EL COLEGIO DE MÉXICO

CENTRO DE ESTUDIOS ECONÓMICOS

"*ESSAYS ON MIGRATION AND DEVELOPMENT IN RURAL MÉXICO*"

TESIS PRESENTADA POR:

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PARA OPTAR POR EL GRADO DE

DOCTOR EN ECONOMÍA

2001-2004

DIRECTOR DE TESIS

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2007

MÉXICO D.F.

Acknowledgments

This work has been made possible thanks to the support of many people and institutions. I owe my advisors, family, friends, classmates, colleagues and professors gratitude for their help during the whole research process and their support when I was tired, doubtful, or discouraged. Their unconditional support made it possible for what started out as a research idea, an intention and a hope, to become a reality. In this sense, the thesis is a collective work, even if some of the people who participated are not aware of it.I want to thank my parents, Sara and Leopoldo, who have taught me the meaning of sacrifice and work with their example in everyday life. All of my family gave me the opportunity to discover my interests and to devote myself to them. My brothers encouraged me with prods and threats all through the process of writing my thesis. I would not have been able to carry out this task without Olga's support; there is nothing I can say here that would be new to her. Thank you for our children and for the endless warmth that you give all of us.I want to express special and deep gratitude to Professor J. Edward Taylor. Without his invaluable advice, direction and support, this thesis would not exist. It is impossible for me to describe the enormous friendship and teachings that he has left in my formation as an economist of migration. Thanks also to my thesis director, Professor Antonio Yúnez Naude, for his advice and the time granted to supervise this work, for the opportunity and trust that he has given me, and for making me his friend and collaborator in research ventures that he is carrying out. While I was a doctoral student, the professors at the Centro de Estudios Económicos of El Colegio de México put all of their effort into transmitting the knowledge that I needed to complete this enterprise. I thank them all, as well as the PRECESAM team, which collaborated to carry out the ENHRUM. Its members deserve special recognition because they gave me access to a unique database on the Mexican rural sector.Along the way I have had the good fortune to receive comments and critiques of my written work presented at various research seminars. There is a core group of people who substantially helped in the development of this thesis: my classmates in the doctoral program, including Hazael, Eduardo, Enrique and Williams. They have provided me an atmosphere in

which I have been able to discuss topics related not only to my research, but also thoughts about everyday concerns. Without them, I fear, my life as a teacher and researcher would have been short.In the process of transforming my initial project into this thesis I accumulated some additional debts. My work would not have been possible without the institutional and financial help of the Consejo Nacional de Ciencia y Tecnología (CONACYT) and PRECESAM and REAP (Rural Economies of the Americas Program at the University of California at Davis). I also feel a deep sense of gratitude toward the Centro Regional de Investigaciones Multidisciplinarias (CRIM), because it gave me support and the opportunity to deepen my knowledge of migratory phenomena from diverse perspectives at a time when this thesis was only a rough draft.This seemingly interminable list of acknowledgments clearly bears out the fact that my project has been an exercise of collaboration and discussion with many people. There are more than those already mentioned who encouraged me to embark on this venture and supported me along the way. Thanks to those who asked me once (if not thousands of times) about how things were going; to those who were concerned about endings or beginnings; to those who nudged me to get a little closer to my goal; and to all who understood the delays and pitfalls on the road to concluding this thesis. All were responsible for a work that I can be reasonably proud of, and to all I give thanks.

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Introduction

International migration is an essential component of globalization. Mobility of people across national borders is becoming higher and higher, with people moving to more and more distant places. Migration arises when people look for better conditions of life; it is a structural phenomenon produced by economic asymmetries and the growing interdependence among countries. The operation of complex social and family networks between the origin and destination countries has helped migrants respond quickly to information and opportunities that originate in neighboring or distant countries, conforming labor markets that transcend national frontiers.[1]

The new era of the global world system is based not only on freer movement of goods, services and capital, but also on a persistent increase in the number of international migrants. By 2000 almost 175 million people (3 percent of the world's total population) were migrants, that is to say, living in a country different from that of their birth. Emigration has grown 13.5% since 1990, when the United Nations reported that there were 154 million immigrants (United Nations, 2002).

Worldwide and in absolute numbers, the United States (US) attracts the highest proportion of migrants around the world (20%). In 2000, the US had around 35 million migrants; 12.4% of its total population was composed by people coming from other parts of the world. Nevertheless, other countries had higher percentages of immigrants in their populations, including United Arab Emirates (74%), Jordan (40%), Israel (37%), Saudi Arabia and Switzerland (25%), Australia (24%) and Kazakhstan (19%).

According to the World Bank, by 2000 and worldwide, Mexico occupied first place in net emigration, with 2 million people living abroad, followed by China with 1.95 million (World Bank, 2005). In Latin America, the country that follows Mexico in terms of number of emigrants is Guatemala, with 390 thousand people.

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[1] Family networks contribute towards diminishing the costs and risks of migration and constitute the most common form in which crucial information is transmitted to new migrants (Massey *et al.*, 1987).

Migratory movements around the world create an international labor market that leads to the generation of incomes part of which are transferred to the countries of origin in the form of remittances. Worldwide, in 2000 total remittances amounted to 62.2 billion dollars, 80% of which were sent to less developed countries. Asia, Latin America and the Caribbean are the areas with the highest proportion of remittances received: 39% and 28% respectively (United Nations, 2002).

In 1990 three European countries (Italy, Germany and Portugal) shared first place as destinations of the world's migrant remittances, receiving 4.8 billion dollars on average. Mexico occupied eighth place with 3.1 billion dollars. By 2003, the composition of remittances had changed radically. Three countries belonging to less developed regions were the main recipients of remittance flows: India with $17.4 billion, Mexico with $14.6 billion and the Philippines with $7.9 billion (World Bank, 2005).

Recent growth in international remittances received by less developed countries is remarkable. For example, in 1990 Nigeria received 10 million dollars in remittances and in 2003 the amount rose to 1.7 billion dollars. This has also been the case for several countries in Latin America and the Caribbean, where Ecuador, Costa Rica, Trinidad and Tobago, Bolivia, Venezuela, Guatemala, Honduras and Haiti stand out. From 1990 to 2003, the growth of remittances received by Mexico was 371% (World Bank, 2005). According to data from Inter American Development Bank (IDB), Mexico is the Latin American country that received the most remittances between 2003 and 2004.

According to data provided by Bank of Mexico, in 1990 the international remittances transferred to Mexico were around $2.49 billion; by 2005, this figure grew to $20.03 billion (this change is equivalent to a yearly average growth rate of 15%). The growth rate of remittances received by Mexico has been increasing, up to 20.6% in 2005 with respect to 2004.

Until the end of the decade of the 1980s, international migration from Mexico mostly originated in a few areas. The states with the greatest migratory tradition were located in the center-west (Zacatecas, Michoacán, Jalisco and Guanajuato, among others). However, since the beginning of the 1990s, international emigration has become more widespread (INEGI, 2001).

The United States is the main destination for Mexican emigrants. Mexico-US flows have grown substantially in recent decades, generating profound economic, political and social effects on both countries (for more details, see Unger, 2005).

Mexicans' emigration to the United States is complex, with deep structural and historical roots in both sides of the border. Two of the main forces that have contributed to structuring the Mexico-

US migratory system are: 1) the push factors related to the supply or expulsion of Mexican laborers looking for better employment and income options than in their places of origin; and 2) the pull factors associated with the demand or attraction of workers to satisfy labor requirements in the American agricultural, industrial and services sectors. To these two forces, social and cultural ones must be added. The latter link the areas of origin and destination in ways that are decisive in reducing costs and risks associated with migratory movements and sustain, recreate and perpetuate these movements (Massey *et al.*, 1993 and 1994).

The extraordinary growth of international emigration and the monetary flow associated to this phenomenon has spurred the interest of social scientists to carry out studies about the diverse effects of migration in the migrant expelling and receiving countries. A subject that has received particular attention is economic development. The debate surrounding the relationship between migration and development has changed in recent years. In the past, migration was seen as a failure to achieve economic development, or even worse, as a contribution to the vicious circle in which migration reinforced the problems of poverty and economic stagnation of labor expelling countries. Recently, a different view has emerged in the literature. It argues that, in addition to benefiting individuals who participate in internal and international migration, migration can contribute to development. In this approach, migration is viewed as part of a virtuous interaction in which development can be reinforced, not only in the country of destination but also in the country of origin of the migrants (Taylor and Martin, 2001). Despite the growing acceptance of this view, the relationship between migration and development is a question that remains to be answered, both theoretically and empirically (Taylor, 1999 and Unger, 2005).

In relation to international migration from rural areas, the literature presents two extreme arguments. One is that increasing rural emigration can generate a complete and permanent relationship of dependence on remittances for the acquisition of consumption goods and not for investment (Adams, 2005; Cornelius, 1990; Díaz-Briquets and Weintraub, 1991). On the other hand, there is the view sustained by adherents of the New Economics of Labor Migration (NELM) that argue that migration contributes to the development of sending communities (Stark, 1991; Stark and Bloom, 1985).

As frequently happens, the true effects of emigration fall between these two opposing perspectives; i.e., emigration and remittances generate both positive and negative impacts on migrant-sending areas.

Several aspects of the impacts of migration on rural development can be studied. The main objective of this thesis is to analyze--with state-of-the-art econometric techniques and representative data--fundamental questions related to migration and its impacts on the rural economy of Mexico. The thesis is made up of three essays. The first essay examines the determinants of internal and international rural out-migration decisions, in an econometric analysis that incorporates both migrant destination and economic sector of employment and that highlights the role of community, household and individual variables shaping migration. The second explores the impacts of domestic and international remittances on poverty and the distribution of rural household income. The third essay tests for the effects of migration on consumption and investment patterns in rural households.

In these ways, the thesis offers new insights into the factors influencing rural emigration and the effects of migration and remittances on Mexico's rural development.

Migration Determinants

In the first paper the determinants of internal and international rural out-migration are studied. The analysis includes two novel extensions of past migration research. First, it incorporates both alternative destinations (internal versus international migration) and sectors of employment (farm *versus* non-farm) into a common theoretical and empirical framework. This is important because different types of individuals are selected into migration to different destination/sector regimes. Second, the study includes both family and community variables, with potentially distinct impacts on migration to specific labor markets. Including family variables in the analysis reflects insights from the new economics of migration theory, by which migration decisions take place within larger social units (i.e., households). Community variables include access to markets which may influence the economic returns from local production. Prior research on migration and market integration has had a country focus, and findings largely have been incidental or else based on applied theoretical or simulation models. This is the first study, as far as I know, that tests for the effects of indicators of local market integration on migration behavior.

