. Perhaps in his mind he had already made the decision to implement a different population policy that was incorporated into the 1973 Law and drafted by the Interior Secretariat.

That was his mission. It never emerged in our specific discussions, but we know that he was responsible for that, and then Alejo, who was working very closely with Echeverría, was asked to join the team, although not at the beginning. Then Carrillo Flores was appointed General Secretary of the Bucharest Conference. I have no idea how that happened because he had no background of demographic issues and was not even a politician; he was simply a respectable civil servant. In 1968, he was Foreign Affairs Secretary and in Washington he was nominated Undersecretary of United Nations and General Secretary of the Bucharest Conference. He used to come and go, and call me up. We were friends and began to get along very well, and Echeverría started to invite mixed groups to one of the halls in Los Pinos on the ground floor, with secretaries of State and all kinds of consultants that he used to have. I always went, as did Gustavo and he saw that we explained Mexico's problems in light of the conference. Once there was a very long meeting with Carrillo Flores, which Alejo attended. By that time, they were already preparing things for Bucharest but they still needed to discuss the matter in more detail and then explain it to the press. At the official level, there had already been several obstacles within the government, stupid, negative ideas such as those about the Mexican Social Security Institute. Even

with Reyes Heroles, it was not as easy as people think it was to go and see him and get him to agree to all that. He always had a different opinion from everyone else, because of his intellectual arrogance. In 1977, I think that the Organization of American States (OAS) organized a highly technical seminar with the BID, attended by a magnificent Chilean sociologist, to help organize the conference secretariat. I was also asked to attend and the two of us were supposed to organize the secretariat to coordinate all the discussions. The problem was that Mexico had not designated a representative, so I was asked to go.

The conference was about to start, so they wanted to know who would represent the Mexican authorities at a technical conference. The thing is that I was going in my capacity as a member of the Conference Secretariat, rather than representing Mexico. In the event, no-one went from Mexico.

So it was thanks to El Colegio de México, that from the 1960s onwards, particularly after the publication of *The Demographic Dynamics of Mexico*, Echeverría finally became aware of the situation. Despite the fact that he knew about the conference, Echeverría may have wanted to produce a definite population policy, which is why everything was drafted at top speed, although only timidly carried out. There is a law of which I was sent a draft. I do not know how much it influenced the way Gustavo wrote it, but the part on family planning is extremely weak. It talks about the authority to regulate the population but does not use the term "family planning." I put that in a program and sent a memo to Luisa María Leal, Moya Palencia's assessor, suggesting that they rewrite the articles. To make that chapter clearer, they needed to explain to everyone that family planning was not a crime but a social achievement.

Finally, by the beginning of the 1980s, was there any awareness of population problems or of the possibility of a crisis regarding the latter in Mexico?

This awareness was concentrated in El Colegio de México, and nowhere else. There was also a small, pioneering family planning

organization with a doctor who came from Puerto Rico, which subsequently joined Fepac (now known as Mexfam), which was the Population Studies Foundation. It was founded by Eduardo Villaseñor, who was a man of extraordinary vision. He was director of Banco de México and had extremely good relations with the United States and other countries. He joined forces with O'Farrill the elder, a famous physician who was one of the pioneers in family planning in Mexico, and they asked me to join the Board in the early days of Fepac twenty-five years ago in about 1980.

March 2004

INTERVIEW WITH CARMEN MIRÓ
FOR BOOK-HOMAGE
TO GUSTAVO CABRERA

José Luis Lezama

In your opinion, how did people regard the population problem in Latin America in the 1960s and early 1970s when Gustavo Cabrera was embarking on his career as a demographer?

During the 1960s and 1970s, the main concern in Latin America regarding the population is what was regarded as "high demographic growth." In fact, at the time, Latin America had an average growth rate of 2.8%. This average was calculated by including Argentina and Uruguay, which grew at an average rate of 1.7%, and six countries with a growth rate of over 3%, Costa Rica being the country with the highest growth rate (3.9% annually).

The fact that Latin America had a high average population growth rate meant that people thought it would continue to grow rapidly, since there were no signs of a decrease in fertility. In at least fourteen countries in the region, the percentage of inhabitants under the age of 15 was 42%, rising to 48% in a minimum of three countries, and it was estimated that this figure would continue to grow. It seems hardly necessary to stress the importance, in terms of the demand for education, health and nutrition services at least, of this group among the population as a whole.

In the 1970s in particular, the North issued several warnings to the region that unless steps were taken to reduce demographic growth, Latin American countries would be unlikely to be able to promote economic growth.

After the 1974 Bucharest Conference and its Plan of World Action on Population (PAMP), when Mexico already had a General Population Law, this climate gradually began to change. By this time, Cabrera was already actively involved in population-related studies and activities in Mexico.

What role did Celade, El Colegio de México and Gustavo Cabrera play in the analysis, teaching and management of demographic problems in Latin America and Mexico?

As far as I know, CEED Mexico was founded in 1964 with the collaboration of Celade faculty. In my opinion, the most important initial contribution of both institutions was the training of personnel capable of applying demographic analysis techniques to the study of the different characteristics of Latin American populations, including Mexico's.