The results of the empirical analysis establish that migration is a selective process. Individual, family, and community characteristics of those who migrate are significantly different from those who stay behind. Furthermore, the selectivity of migration is different for distinct migrant destinations (within Mexico and the US) as well as for different sectors of employment (agricultural and non-agricultural). Models that do not consider the character of labor market at migrant destinations are likely to yield misleading results. For example, human capital theory

predicts that educated people have a higher tendency to migrate internationally than less educated people. However, it is found that this is not necessarily the case for unauthorized migration to low-skill labor markets abroad.

Remittances, Inequality and Poverty

The second paper is focused on establishing the effects of remittances on poverty and income inequality. Impacts of migrant remittances on income inequality have been a subject of considerable economic research. However, findings often have been contradictory, and a unifying theory of remittances and inequality has been elusive. The same is true for the influence of remittances on poverty, which largely has been ignored in the development economics literature. There has been no effort, as far as I know, to explain the sometimes striking observed differences in the impacts of internal and international migrant remittances on rural inequality and poverty across regions.

This second article seeks to offer an explanation for the diverse impacts of remittances on inequality and poverty across regions. Using Gini and poverty decomposition techniques and data from rural Mexico, it presents evidence that marginal effects of remittances on inequality and poverty vary, in a predictable way, across regions with different levels of migration prevalence. In the case of international migration, which entails significant costs and risks, the impacts of remittances are more equalizing and have a larger effect on alleviating poverty as the share of households with access to remittance income increases.

Migration and Expenditures

The third paper uses an econometric methodology to examine the effects of migration on expenditure patterns of migrant households in Mexico's rural communities. It is known that migration reshapes rural economies in ways that may go beyond the contribution of migrant remittances to household income. Consumption and investment expenditures by migrant-sending households may transmit some of the impacts of migration to others, inside and outside the rural economy, and they also may shape the potential effects of migration within the source household. Numerous studies have attempted to quantify the impact of migrant remittances on expenditures in migrant-sending households following one of two approaches. The first asks how migrant remittances are spent. This approach has the advantage of being simple but the significant disadvantage of ignoring the possibility of achieving fungible income from migrant and non-migrant sources. Remittances have almost certainly indirect effects on expenditures through their

contribution to households' total budgets. Based on a household expenditure demand system, the second approach uses a regression approach that considers remittances as an explanatory variable, in addition to total income and other controls. An advantage of this method is that it enables to test whether remittances affect expenditures in ways that are independent of their contribution to total income. However, it does not take into account myriad of other ways, besides remittances, in which migration may influence expenditure patterns in households with migrants. It also may suffer from econometric bias, which results from the endogeneity of migration and remittance receipts. The same variables may simultaneously affect both remittances and household expenditures, and unless controls are incorporated for this, biased estimates may result.

In this paper a third approach is proposed, designed to model the full impact of migration on expenditure patterns in migrant-sending households. A censored demand system that includes migration and its interactions with expenditure of the household is estimated, while controlling for the fact that migration, like expenditures, represents an endogenous household choice. This approach is used to test whether the parameters in the demand system differ significantly between households with and without migrants.

The econometric results reveal that, other things being equal, patterns of demand differ significantly between households that have migrants and those that do not. An income change in migrant-sending households, whether from remittances or other sources, has a disproportionately greater effect on some types of expenditure than does the same income change in otherwise similar non-migrant households. Findings do not support the argument frequently made in the literature that migrant households spend their income disproportionately on spendthrift consumption. Households that engage in migration, compared with otherwise similar households without migrants, spend a larger share of their marginal dollar on investments and a smaller share on consumer goods. Interestingly, the international migrant household group spends less on housing than otherwise similar non-migrant households. The difference in marginal budget shares for housing between non-migrant households and international migrant households is negative. In other words, increases in rural incomes have a slightly larger positive effect on housing expenditures when not associated with international migration. It would appear that high housing expenditures for international migrant households are more a function of these households' high incomes than of their migration status. Inasmuch as this analysis controls for endogeneity of international and internal migration, these findings probably do not reflect differences in expenditure patterns between migrant and non-migrant households prior to migration.

The data used for this doctoral research comes from the Mexico National Rural Household Survey (*Encuesta Nacional a Hogares Rurales de Mexico*, or ENHRUM). This survey provides detailed data on assets, socio-demographic characteristics, production, income sources, and migration from a nationally and regionally representative sample of rural households surveyed in January and February 2003. The sample includes 1,782 households in 14 states. The data are for 2002, with the exception of household members' labor and migration histories, which covering the period from 1980 to 2002.

INEGI, Mexico's national bureau of statistics and geography, designed the sampling frame to provide a statistically reliable characterization of Mexico's population living in rural areas, or communities with fewer than 2,500 inhabitants. For reasons of cost and tractability, individuals in hamlets or disperse populations with fewer than 500 inhabitants were not included in the survey. The result is a sample representative of more than 80 percent of the population considered by Mexican government as rural.

Survey teams visited each community twice, first in summer 2002, to conduct a survey of community characteristics via interviews with local leaders, service providers, and school teachers, and again in January-February 2003, to carry out the household survey. In the present research, household survey is the source of all information on individual and family characteristics, and community variables were constructed from the community survey.

In order to implement the survey, Mexico was divided into five regions, reflecting INEGI's standard regionalization of the country: Center, South-Southeast, West-Center, Northwest, and Northeast.

Chapter 1

Determinants of Migration, Destination and Sector Choice: Disentangling Individual, Household and Community Effects.

Migration is a selective process. The individual, family, and community characteristics of those who migrate are different than those who stay behind. The basic premise of this paper is that the selectivity of migration is different for distinct migrant destinations as well as for different sectors of employment at those destinations. Models that do not consider the character of the labor market at migrant destinations are likely to yield misleading results. For example, human capital theory predicts that educated people have a higher propensity to migrate internationally than less educated people. A number of empirical studies support this prediction (e.g., see Adams, 2003). However, it is not necessarily the case for unauthorized migration to low-skill labor markets abroad.

The present study includes two novel extensions of past empirical migration research. First, it incorporates both alternative destinations (internal versus international) and sectors of employment (farm versus nonfarm) into a common theoretical and empirical framework. This is important because, as we shall see, different types of individuals are selected into migration to different destination/sector regimes. Second, the study includes both family and community variables, with

potentially distinct impacts on migration to specific labor markets. Including family variables in the analysis reflects insights from the new economics of migration theory that migration decisions take place within larger social units (i.e., households). Community variables include access to markets, which may influence the economic returns from local production. Past research on migration and market integration has had a country focus, and findings largely have been anecdotal (Martin, 1993) or else based on applied theoretical or simulation models (Levy and Wijnberger, 1992; Hinojosa-Ojeda and Robinson, 1992). This is the first study to my knowledge that tests for the effects of indicators of local market integration on migration behavior.

To model the selectivity of internal and international migration to farm and nonfarm jobs, limited-dependent variable methods and data from the 2003 Mexico National Rural Household Survey (*Encuesta Nacional a Hogares Rurales de México*, or ENHRUM) are employed. The ENHRUM is unique in providing detailed socio-demographic and economic information on a nationally representative sample of rural households in Mexico. Current and retrospective migration data, including migrants' sector of employment, were gathered for all household members as well as for sons and daughters of household heads or their spouses who were living outside of the household at the time of the survey.

Mexico is an ideal site to study the selectivity of migration and its implications. Mexico's rural economies are being transformed as migrants integrate households and communities with labor markets in Mexico and the United States. Findings from the 2003 ENHRUM reveal that people are leaving Mexico's villages at an unprecedented rate. Figure 1.1 shows that the percentage of Mexico's village populations working at both internal and international migrant destinations increased sharply at the end of the 20th century. More than half of all migrants leaving Mexican villages go to destinations in Mexico; however, villagers' propensity to migrate to U.S. jobs more than doubled from 1990 to 2002. This surge in migration mirrors an unexpectedly large increase in the number of Mexico-born persons living in the United States revealed by the U.S. 2000 Census.[2] To date, most of the understanding of the selectivity and economic impacts of migration in rural Mexico comes

[2] The Mexico-born population in the United States increased from 6.7 million to 10.6 million between 1990 and 2000 (United States Census Bureau).

from a limited number of nonrandom community case studies.[3] The ENHRUM data are nationally representative of Mexico's rural households.

The rest of the chapter is structured as follows. In section 1.1 the background on selectivity migration process is discussed. Section 1.2 presents the conceptual framework of the principal determinants of migration. The basic characteristics of data and variables are described in section 1.3. Estimation and Results are presented in Section 1.4, and section 1.5 offers concluding remarks.

1.1 Background

Understanding the selectivity of migration is important for several reasons. Characteristics of migrants, their households and their communities of origin can shape migrants' success at their destinations as well as their impacts at home. These characteristics determine which households and communities bear the costs of human capital "lost" to migration, as well as the distribution of migration's potential benefits through remittances and the income multipliers they may create. Immigration policies of countries receiving migrants attempt to influence the characteristics of legal migration, but they have less influence over the characteristics of unauthorized migrants. Because of migrant selectivity, market integration can alter the characteristics of rural populations through its influence on migration. Different theoretical models of migration imply different selectivity patterns, and these models can provide guidance for policy interventions to influence migration and its impacts, including remittance-induced development. Some sectors of migrant-destination countries rely heavily on foreign labor. For example, migrants from Mexico represented 77 percent of the U.S. farm workforce in 1997-98, up from 57 percent in 1990 (U.S. Department of Labor, 2000 and 1991). The determinants of migration are critical to the livelihood of these sectors.

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[3] These include socio-demographic surveys by the Mexico Migration Project (MMP) (Population Studies Center, University of Pennsylvania, Philadelphia; www.pop.upenn.edu/mexmig/welcome.html) and various economic surveys of communities conducted in the 1980s and 1990s by the University of California, Davis and El Colegio de Mexico (Taylor and Yúnez-Naude, 2000; Taylor, 1987 and 1986). Although households were sampled randomly within villages in the data used for these studies, selection of villages was not random and the surveys spanned a number of years. MMP surveys tend to focus on relatively high-migration communities in central Mexico.

Different migration theories imply different sets of variables shaping migration decisions and different impacts of migration on rural economies. A well-developed literature addresses the question of migrant selectivity by merging individual-migration theories with human capital theory arising from the early work of Mincer (1974), Becker (1975), and others. Wages at prospective migrant origins and destinations are assumed to be a function of individuals' skills affecting their productivity at origin and destination. In the Todaro model, human capital characteristics of individuals may influence both their wages and their likelihood of obtaining a job once they migrate. Characteristics of individuals may also affect migration costs. The human capital view of migration has the key implication that the types of individuals selected into migration are those for whom, over time, the discounted income (or expected-income, net of migration costs) differential between migration and nonmigration is greatest and/or migration costs are lowest.

Almost overwhelmingly, human capital theory predicts that the most educated people migrate. This, however, hinges on the assumption that schooling has a greater positive effect on earnings at migrant destination than origin. This is likely to be the case for internal migration to nonfarm jobs or legal international migration, but not necessarily for internal migration to agricultural jobs or unauthorized international migration to any job.

The new economics of labor migration (NELM) brings a household perspective to the analysis of migration behavior. Household variables, including assets and the human capital of household members other than migrants, are hypothesized to influence migration decisions via their effect on migration costs (including the opportunity cost to households of allocating their members to migration work) as well as the impacts of remittances and the income security that migrants provide on the expected utility of the household as a whole.

Economic and market conditions in rural areas, particularly access to markets for inputs and outputs, are also likely to shape the benefits and costs of migration for rural households. I am not aware of any research that tests for the effects of local market integration on migration. This is surprising in light of interest at the aggregate level in interactions between market reforms and international migration. Most international trade theory posits that trade and migration are substitutes (e.g., see Heckscher, 1949; Ohlin, 1933; Mundell, 1957 and Stolper and Samuelson, 1949), although not necessarily in the short run (Martin and Taylor, 1996). Results of the present study show evidence on a local level that this may not be the case.

If family and community as well as traditional human capital variables shape migration decisions, omitting any of these variables from the analysis is likely to result in biased estimates of migration model parameters.

1.2 Conceptual Framework

Migration is the result of individuals and households weighing the utility that is attainable under different migration regimes with the utility from not migrating. A migration regime is defined as a combination of place (the village of origin in the case of nonmigration, internal migrant destinations, or foreign destinations) and sector of employment. There are five potential regimes in this empirical model: nonmigration, two destination types (internal and international) and two employment sectors in each (farm and nonfarm).

Migration entails a discrete, dichotomous or polychotomous choice. A reduced-form approach, in which income or expected-income is replaced by a vector of exogenous (i.e., human-capital, capital and, in the case of NELM models, household) variables, has been used in a number of studies utilizing probit or logit estimation techniques (e.g., see Taylor, 1986, and Emerson, 1989). Multinomial logit, probit, tobit, two-stage (Heckman) and various maximum-likelihood techniques for estimating discrete-continuous models, not available or accessible two decades ago, today are widely used to estimate migration-decision models at a micro (individual or household) level. Recent examples include Perloff et al. (1998), Emerson (1989), Taylor (1987, 1992), Stark and Taylor (1989, 1991), Lucas and Stark (1985), and Barham and Boucher (1998). Explicitly or implicitly, these empirical studies are grounded in a random-utility theoretic model in which it is assumed that households make migration decisions that maximize their welfare.

Two major determinants of utility are the income the person-i's household receives independent of individual i's regime choice and the income the individual generates under alternative migration regimes. Household income is the sum of net incomes from all household production and labor activities, excluding individual i. This income depends on person i's family characteristics, ZF^i, including assets that affect the productivity of investments on and off the farm and migrant networks (Massey, et al., 1987 and 1993) that influence remittances from other family members besides person i. Income also may be influenced by community context variables, ZC^i, that affect the economic returns to family resources inside and outside the village. An example of ZC^i might be access to outside markets for family farm production or wage labor.

Nonmigrants have the option of supplying labor to local labor markets or to family farm production. Those who participate in the labor market receive a wage that depends on their human capital, ZH^i, and context variables that influence the returns to human capital in local labor markets. Nonmigrants who work in family farm or nonfarm production activities produce a value product that depends on family, community and human capital variables. Migrants receive a wage that depends on their human capital as well as family and community variables influencing migration success (e.g., migration networks; see Taylor, 1986 and Munshi, 2003).

Individual, family and human capital characteristics may affect remittance behavior, migrants' wages and migrants' willingness to share their earnings with the household, through remittances. Finally, individual, family and community variables may influence migration costs, as well as the ability to finance these costs. Wealth and migration networks may play a particularly important role in this regard (López and Schiff, 1998; Taylor, 1987).

The impact of a given variable on migration probabilities is a mixture of the variable's expected influences on incomes at origin and destination and on migration costs.

In this study, it is not attempt to isolate income and cost effects. The goal in this research is to estimate the differential net effects of individual, family and community variables on observed migration outcomes. The influence of a particular variable may be different for different migrant destinations and different sectors of employment, reflecting in part the differential returns to human and migration capital. The empirical models, described below, are multinomial logits, in which the probability that individual *i* is paired with migration destination-and-sector regime *d* is given by:

$$prob(U_d^i \geq U_j^i \forall j \neq d) = \frac{e^{\beta_d Z^i}}{\sum_{j=0}^{J} e^{\beta_j Z^i}} \quad (1.1)$$

where Z^i is a vector of individual i's individual, family, and community characteristics; that is, $Z^i = [ZH^i, ZF^i, ZC^i]$.

1.3. Data and Variables

As mentioned, data to estimate the model are from the ENHRUM (see the Introduction). In this analysis, the dependent variable is the migration-employment regime in which individuals were

observed in 2002. The human capital, family and community variables are summarized in Tables 1.1 and 1.2 and described below.

1.3.1 Individual Characteristics

Individual variables include the standard Mincer (1974) variables: years of completed schooling; age, which captures both life-cycle and experience; age-squared; gender (a dummy variable equal to 1 if male, 0 if female); status in household (1 if household head, 0 otherwise); and marital status (1 if married, 0 otherwise). The average adult (12 or older) household size is 5.6, nearly evenly divided between males and females (Table 1.1). The data reveal low levels of human capital. Average schooling of household members is just under 6 years, but schooling of household heads averages just over 4 years. Average schooling is highest for internal migrants in nonfarm jobs (7.3 years). It is lowest for internal migrants in farm jobs (3.8 years; see Table 1.2).

Twenty six percent of nonmigrants are household heads, compared with 18% of internal and 23% of international migrants. Most international migrants from rural Mexico work in nonfarm rather than farm jobs. In the ENHRUM sample, 78% of all international migrants were observed in nonfarm jobs in 2002. Farm labor migration is dominated by males. The female share is highest (35%) for internal migration to nonfarm jobs and lowest (5%) for international migration to farm jobs. A higher percentage of migrants (62% of internal, 72% of international) than nonmigrants (60%) are married.

1.3.2 Family Characteristics

Family characteristics include physical capital: land, livestock holdings, and equipment. Landholdings are measured in value terms, to reflect both quality and quantity. Livestock is proxied by the number of large animals (oxen, horses, cows) owned by the household. Equipment is proxied by number of tractors owned by the household. Family characteristics also include human capital of family members other than person i, measured by the number of males and females with secondary education; years of completed schooling of the household head; migration networks; and an index of family wealth. The wealth index was constructed using the method of principal components with data on household assets, principally housing characteristics (number of rooms; materials used for the construction of floors, walls and roofs; dummy variables indicating whether the house had running water, electricity, and sewerage), and other services and durables (telephone, television, and a refrigerator). The procedure follows closely the one used by McKenzie and Rapoport (2005). Two migration network variables were constructed, calculated as

the number of family members working in the United States and at internal migrant destinations in 1990. This year was selected in order to minimize potential endogeneity of migration networks.

On average, households had landholdings valued at 116,000 pesos (approximately US$11,600), 3.6 large animals, 0.21 family migrants at internal destinations, and 0.13 migrants in the United States. Few households own tractors; the average per household is 0.06. The data show that there are wide disparities in each of these variables.

Households of nonmigrants had an average of 0.17 family members working as internal migrants and 0.10 working abroad in 1990. Internal migrants' households had more family members at internal destinations (0.65) and few in the United States (0.05). International migrants' households had above-average numbers of family members at both international and internal destinations (0.56 and 0.19, respectively).

Summary statistics reveal that households of international migrants had above-average wealth, indicated by a positive wealth index mean, while internal migrant households had below-average wealth (a negative mean). The wealth index for nonmigrant households (0.05) is identical to the average wealth index for the full sample. The average value of landholdings is higher in households of nonmigrants (122,000 pesos) than of internal or international migrants (67,000 and 88,000 pesos, respectively). International migrants' households average 5.8 head of livestock (oxen, cattle and horses), compared with 3.6 for nonmigrants' households and 2.3 for households of internal migrants.

Average schooling of heads is 4.1 years in households of nonmigrants, 3.4 years in households of internal migrants, and 3.6 years in households of international migrants.

1.3.3 Community Characteristics

There are several candidates for indicators of access to markets and access risk at the community level. Two were included in the econometric model. The first is frequency of transport availability between the village and commercial centers with which villagers transact. The construction of the frequency of transport variable was the following: (a) To create a list of commercial centers (node) with which each village interacted; (b) to construct an index of frequency of regularly scheduled transportation between the village and each of these nodes, ranging from 0 (less than one trip per day) to 3 (more than six trips per day); and (c) to sum this frequency index across commercial nodes. The higher the value of this index, the greater the frequency of transport and number of outside communities with which the village is linked via

regularly scheduled transportation. The second indicator is a proxy for security of market access, a dummy variable equal to 1 if the village is accessible in the case of natural disasters and zero otherwise (e.g., is located at the end of a road or across a bridge that may become inaccessible). The list of community variables also includes the presence of local nonfarm enterprises, which may offer employment alternatives to migration.

The frequency of transport index averages 8.5 but ranges from 0 to 24. Fourteen percent of villages lack access during weather shocks, and one in four has a nonagricultural enterprise. Both frequency of transport and insecurity of market access are highest for households of internal migrants. The share in villages with nonagricultural enterprises is highest for nonmigrants (0.26) and lowest for internal migrants (0.15).

Correlations among this complex set of variables limit the usefulness of summary statistics to identify migration determinants. A multivariate regression approach that controls for these correlations is required in order to obtain reliable estimates of the effects of individual, family and community characteristics on migrant destination and employment sector choice.

1.4. Estimation and Results

Figure 1.2 illustrates trends in the percentage of rural Mexicans employed as internal and international migrants in farm and nonfarm jobs from 1980 through 2002. It shows a sharp upward trend in the percentage of villagers working as internal and international migrants in nonfarm jobs, a mildly upward trend in the percentage in U.S. farm jobs, and a declining trend in the percentage in agricultural jobs in Mexico. The decrease in internal migrants employed in farm jobs reflects a decline in Mexico's agricultural employment in the 1990s.[4] In 2002, an average of 14 percent of Mexican village populations was working in the United States. This figure is higher than for the total Mexican population; approximately 9 percent of all Mexicans were in the United States in 2002.[5] Most international migrants from rural Mexico (82 percent) were employed in

[4] The total nonfarm payroll in Mexico increased by 73% from 1990 through 2001 in real terms, while the farm payroll decreased by 5.2% (México, Instituto Nacional de Estadística, Geografía e Informática or INEGI)

[5] The Current U.S. Population Survey shows that there were a total of 9.82 million Mexicans in the United States in 2002. In that same year, the population of Mexico was estimated at 103 million. This means that approximately 9 percent of all Mexicans were living in the United States.

U.S. nonfarm jobs. On average, 15 percent of village populations were observed as internal migrants. Of these, 90 percent were in nonfarm jobs.