After Bucharest, population departments were created in planning ministries or similar offices and attempts were made to provide elements to contribute to the design of population policies. Mexico was one of the few countries to set goals for population growth, which it did through Conapo. Gustavo Cabrera was a key figure during this stage and his management of Conapo as Secretary of the Council and Conapo's contributions placed Mexico at the forefront of population studies.

What was the link between Celade-Colmex and how did this translate into benefits for the research, teaching and management of population problems?

After contributing to the initial organization of CEED and the training of two Mexican demographers whose contribution proved crucial to the development of demography in Mexico (Cabrera and Benítez), Celade continued to collaborate with CEED through visits by Celade faculty to teach subjects on CEED's curriculum.

Through Benítez' participation, Mexico was present in the Program of Comparative Fertility Surveys in Latin America, which made a significant contribution to the study of various aspects of

one of the key variables in demographic behavior. In Mexico, the results of these surveys proved invaluable in determining the main characteristics of fertility. In 1970, Mexico hosted the Latin American Population Conference, in whose organization El Colegio faculty played a key role. The participation of several Mexican demography scholars in various sessions at the Conference proved that CEED had played a key role in their training. During the early years of CEED's development, Cabrera's contribution as Academic Coordinator and subsequently its director was a crucial factor in the prestige and recognition the Center soon earned in Latin America.

After all, it was the second institution in the region that was able to train demographers capable of contributing research and studies on Latin American populations.

ABOUT THE AUTHORS

Blanca Margarita Aguilar Ganado

Scientific dissemination program "Tiempo Completo", Head Offices of Scientific Research, UNAM.
Research areas:
- Scientific dissemination
- Contraception and public policies
E-mail: maggiar2003@yahoo.com.mx.

Francisco Alba

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Internacional migration
- Population and development
- Economic integration
E-mail: falba@colmex.mx.

Araceli Damián

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- The multidimensional nature of the problem of poverty (basic needs, income and time)
- Gender, poverty and labor market

- The effects of time poverty on the population's well-being.
E-mail: adamian@colmex.mx.

Beatriz Figueroa Campos

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Fertility and sources of demographic information
E-mail: bafig@colmex.mx.

Juan Guillermo Figueroa Perea

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Reproductive rights, health and public policies
- Male reproductive behavior
- Religion and reproductive rights of believers
- Ethics and research in social sciences
E-mail: jfigue@colmex.mx.

Brígida García

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Labor force, family and gender
E-mail: bgarcia@colmex.mx.

Gustavo Garza

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Urban and regional studies
E-mail: ggarza@colmex.mx.

Silvia E. Giorguli Saucedo

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Education, teenage labor and family structures
- Internacional migration
E-mail: sgiorguli@colmex.mx.

Boris Graizbord

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Social geography, economic geography and metropolitan transport
- Urbanization and environment
E-mail: graiz@colmex.mx.

Valentín Ibarra Vargas

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Regional economy
- Urban transport
E-mail: vibarra@colmex.mx.

José Luis Lezama

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Environmental policy
- City and environment
- Environment and society
- Social theory and environment
E-mail: jlezama@colmex.mx.

Gabriela Mejía Paillés

Doctoral candidate in Demography and Population Studies at the London School of Economics
E-mail: G.Mejía-Pailles@lse-ac.uk.

Alejandro Mina Valdés

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
• Mathematical demography
• Population statistics
• Mortality by causes
• Formal demography
E-mail: amina@colmex.mx.

José B. Morelos

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
• Mortality
• Labor force
E-mail: jmorelos@colmex.mx.

Orlandina de Oliveira

Professor-researcher at the Center for Sociological Studies (CES), El Colegio de México.
Research areas:
• I abor markets
• Family and gender
E-mail: odeolive@colmex.mx.

Manuel Ordorica

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Evaluation of demographic information
- Population forecasts
- Mathematical demography
E-mail: mordori@colmex.mx.

Catherine Paquette

Researcher at the French Institute of Research for Development (IRD).
Research areas:
- Urban policies
- Reurbanization dynamics
- Intra-urban mobility
- Recomposition of intra-urban centralities
E-mail: catherine.paquette@ird.fr.

Julieta Quilodrán

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Marriage rates and family: formation of unions, choice of spouse, separations, divorce and re-marriage
- Fertility: levels and trends
- Transitions to adulthood
E-mail: jquilo@colmex.mx.

Crescencio Ruiz Chiapetto

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Population distribution

- Urban economy
- Intermediate cities

E-mail: cruiz@colmex.mx.

Clara E. Salazar

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Environment, urban periphery and land regularization processes
- Urban structure and social actors

E-mail: csalazar@colmex.mx.

Jaime Sobrino

Professor-researcher at the Center for Demographic, Urban and Environmental Studies (CEDUA), El Colegio de México.
Research areas:
- Regional analysis
- Territorial competitiveness
- Metropolitan expansion

E-mail: ljsobrin@colmex.mx.

This work presents the results of a group of research projects on various aspects of the demographic, urban and environmental problems of present-day Mexico. These projects are a sample of what is currently being researched in Mexico, particularly at the Center for Demographic, Urban and Environmental Studies, El Colegio de México. The articles analyze both the basic, technical and theoretical aspects of the three disciplines referred to above, as well as important issues in decision-making and public policy. Some of the key issues in the evolution of population, urban and environmental problems in recent years that have defined the profile of contemporary Mexico are summarized in the various studies included in this work.