The estimation procedure was the following. First, a 2-regime logit model for migration and nonmigration[6] and a 3-regime multinomial model for nonmigration, international migration, and internal migration were estimated. The model was then expanded to the 5 destination- sector (agriculture and nonagriculture) regimes. All three models were estimated using maximum likelihood in Stata.

Table 1.3 reports the estimation results for the 2- and 3-regime migration models, and Table 1.4 reports the results for the 5-choice migration/sector regime model. The columns in these two tables correspond to migrant destinations (Table 1.3) and sectors of employment (Table 1.4); the rows to explanatory variables. Asymptotic t-statistics appear in parentheses underneath the parameter estimates. The estimates presented in these tables are of the vector β_d in Equation (3). As noted earlier, they represent the utility returns to each characteristic in regime d. These have the same signs and significance as the marginal effects of explanatory variables on migration probabilities. To obtain estimates of the probabilities of participating in migration or migration/sector regimes, these must be used together with variable means as shown in Equation (3). Estimated effects of explanatory variables on migration and sector probabilities are presented in Tables 1.5 and 1.6, respectively.

Each table reports results for the three sets of explanatory variables in the model: individual, family and community characteristics. In most cases, all three play a significant role in shaping migration decisions.

1.4.1 The Selectivity of Migration from Rural Mexico

Total migration includes a heterogeneous mixture of migration to internal and international destinations and to farm and nonfarm jobs. The first data column of Table 1.3 reveals that, despite this heterogeneity, most individual, household and community variables are significant in explaining the movement of individuals out of villages. Household heads are significantly less likely to migrate than non-heads. This finding is consistent with the hypothesis that heads have family farm-specific human capital and thus a high opportunity cost of migrating. Males are significantly more likely to migrate than females. The probability of migration increases with age,

[6] A 2-choice probit was also run, with identical qualitative results.

but at a decreasing rate. This reflects the selectivity of migration on the working-age population but not on the very young or elderly. Married villagers are significantly more likely to migrate than those who are not married, a finding that is similar to the positive effect of this variable in studies of labor-force participation. Other things being equal, the probability of migration rises significantly with years of completed schooling of the individual, suggesting that the economic returns to schooling, on average, are higher in migrant labor markets than in the village. However, migration is negatively associated with schooling of the household head. This is consistent with the expectation that household heads' schooling raises the productivity of labor in family production activities, thereby raising the opportunity cost of migration. There is evidence that migration propensities are lower in households with adult males (other than the migrant and head) who have secondary education. Interestingly, the number of males and females over 15 years in the family are not significantly related to migration propensities when we control for all other variables in the model. It appears that human, family and community capital variables, not sheer numbers of adult family members, are the critical variables promoting migration.

As the value of family landholdings increases, the probability of migration decreases. This is what we would expect if household landholdings and land quality increase the productivity of family labor. Livestock holdings are not significantly associated with migration. Livestock production is not labor intensive and, unlike other land-based production activities, it does not appear to compete with migration for family labor. Controlling for these assets, the index of household wealth does not significantly affect migration in general (although this is not true for migration to specific destinations; see below). Both migration network indicators have an effect on migration that is positive and highly significant, supporting findings by Massey (1987) and others that migration is a network-driven process.

All three community variables significantly explain total migration. Migration increases with villages' transportation access to commercial centers, which we use as a proxy for market integration.[7] This finding may suggest that migration and market integration are complements on a local level. The relationship between insecurity of market access and migration is positive and significant. Other things being equal, individuals in villages with insecure access to outside

[7] Other proxies for market access were used, such as distance to the nearest commercial center and quality of roads, but these variables were not found to be statistically significant.

markets are more likely to migrate than individuals in villages where market access is secure. Migration decreases when nonfarm enterprises are present in the village.

Multinomial logit results (Tables 1.3 and 1.4) reveal that the impacts of these explanatory variables are not uniform across migration destinations or sectors of migrant employment.

1.4.2 Internal Migration

The effects of schooling on migration are sector-specific. Years of completed schooling has a significant positive effect on total migration (Table 1.3) and on internal migration to nonfarm jobs (Table 1.4), in which the economic returns to schooling obtained in Mexico are likely to be high. However, it is negatively associated with internal migration to farm jobs, in which skill requirements are minimal and thus the economic returns to education are likely to be small. A similar pattern is evident for the other major human capital variable. Age has a quadratic (inverted-U) relationship with total migration, internal migration, and internal migration to nonfarm jobs. However, there is no significant evidence of an age (or experience) effect on internal migration to farm jobs. The negative effect of the household-head variable on migration probabilities is robust across migrant destinations. However, it is not significant for internal migration to farm jobs. Males are more likely than females to migrate internally to jobs in both sectors.

Most of the family characteristics that significantly explain migration also explain internal migration to nonfarm jobs. However, few are significant in explaining migration to farm jobs. The exceptions are the number of females with secondary education, which is negatively associated with internal farm labor migration, and the internal migration network instrument. Internal migration to nonfarm jobs is significantly and positively shaped by individuals' schooling. However, as schooling of the household head rises, the propensity for other household members to migrate internally to nonfarm jobs decreases. Landholdings have a significant negative effect on internal migration, although this effect is not significant for internal migration to farm jobs. Livestock holdings have no significant effect on internal migration to either sector. In contrast to *total* migration, the propensity for internal migration decreases significantly (linearly) with household wealth. The number of family members at internal migrant destinations (lagged 10 years) has a significant positive effect on internal migration to both farm and nonfarm jobs. There is no significant evidence of competition between U.S. migration networks and internal migration to either sector.

Community context variables also differentially influence internal-migrant destinations. Internal migration to nonfarm (but not farm) jobs is positively associated with the extent of village integration with outside markets. The presence of nonagricultural enterprises in the village appears to compete with internal migration to nonfarm but not farm jobs. Insecurity of market access increases the likelihood of internal migration to both sectors, a finding consistent with migration's role as a risk buffer for rural households.

1.4.3 International Migration

There is a striking difference in the association between schooling and migration for internal and international migration. International migration for rural Mexicans overwhelmingly entails unauthorized entry and employment in low-skill jobs requiring at most primary schooling. Wages in those jobs frequently are more than 10 times the minimum wage in Mexico; however, they generally do not depend on education. Few U.S. farmers, contractors, or households are aware of the schooling levels of the unauthorized Mexican immigrants they hire. In light of this, it is not surprising that individuals' years of completed schooling do not significantly affect their probability of international migration to either farm or nonfarm jobs. The number of females with secondary education is not associated with international migration to either sector, either. However, as in the case of internal migration to nonfarm jobs, the household head's schooling is negatively associated with international migration to both farm and nonfarm sectors (the coefficient of the later being highly significant).

Like internal migrants, international migrants are significantly more likely to be males and less likely to be household heads. Age has a significant inverted-U shaped relationship with the likelihood of international migration to both farm and nonfarm jobs, and married individuals are significantly more likely to be foreign migrants.

Migration networks, proxied by the number of family members in the United States in 1990, are by far the most statistically significant family variables influencing international migration. This is consistent with many past studies of Mexico-to-U.S. migration. It is noteworthy that migration networks have a much more significant effect on international than on internal migration. This no doubt reflects the greater costs and risks, and thus the greater value of family contacts, in international migration. It generalizes Taylor's (1986) finding that networks have differential effects on internal and international migration. (That study had access to data from only two villages.)

Controlling for migration networks and other variables, there is no evidence that local market integration discourages international migration. Frequency of transport is positively associated with international migration to both sectors, although it is not significant. Controlling for market access, villages at risk of losing their access to outside markets in times of weather shocks have higher international migration probabilities. The presence of local nonfarm enterprises does not significantly discourage international migration to either farm or nonfarm jobs.

1.4.4 Statistical Versus Quantitative Significance

Statistical significance reported in Tables 1.3 and 1.4 does not necessarily imply that variables are important quantitatively in explaining migration. Tables 1.5 and 1.6 present estimated marginal effects of variables on migration-sector choice probabilities. They were constructed using the logit parameter estimates and probability function (equation 3) by increasing each variable by a small amount and then recalculating migration destination-sector probabilities, holding all other variables constant at their means. For dummy variables (household head, gender, marital status), probabilities were calculated setting the variable first to 1 and then to 0. Other discrete variables (schooling, age, numbers of family members, tractors, migration networks) were increased by one unit above their means. Continuous variables (wealth, land value) were increased by 1 percentage point above their means.

To assess the importance of percentage effects of each variable, it is useful to bear in mind the baseline probability of each destination and sector choice at the means of all variables. These are given in Table 1.7. The highest probabilities are for migration to nonfarm sectors abroad and in Mexico (0.067 and 0.066, respectively). The lowest is migration to farm jobs in Mexico (0.003). A change in an explanatory variable may have a small absolute effect but a large relative effect on the probability of migration to a destination-sector combination whose baseline probability is low (e.g., international migration to farm jobs). Nevertheless, it is the absolute effects that are of most interest from the standpoint of identifying variables that influence whether individuals migrate, their destinations and their sectors of employment.

A comparison of Tables 1.3 and 1.4 with 1.5 and 1.6 illustrates the difference between statistical and scientific significance when modeling migration, particularly for specific destination-sector combinations. Many more variables are quantitatively important in explaining the probability of leaving the village (first data column in Table 1.5) than the probability of migrating to specific destinations. Fewer are quantitatively important in explaining sector of employment at specific migrant destinations (Table 1.6).

Other things being equal, males have a 14% higher probability of leaving the village as labor migrants than females. The effects of the other dichotomous variables (household head and marital status), while statistically significant, are quantitatively smaller than that of the gender variable: married individuals are 2.4% more likely to migrate, while household heads are 4.4% less likely to migrate. Schooling is both statistically and quantitatively significant. A 1-year increase in schooling above the mean of 5.9 years raises the migration probability by 0.78 percentage points. Age has a larger quantitative effect; a 1-year increase in age is associated with a 1.3-percentage-point increase in migration probability.

Migration networks are important both statistically and quantitatively. The ex-ante presence of an additional family member at an internal migrant destination, other things being equal, raises the probability of migration by 5%, and an additional member at a U.S. migrant destination increases the migration probability by nearly 7%.

Insecurity of market access appears to be the most important community variable influencing total migration as well as migration to each destination. The nonagricultural enterprise and frequency of transportation variables both have a quantitatively important effect on internal but not international migration.[8]

Even the most significant determinants of migration have a smaller quantitative effect on migration to specific destinations than on total migration. For example, the probability of migrating, ceteris paribus, is 14.2% greater for males than for females. The probability of internal migration, however, is only 4.4% higher for males, while that of international migration is 6.6% higher. From a quantitative perspective, the most significant variables explaining internal migration appear to be gender, internal-migration networks, household-head status, and inaccessibility to markets during weather shocks. The probability of internal migration increases by 0.56 percentage points per year of schooling and 0.62% per year of age or experience. The most important variables driving international migration from a quantitative perspective are gender, U.S. migration networks, physical capital (tractors, which are a substitute for migrant labor

[8] It is important to bear in mind the units in which variables are measured when comparing impacts of changes in variables on migration probabilities. In general, one would expect to find quantitatively larger effects of dummy variables like inaccessibility during weather shocks or gender, which take on a value of 0 or 1, than of variables that can take on a larger range of values like frequency of transport (0 to 24) and age (12 to 100).

on the farm), and insecurity of market access. The wealth index is statistically significant in explaining migration, but the effect of a change in this variable on the probability of migration to either destination is negligible.

Because the probability of internal migration to farm jobs is very small, none of the variables has a measurable impact on the probability of internal farm labor migration. (All are less than 0.0 and thus are not shown in Table 1.6). The vast majority of internal migrants (more than 95%) are employed in nonfarm jobs; thus, the effects of explanatory variables on this destination-sector combination are similar to those on the overall probability of internal migration.

There are more quantitative differences between sectors in the case of international migration. Migration to farm jobs abroad is influenced in a quantitatively important way by gender, international migration networks, and insecurity of market access. However, the effects of all three of these variables are much larger quantitatively for international migration to nonfarm jobs. The gender variable has a quantitatively larger effect on the probability of international migration to nonfarm jobs than on the probability of any other destination-sector combination. Although education has a statistically significant effect on international migration to nonfarm (but not farm) jobs, this effect is quantitatively small—less than 0.03% per year of completed schooling. This undoubtedly reflects a low economic return from schooling for migrant workers from rural Mexico in U.S. farm and nonfarm jobs.

1.4.5 Measurement Issues and Unobserved Variables

Some variables may be affected by migration and remittances. This is a difficult methodological problem that bedevils many migration and remittances studies. For example, family investments in education, physical capital, and housing are likely to be affected by the presence of a migrant or the receipt of remittances (e.g, see Adams, 1991). If the economic value of a skill is higher than cost of acquiring it, economic logic suggests that an individual should invest in schooling. This calculus may hinge on access to migrant labor markets, reflected in household migration history. Individuals who do not view themselves as having a high probability of migration or access to migrant labor markets are likely to use the returns to schooling within the village as their reference when making schooling decisions. If returns to schooling are higher in migrant labor markets than in the village, then a positive probability of migrating may stimulate investments in schooling. This is the rationale behind recent research on the so-called "brain gain." If the individual has a positive probability of migrating to a destination where wages are high but the returns to schooling are low,

there may be a disincentive to invest in schooling. This might be the case for unauthorized migration to low-skilled labor markets abroad.

Wealth, tractor ownership, value of landholdings, and education variables are for a year prior to 2002, the year in which migration decisions are modeled in this analysis. That is, they are predetermined variables. A significant portion of household landholdings are comprised of *ejido*, or reform-sector, parcels distributed to households decades earlier. Nevertheless, it may still be argued that these variables are not truly exogenous, inasmuch as both, they and current migration are correlated with past migration decisions.

The main econometric concern surrounding endogeneity is that the inclusion of "contaminated" explanatory variables may bias findings with respect to other explanatory variables in the model. To explore this possibility, we re-estimated the model omitting the explanatory variables most likely to be influenced by past migration behavior: physical assets (proxied by ownership of tractors), wealth (reflecting housing characteristics), the value of land holdings, and family schooling. None of the key results of this analysis change when these variables are excluded from the regressions.[9]

Unobserved variables also may influence migration decisions. This may bias econometric results if omitted variables are correlated with the included, explanatory variables in the model. Individual-level fixed effects estimation cannot be used to address this problem using cross-sectional data, and generally, there are limitations to the use of fixed-effects methods in limited dependent variable models (Green, 2004). The model was re-estimated using regional dummy variables to control for unobserved regional characteristics that might affect migration decisions (the use of regional dummy variables is allowed by the ENHRUM data, see Introduction). None of the findings changed qualitatively, and the inclusion of location fixed effects resulted in only minor quantitative changes. Other things being equal, international migration probabilities tend to be higher and internal migration probabilities tend to be lower in the central and northern regions than in the southern (default) region. Nevertheless, when distance to the Mexico-U.S. border is

[9] When all of these variables are excluded, the nonagricultural enterprise dummy becomes statistically significant in the internal farm migration equation and, in the U.S. farm migration equation; the marital status dummy becomes insignificant while the number of males over 15 years old becomes significant. There are no other qualitative changes and only minimal quantitative changes.

included among the community characteristics in the regression, the coefficient on this variable was just significant at the 0.10 level for internal farm migration but insignificant for all other migration-sector combinations. Thus, it would appear that unobserved regional characteristics besides the distance to the U.S.-Mexico border influence migration decisions. Only the West-Central regional dummy variable is significant in explaining international migration to farm jobs, and none of the regional dummy variables is significant in explaining internal migration to farm jobs.

1.5 Conclusions

The econometric results presented in this paper indicate that migration is highly selective of individuals, families and communities. However, this selectivity differs significantly by migrant destination and sector of employment. For example, individuals' schooling has a significant positive effect on internal migration to nonfarm–but not farm–jobs. Schooling has no significant effect on international migration, which usually entails unauthorized entry and work in low-skill labor markets where the returns to schooling obtained in Mexico are likely to be small. Family contacts in the United States significantly affect international migration to both farm and nonfarm jobs. Networks in Mexico significantly affect internal migration, but much less for farm than for nonfarm jobs. Work experience has a significant positive effect on international migration to both farm and nonfarm jobs, but its effect on internal migration is significant only for nonfarm migration. Family landholdings do not significant affect internal migration. However, they have a significant positive effect on international migration to farm jobs. Household wealth has a significant negative effect on internal migration to nonfarm jobs but a positive effect on international migration to both sectors.

A few variables appear to have relatively uniform effects across migration-sector regimes. Schooling of household heads appears to raise the opportunity cost of migrating for other household members. Males are significantly more likely to migrate to all destination/sector combinations than are females. Insecurity of market access during weather shocks uniformly stimulates migration. The presence of nonagricultural enterprises in villages discourages migration but is statistically and quantitatively significant only for internal migration to nonfarm jobs.

These findings have implications for modeling, theory, and policy. Because migration and sector choice are interrelated, they cannot be modeled independently from one another. The model presented here brings both migration destinations and sectors of migrant employment into an

integrated modeling framework. Not only individual but also family and community characteristics are significant in shaping migration. In particular, migrant networks and access to markets and access risk at the community level influence migration and sector choice. As access to migrant labor markets and market integration in rural Mexico increase, migration patterns are likely to change. Moreover, as market integration and other policies, including U.S. immigration policies, change, the mix of characteristics in rural areas will be affected via the selectivity of migration to different locales and sectors.

The significant effect of network variables in both internal and international migration reflects a migration momentum that can be reinforced by legalization and guest worker programs in the United States and policies and events that encourage migration within Mexico. These findings support the conclusion of several past studies that networks of existing contacts at migrant destinations are a key determinant of the magnitude of migration and sector of employment for future migrants (Munshi, 2003; Taylor, 1987), but there are other key determinants, as well.

The association between trade integration and migration is complex. The U.S. Commission for the Study of International Migration and Cooperative Economic Development concluded that "expanded trade between the sending countries and the United States is the single most important remedy" for unwanted migration. However, it also warned that "the economic development process itself tends in the short to medium term to stimulate migration." The same policies that accelerate economic growth --including privatization, land reform, and freer trade--, temporarily increase migration pressures, because of the displacement and disruptions that accompany market liberalization (Martin, 1993). With income growth households have more resources to finance migration (López and Schiff, 1998; Faini and Venturini, 1993). Greater integration with markets may enhance information flows about migrant work opportunities.

One of the findings of the present research is that, at a local level, there is no evidence that integration with outside markets discourages migration. Other things being equal, the level of transportation infrastructure is positively related to migration, particularly to internal destinations. However, when access to markets outside the village is insecure, migration propensities increase. This is consistent with migration's role as a risk management tool in rural households. In the final analysis, market openness, *ceteris paribus*, may simply make it easier to migrate, and exposure to market risks may create new migration incentives.

In the short run, market integration and U.S. immigrant legalization policies, which strengthened migration networks, may have accelerated the movement of population out of rural Mexico. In the

long run, the migration of people out of rural areas surely will continue in Mexico, as it has in virtually all countries experiencing income growth. The selectivity of migration on specific variables suggests that changes in the magnitude and patterns of migration will alter the characteristics of rural households and communities over time.

Figure 1.1. Labor Migrants as Percentage of Mexican Village Populations, by Migrant Destination, 1980-2002

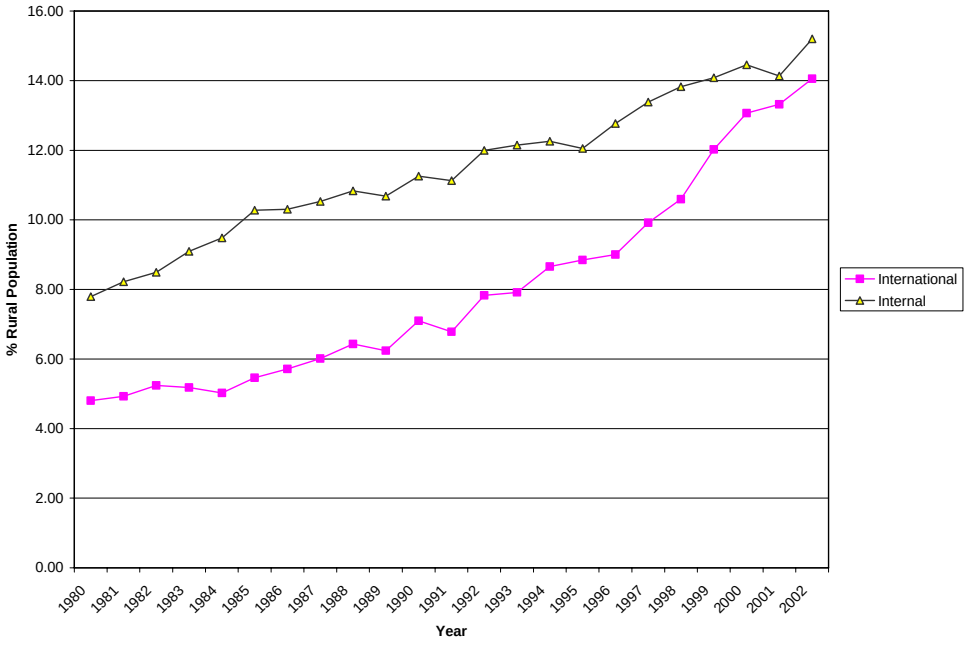

Figure 1.2. Labor Migrants as Percentage of Mexican Village Populations, by Migrant Destination and Sector of Employment, 1980-2002

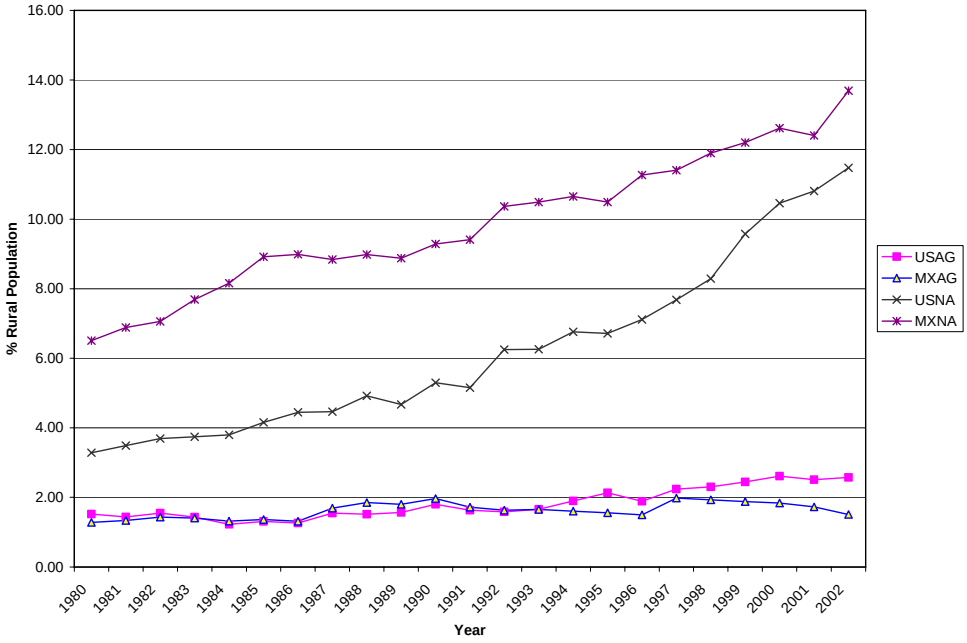

Table 1.1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Individual Characteristics				
Household Head (Dummy)	0.25	0.43	0.00	1.00
Sex (Dummy, 1 = male)	0.49	0.50	0.00	1.00
Age	34.93	17.77	12.00	100.00
Marital Status (Dummy, 1 = married)	0.61	0.49	0.00	1.00
Years of Completed Schooling	5.91	3.66	0.00	20.00
Family Characteristics				
Number of males over 15 years in the family	2.74	1.82	0.00	11.00
Number of females over 15 years in the family	2.83	1.85	0.00	11.00
Number of males in family with secondary education	0.91	1.17	0.00	8.00

Number of females in family with secondary education	0.87	1.15	0.00	7.00
Schooling of Household Head	4.03	3.54	0.00	20.00
Land value/100000	1.16	6.56	0.00	144.00
Livestock (number of large animals in 2001)[10]	3.65	14.68	0.00	252.00
Tractors Owned by Household in 2001	0.06	0.24	0.00	2.00
Wealth Index	0.05	2.01	-6.28	4.48
Wealth Index-squared	4.03	5.08	0.00	39.46
Number of Family Members at Internal Migrant Destination in 1990	0.21	0.57	0.00	5.00
Number of Family Members at U.S. Migrant Destination in 1990	0.13	0.44	0.00	5.00
Community Characteristics				
Frequency of Transport	8.53	5.83	0.00	24.00
Inaccessibility During Weather Shocks (Dummy)	0.14	0.35	0.00	1.00
Nonagricultural Enterprise in Village (Dummy)	0.25	0.43	0.00	1.00

Sample Size = 7,298

Table 1.2. Variable Means by Migrant Destination and Sector of Employment

	Migration Destination		**Migration/Sector Regime**			
Non Migration	**Internal Migration**	**International Migration**	**Mexico, Farm**	**Mexico Nonfarm**	**U.S. Farm**	**U N**

[10] Livestock includes oxen, cattle and horses.

Characteristics							
ead (Dummy)	0.26	0.18	0.23	0.44	0.17	0.33	0
, 1 = male)	0.45	0.66	0.84	0.80	0.65	0.95	0
	35.45	30.81	32.57	31.08	30.80	33.04	3
s (Dummy, 1 = married)	0.60	0.62	0.72	0.80	0.61	0.69	0
mpleted Schooling	5.75	7.13	6.65	3.84	7.30	6.15	6
aracteristics							
ales over 15 years in the family	2.66	3.01	3.52	2.12	3.05	3.60	3
emales over 15 years in the family	2.80	3.00	3.11	1.76	3.06	2.77	3
ales in family with secondary education	0.89	0.98	1.03	0.44	1.00	1.18	0
emales in family with secondary education	0.86	0.98	0.86	0.12	1.02	0.73	0
Household Head	4.11	3.45	3.58	3.40	3.45	3.22	3
00000	1.22	0.67	0.88	0.10	0.70	0.75	0
umber of large animals in 2001)	3.60	2.26	5.83	0.32	2.36	4.47	6
ned by Household in 2001	0.05	0.04	0.13	0.00	0.04	0.05	0
	0.05	-0.85	1.03	-1.81	-0.80	0.73	1
-squared	4.01	4.75	3.61	7.74	4.60	4.07	3
amily Members at Internal Migrant Destination in	0.17	0.65	0.19	0.48	0.66	0.14	0
Family Members at U.S. Migrant Destination in	0.10	0.05	0.56	0.00	0.05	0.48	0
y Characteristics							
Transport	8.44	9.74	8.39	8.64	9.79	8.58	8
y During Weather Shocks (Dummy)	0.13	0.26	0.14	0.56	0.24	0.18	0

ral Enterprise in Village (Dummy)	0.26	0.15	0.24	0.24	0.15	0.21	0
	6297	510	491	25	485	110	3
7,298							

Table 1.3. One- and Two-Destination Multinomial Logit Model Results

Variable	**Migration Destination**		
	All Migration	**Internal Migration**	**International Migration**
Individual Characteristics			
Household Head (Dummy)	-0.580	-0.652	-0.572
	(-4.55)***	(-3.79)***	(-3.25)***
Sex (Dummy, 1 = Male)	1.659	1.220	2.302
	(17.31)***	(10.1)***	(15.21)***
Age	0.180	0.163	0.201
	(10.57)***	(7.48)***	(7.96)***
Age-squared	-0.002	-0.002	-0.003
	(-11.36)***	(-7.52)***	(-8.99)***
Marital Status (Dummy, 1 = married)	0.324	0.129	0.599
	(3.13)***	(0.97)	(4.00)***
Years of Completed Schooling	0.080	0.144	0.010
	(5.71)***	(7.82)***	(0.55)
Family Characteristics			
Number of males over 15 years in the family	0.043	0.042	0.051
	(1.53)	1.09	(1.37)
Number of females over 15 years in the family	0.032	-0.025	0.065
	(1.16)	-0.65	(1.75)*
Number of males in family with secondary education	-0.105	-0.126	-0.098
	(-2.54)**	(-2.28)**	(-1.74)*
Number of females in family with secondary education	0.037	0.115	-0.029
	(0.89)	(2.08)**	(-0.5)
Schooling of Household Head	-0.074	-0.078	-0.061
	(-5.38)***	(-4.17)***	(-3.21)***
Land value/100000	-0.039	-0.048	-0.035
	(-2.53)**	(-1.85)*	(-1.92)*
Livestock (number of large animals in 2001)	-0.002	-0.009	-0.001
	(-0.62)	(-1.18)	(-0.49)
Tractors Owned by Household in 2001	0.478	0.141	0.695
	(2.96)***	(0.52)	(3.6)***
Wealth Index	-0.010	-0.239	0.264
	(-0.43)	(-6.6)***	(7.2)***
Wealth Index-squared	0.010	-0.016	-0.009
	(1.22)	(-1.36)	(-0.68)
Number of Family Members at Internal Migrant Destination in 1990	0.557	0.716	0.107
	(10.24)***	(11.91)***	(1.03)

Number of Family Members at U.S. Migrant Destination in 1990	0.813	-0.221	1.154
	(10.1)***	(-1.11)	(12.3)***
Community Characteristics			
Frequency of Transport	0.019	0.029	0.009
	(2.89)***	(3.59)***	(0.91)
Inaccessible During Weather Shocks (Dummy)	0.548	0.465	0.633
	(5.18)***	(3.63)***	(3.92)***
Nonagricultural Enterprise (Dummy)	-0.297	-0.506	-0.061
	(-3.09)***	(-3.64)***	(-0.48)

Default category: In village.

Sample Size = 7,298. Likelihood Ratio χ^2 (42) = 1,642.86.

Table 1.4. Two-Destination, Two-Sector Multinomial Logit Model Results

Variable	**Migration/Sector Regime**			
	Mexico, Farm	**Mexico Nonfarm**	**U.S. Farm**	**U.S. Nonfarm**
Individual Characteristics				
Household Head (Dummy)	-0.347	-0.712	-0.082	-0.742
	(-0.53)	(-3.99)***	(-0.24)	(-3.76)***
Sex (Dummy, 1 = Male)	2.007	1.2037	3.422	2.147
	(3.06)***	(9.81)***	(7.18)***	(13.4)***
Age	0.107	0.163	0.155	0.219
	(1.02)	(7.33)***	(3.54)***	(7.4)***
Age-squared	-0.002	-0.002	-0.002	-0.003
	(-1.49)	(-7.25)***	(-4.34)***	(-8.17)***
Marital Status (Dummy, 1 = married)	1.135	0.092	0.513	0.618
	(1.61)	(0.68)	(1.78)*	(3.73)***
Years of Completed Schooling	-0.258	0.158	-0.015	0.020
	(-2.65)***	(8.44)***	(-0.4)	(0.93)
Family Characteristics				
Number of males over 15 years in the family	-0.103	0.048	0.089	0.040
	(-0.5)	(1.25)	(1.29)	(0.99)
Number of females over 15 years in the family	-0.073	-0.017	-0.004	0.084
	(-0.36)	(-0.45)	(-0.06)	(2.08)**
Number of males in family with secondary education	0.325	-0.139	0.075	-0.155
	1.02	(-2.49)**	(0.76)	(-2.44)**
Number of females in family with secondary education	-1.119	0.123	-0.072	-0.022
	(-1.86)*	(2.21)**	(-0.61)	(-0.36)
Schooling of Household Head	0.023	-0.077	-0.117	-0.044
	(0.25)	(-4.04)***	(-2.95)***	(-2.15)**
Land value/100000	-1.527	-0.044	-0.033	-0.036
	(-1.33)	(-1.74)*	(-0.85)	(-1.78)*
Livestock (number of large animals in 2001)	-0.250	-0.007	0.001	-0.002
	(-1.11)	(-1.05)	(0.14)	(-0.53)
Tractors Owned by Household in 2001	-28.756	0.123	-0.178	0.836
	(0.00)	(0.45)	(-0.37)	(4.15)***

Wealth Index	-0.085	-0.247	0.221	0.293
	(-0.47)	(-6.68)***	(3.53)***	(6.58)***
Wealth Index-squared	0.020	-0.018	0.029	-0.029
	(0.43)	(-1.57)	(1.3)	(-1.7)*
Number of Family Members at Internal Migrant Destination in 1990	0.861	0.713	-0.138	0.167
	(3.06)***	(11.71)***	(-0.57)	(1.49)
Number of Family Members at U.S. Migrant Destination in 1990	-30.901	-0.197	1.105	1.167
	(0.00)	(-0.99)	(7.69)***	(11.84)***
Community Characteristics				
Frequency of Transport	-0.002	0.031	0.023	0.004
	(-0.06)	(3.71)***	(1.27)	(0.4)
Inaccessible During Weather Shocks (Dummy)	2.506	0.357	0.835	0.553
	(4.43)***	(2.69)***	(2.96)***	(2.97)***
Nonagricultural Enterprise (Dummy)	0.920	-0.571	-0.225	-0.024
	(1.46)	(-3.99)***	(-0.89)	(-0.17)

Default category: In village.

Sample Size = 7,298. Likelihood Ratio χ^2 (84) = 1777.63.

Table 1.5. Estimated Marginal Effects on Migration Probabilities

Variable	All	**Migration Destination**	
		Internal Migration	**International Migration**
	Percentages (%)		
Individual Characteristics			
Household Head (Dummy)	-4.399***	-2.046***	-1.135***
Sex (Dummy, 1 = male)	14.234***	4.352***	6.267***
Age	1.327***	0.623***	0.499***
Age-squared	-0.019***	-0.008***	-0.007***
Marital Status (Dummy, 1 = married)	2.434***	0.415	1.320***
Years of Completed Schooling	0.767***	0.562***	0.011
Family Characteristics			
Number of males over 15 years in the family	0.391	0.150	0.118
Number of females over 15 years in the family	0.368	-0.095	0.159*
Number of males in family with secondary education	-0.943**	-0.429**	-0.209*
Number of females in family with secondary education	0.194	0.449**	-0.077
Schooling of Household Head	-0.639***	-0.271***	-0.132***
Land value/100000	-0.314**	-0.002*	-0.001*
Livestock (number of large animals in 2001)	-0.017	-0.031	-0.003
Tractors Owned by Household in 2001	3.971***	0.450	2.263***
Wealth Index	-0.072	0.000***	0.000***
Wealth Index-squared	0.107	-0.002	-0.001
Number of Family Members at Internal Migrant Destination in 1990	4.947***	3.664***	0.162

Number of Family Members at U.S. Migrant Destination in 1990	6.908***	-0.886	4.871***
Community Characteristics			
Frequency of Transport	0.139***	0.109***	0.018
Inaccessibility During Weather Shocks (Dummy)	5.493***	1.897***	1.779***
Nonagricultural Enterprise in Village (Dummy)	-2.435***	-1.569***	-0.101

*** significant at 1%; ** significant at 5%; * significant at 10% in the Multinomial Logit Model for the columns of migration destination and the marginal effects are reported for the Probit Model in the column of all migration.

Table 1.6. Estimated Marginal Effects on Migration-Sector Probabilities

Variable	**Migration/Sector Regime**		
	Mexico Nonfarm	**U.S. Farm**	**U.S. Nonfarm**
Individual Characteristics			
Household Head (Dummy)	-2.117***	-0.017	-1.061***
Sex (Dummy, 1 = male)	4.110***	1.842***	4.183***
Age	0.594***	0.057***	0.407***
Age-squared	-0.007***	-0.001***	-0.006***
Marital Status (Dummy, 1 = married)	0.276	0.174*	1.005***
Years of Completed Schooling	0.595***	-0.008	0.024***
Family Characteristics			
Number of males over 15 years in the family	0.168	0.033	0.067
Number of females over 15 years in the family	-0.065	-0.002	0.152**
Number of males in family with secondary education	-0.451**	0.031	-0.242
Number of females in family with secondary education	0.460**	-0.027	-0.046
Schooling of Household Head	-0.256 ***	-0.039***	-0.070**
Land value/100000	-0.002*	0.000	-0.001*
Livestock (number of large animals in 2001)	-0.025	0.000	-0.002
Tractors Owned by Household in 2001	0.367	-0.068	2.189***
Wealth Index	0.000***	0.000***	0.000***
Wealth Index-squared	-0.003	0.000	-0.002
Number of Family Members at Internal Migrant Destination in 1990	3.492***	-0.060	0.238
Number of Family Members at U.S. Migrant Destination in 1990	-0.764	0.697***	3.671***
Community Characteristics			
Frequency of Transport	0.111***	0.008	0.006
Inaccessibility During Weather Shocks	1.341***	0.403***	1.117***
Nonagricultural Enterprise in Village	-1.769***	-0.071	-0.008

*** significant at 1%; ** significant at 5%; * significant at 10% in the Multinomial Logit Model

Table 1.7. Baseline Probability for Each Migration Destination/Sector Regime

Sector of Employment	Migration Destination		
	Internal	**International**	**All Migrants**
Farm	0.003	0.015	0.018
Nonfarm	0.066	0.052	0.119
Both	0.070	0.067	0.137
Number of Migrants	510	491	1001
Total Sample Size (Migrants Plus Nonmigrants)	7298		

Source: ENHRUM 2003

Chapter 2

Remittances, Inequality and Poverty: Evidence from Rural Mexico

Impacts of migrant remittances on income inequality have been a focus of considerable economic research. However, findings often have been contradictory, and a unifying theory of remittances and inequality has been elusive. The same is true for the influence of remittances on poverty, which largely has been ignored in the development economics literature. There has been no effort, to my knowledge, to explain the sometimes striking observed differences in the impacts of internal and international migrant remittances on rural inequality and poverty across regions.

This paper seeks to offer an explanation for the diversity of impacts of remittances on inequality and poverty across regions. Using Gini and poverty decomposition techniques and data from the 2003 Mexico National Rural Household Survey, it offers evidence that the marginal effects of remittances on inequality and poverty vary, in a predictable way, across regions with different levels of migration prevalence. In the case of international migration, which entails significant costs and risks, the impacts of remittances are more equalizing and have a larger effect on alleviating poverty as the share of households with access to remittance income increases.

The rest of the chapter is organized as follows. Section 2.1 summarizes the different economics perspectives on remittances, inequality and poverty. Section 2.2 offers some evidence on

inequality and poverty in rural Mexico and techniques on income source Gini and poverty decomposition are presented. Section 2.3 discusses the empirical results. Section 2.4 concludes.

2.1. Research on Remittances, Inequality and Poverty

A number of researchers have examined the distributional effects of migrant remittances by comparing income distributions with and without remittances (Barham and Boucher, 1998; Oberai and Singh, 1980; Knowles and Anker, 1981) or by using income-source decompositions of inequality measures (Stark, Taylor and Yitzhaki, 1986, 1988; Adams, 1989, 1991; Adams and Alderman, 1992). These studies offer conflicting findings about the impact of remittances on inequality.

Stark, Taylor and Yitzhaki (1986) provide a theoretical explanation for these conflicting findings. They argue that rural out-migration, like the adoption of a new production technology, entails costs and risks. The costs and risks are likely to be especially high in the case of international migration. Given this fact, pioneer migrants tend to come from households at the upper-middle or top of the sending-area's income distribution (e.g., Portes and Rumbaut, 1990; Lipton, 1980), and the income they send home in the form of remittances is therefore likely to widen income inequalities in migrant-source areas.

Over time, access to migrant labor markets becomes diffused across sending-area households through the growth and elaboration of migrant networks (see Massey, Goldring, and Durand, 1994), much as new agricultural technologies become diffused across farms. If households at the middle or bottom of the income distribution gain access to migrant labor markets, an initially unequalizing effect of remittances may be dampened or reversed. Stark, Taylor and Yitzhaki (1988) found that remittances from international migrants had an unequalizing effect on the income distribution in a Mexican village that recently had begun to send migrants abroad, but an equalizing effect on another village that had a long history of participating in international migration.

The present research extends Stark, et al. It uses new, nationally representative data from rural Mexico to estimate the marginal effects of both international and internal migrant remittances on inequality in regions with different levels of migration prevalence. If the migration diffusion hypothesis is correct, one would expect to find a negative correlation between the prevalence of international migration (i.e., the share of households with migrants abroad) and the marginal

impact of international-migrant remittances on inequality. For internal migration, which usually entails lower costs and risks, one would expect this correlation to be weaker.

2.1.1 Remittances and Poverty

Interactions between migration and poverty—both at migrant origins and destinations—are among the least researched and understood topics in economics. This is surprising, because the majority of the world's migration originates in rural areas, where most of the world's poverty is also concentrated.

The possible impacts of migration on poverty are bracketed by two extremes: the "optimistic" and "pessimistic" scenarios.

The optimistic scenario is that migration reduces poverty in source areas by shifting population from the low-income rural sector to the relatively high-income urban (or foreign) economy. Income remittances by migrants contribute to incomes of households in migrant-source areas. If remittances are significant and if some migrants originate from poor households, remittances may reduce rural poverty.

The pessimistic view is that poor households face liquidity, risk, and perhaps other constraints that limit their access to migrant labor markets. This is particularly likely to be the case for international migration, which usually entails high transportation and entry costs (e.g., smugglers' or recruiters' fees). Households and individuals participating in migration benefit (otherwise, it is not clear why they would participate). However, these beneficiaries of migration may not include the rural poor. If migration is costly and risky, at least initially migrants may come from the middle or upper segments of the source-areas income distribution, not from the poorest households. The poor will not benefit unless obstacles to their participation in migration weaken over time.

The true impacts of migration on poverty are likely to be found not at one extreme or another, but somewhere in between and varying over time. The diffusion hypothesis presented above for inequality may also apply to poverty. Initially, when few households have access to migrant labor markets abroad, international-migrant remittances are likely to flow primarily to middle and upper-income families. If this is the case, then changes in remittances will have little effect on poverty. However, if access to international migration eventually becomes diffused downward through the income distribution, poverty may become increasingly sensitive to changes in remittances. That is, there may be a negative relationship between the prevalence of international

migration and the marginal effect of international-migrant remittances on poverty. A given percentage increase in remittances would reduce poverty by a greater amount in a region where a large share of households have migrants abroad than in a region in which households with international migrants are rare. If internal migration is low cost and entails little risk, even the "pioneer" internal migrants may originate from poor households, and so the relationship between internal migration prevalence and poverty impacts of remittances is likely to be weaker. If remittances from internal migrants are lower than remittances from international migrations, this would further attenuate the impact of a given percentage change in internal remittances on poverty, even if many internal migrants come from poor rural households.

Some insights into migration-poverty interactions may be gleaned, mostly indirectly, from the existing literature. Adams (2004) compared the poverty headcount, poverty gap, and squared poverty gap of Guatemalan households that received remittances from international and/or internal migrants, with those of households that did not receive remittance income. He found that both internal and international remittances reduced poverty. Remittances had a quantitatively larger effect on the severity of poverty (the "poverty gap") than on the poverty rate (headcount). This study highlights the importance of taking into account both the incidence and severity of poverty when measuring remittance impacts. Adams (1986) found that international remittances had a small but favorable effect on poverty in a sample of households in rural Egypt. The number of households in poverty declines by 9.8 percent, and the Sen poverty index falls by 12 percent, when per-capita incomes are calculated without including remittances. Adams and Page (2003) performed a cross-country analysis of international migration and poverty. They found that a 10-percent increase in international migration (the share of a country's population living abroad) was associated with a 1.9-percent decrease in the share of people living in poverty. In a study of 2400 municipalities, Lopez Cordova (2004) found that a higher prevalence of remittances (fraction of households receiving remittances) was correlated with lower poverty (using a headcount measure) in 2000.

To my knowledge, no study has attempted to explain variations in poverty effects of international and internal migrant remittances across space. The present research takes a step towards filling this lacuna by using household survey data from rural Mexico to estimate the effects of marginal changes in migrant remittances on poverty in regions with differing levels of migration prevalence. This is done with three variants of the Foster-Greer-Thorbecke poverty index.

2.2. Migration, Remittances, Inequality and Poverty in Rural Mexico

In the past decade rural Mexico has experienced a massive outflow of rural labor to Mexican urban centers and to the United States. Between 1990 and 2002, the share of Mexico's rural population working in the United States rose from 7% to 14%, and the share at internal-migrant destinations rose from 11% to 15%; however, the share varies widely across regions (see chapter 1). This makes Mexico an ideal laboratory in which to examine impacts of migration and remittances in rural areas with different levels of integration with migrant labor markets.

To date, empirical research on economic impacts of migration in rural Mexico has been based on detailed surveys of small numbers of communities, at best. This, together with the tremendous heterogeneity that characterizes rural Mexico, has limited the extent to which findings from these studies can be generalized to the rural economy as a whole.

The present research uses new data from the Mexico National Rural Household Survey (Encuesta Nacional a Hogares Rurales de Mexico, or ENHRUM, see the Introduction). The survey was designed to be representative both nationally and regionally. Data from this survey make it possible to quantify migration and remittances at the household level, as well as to test for influences of these variables on household total income, on income inequality, and on poverty.

Table 2.1 summarizes migration from households in rural Mexico. Sixteen percent of all households in the sample had a family member living in the United States (U.S.) at the start of 2002, the year of the survey, and 26 percent had a family member living in another part of Mexico. Many households had more than one migrant. The number of U.S. migrants per household ranged from 0 to 9, while the number of internal migrants ranged from 0 to 10. The average household in the sample had 0.35 U.S. migrants and 0.71 internal migrants in 2002—or 1.06 migrants in total.

There are sharp differences in migration experience among the five rural regions of Mexico. The West-Central region traditionally has had the highest propensity to send migrants to the U.S. It currently has the highest participation rates in international migration and the most international migration experience. Nearly 28% of all households in this region have at least one family member in the United States, and the average household has 0.62 U.S. migrants. By contrast, 7.5% of households in the south-southwest have U.S. migrants, with an average of 0.10 U.S. migrants per household. These inter-regional differences are the basis for comparing differences in the distributional and poverty effects of remittances at different levels of household involvement in migration.

Figure 2.1 illustrates differences in historical trends in international migration, respectively, at the village level across the five regions from 1980 to 2002. It was constructed from retrospective migration histories assembled for all family members in the ENHRUM sample, including sons and daughters who were not part of the household at the time of the survey. Villages with large concentrations of international migrants in 2002 have a history of increasing participation in migration throughout the 1980-2002 period. Only in rare cases did a village with a high concentration of migrants in 2002 begin to participate in migration late in the period. It is used 2002 concentrations of migrants as a proxy for migration histories in our analysis of distributional and poverty effects of migrant remittances, presented below.

2.2.1 Remittances and Income in Rural Mexico

Detaile data on hold-farm production, wage work, and migration make it possible to estimate total income for each household in the ENHRUM sample. Total income is the sum of income from six sources: family production (crop, livestock, nonagricultural, commerce, service, natural resource extraction); agricultural wage labor; nonagricultural wage labor; internal migrant remittances; international migrant remittances; and public transfers. This list of incomes is exhaustive; the sum of income from the six sources equals household total net income.

There are various methods to arrive at estimates of net income from rural household production activities. Values of family factors like labor, land and capital were not imputed, because it is not obvious what prices should be used to do this. Net income from household production activities was estimated as the gross value of production (using observed local prices) minus purchased inputs. This method yielded net incomes from crop production that were very low or negative in some cases, especially for staples and small animals. Subtracting imputed values of family inputs (e.g., family labor at local wages) from these net income figures would yield mostly negative net staple and livestock incomes. Gross income from livestock production was estimated as the change in value of standing herds between the end and start of the survey year, plus (a) sales of animals and animal products; (b) home consumption of home-produced animals and animal products minus (c) livestock purchases and (d) livestock input costs (feed, medicines, and other costs). Incomes from all other household production activities were estimated in a manner analogous to net crop income (as gross value of production minus purchased input costs). Salary and wage income was summed across all household members and jobs. Migrant remittances were summed across all remitters and, in the case of dollar-denominated remittances from the U.S., transformed to pesos using the prevailing average 2002 exchange rate of 10 pesos per U.S. dollar.

Table 2.2 summarizes rural households' total net income and remittances from internal and international migrants, nationally and by region. Average household total income for the whole sample in 2002 was 53,465 pesos (U.S. $5,346). This comes out to an average per-capita income of approximately U.S. $1,372 per year. The composition of incomes reported in the table reveals a significant role for migrant remittances in rural Mexico: 13 percent of household total income and 16 percent of per-capita income comes from migrant remittances (mostly from the U.S.)

Migrant remittances are not equally distributed across regions (Table 2.2). The percentage of household income from international migrant remittances ranged from 3.6 in the Northwest to 20.1 in the Northeast. The percentage from internal migrant remittances ranged from 0.54 to 3.7 percent.

The numbers in Tables 2.1 and 2.2 reveal that migrant remittances potentially have significant impacts on rural income inequality and poverty, but these impacts are not likely to be uniform across regions with vastly different prevalence and histories of migration.

2.2.2 Income Source Gini Decomposition

To explore the impacts of remittances on rural income inequality, it is first necessary to select an inequality index. Various indices exist. Following Ray (1998), an inequality index should have 5 basic properties: (1) adherence to the Pigou-Dalton transfer principle; (2) symmetry; (3) independence of scale; (4) homogeneity with respect to population; and (5) decomposability.

The Piguo-Dalton principle maintains that inequality, as measured by the index, should increase when income is transferred from a low-income household to a high-income household. An index displays symmetry if the measured level of inequality does not change when individuals trade positions in the income distribution—that is, the identity of individuals or households is irrelevant. Independence of income scale means that a proportional change in all incomes does not alter inequality. Homogeneity means that a change in the size of the population will not affect measured inequality. Finally, in order to explore influences of specific income sources on inequality, the index needs to be decomposable with respect to income sources. (Ray also refers to decomposability by population subgroup; however, this is not the interest in this study.)

The inequality measures that satisfy these 5 requirements include the coefficient of variation, Theil's entropy index (T), Theil's second measure of inequality (L), and the Gini coefficient (G). The two Theil measures can be disaggregated by population subgroup but not by income source. The Gini coefficient is probably the most intuitive measure of inequality, with its neat

correspondence to the Lorenz curve and easy-to-interpret decomposition of remittance effects. This is the measure used in the present study.

Following Lerman and Yitzhaki (1985), the Gini coefficient for total income inequality, G, can be represented as:

$$G = \sum_{k=1}^{K} S_k G_k R_k \quad (2.1)$$

where S_k is the share of component k in total income, G_k is the source Gini, corresponding to the distribution of income from source k, and R_k is the Gini correlation of income from source k with the distribution of total income.[11]

Equation (1) permits to decompose the influence of any income component, in this case remittances, upon total income inequality, as the product of three easily interpreted terms:

how important the income source is with respect to total income (S_k)

how equally or unequally distributed the income source is (G_k)

whether or not the income source is correlated with total income (R_k).

For example, if remittances represent a large share of total income, they may potentially have a large impact on inequality. (If their share in total income is nil, so must be their contribution to inequality.) However, if they are perfectly equally distributed (G_k = 0), they cannot influence inequality even if their magnitude is large. If remittances are large and unequally distributed (S_k and G_k are large), they may either increase or decrease inequality, depending upon which households, and at which points in the income distribution, receive them. If remittances are unequally distributed and flow disproportionately towards households at the top of the income distribution (R_k is positive and large), their contribution to inequality will be positive. However, if

Con formato: Numeración y viñetas

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[11] The properties of R_k are the following:

$-1 \leq R_k \leq 1$. R_k equals zero if y_k and Y are independent, and it equals 1(-1) if y_k is an increasing (decreasing) function of total income.

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If y_k and Y are normally distributed, then R_k is equal to the Pearson correlation coefficient.

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they are unequally distributed but target poor households, remittances may have an equalizing effect on the rural income distribution, and the Gini index may be lower with than without remittances.

Using the Gini decomposition, it is possible to estimate the effect of small changes in remittances on inequality, holding income from all other sources constant (Stark, Taylor and Yitzhaki, 1986). Consider a small percentage change in income from source j (remittances) equal to π, such that

$y_j(\pi)=(1+\pi)y_j$. Then $$\frac{\partial G/\partial \pi}{G} = \frac{S_j G_j R_j}{G} - S_j \quad (2.2)$$

.-where S_j, G_j and R_j denote the source-j income share, source Gini, and Gini correlation, and G denotes the Gini index of total income inequality prior to the remittances change. The percentage change in inequality resulting from a small percentage change in remittances equals the initial share of remittances in inequality minus the share of remittances in total income. One can easily see that, as long as remittances are an important component of rural incomes,If the Gini correlation of remittances and total income, R_j, is negative or zero, an increase in remittances necessarily reduces inequality, but

Con formato: Numeración y viñetas

.-If the Gini correlation is positive, the distributional impact of remittances depends on the sign of R_jG_j-G. A necessary condition for inequality to increase with remittances is that the source Gini for remittances exceed the Gini for household total income, that is, $G_j>G$. This follows from the property that $R_j \leq 1$.

2.2.3 Poverty Decomposition

A modification of the Foster-Greer-Thorbecke (1984) poverty index was used to analyze the poverty implications of remittances. I have found no such poverty decomposition in the literature for Mexico. Huppi and Ravallion (1991) perform an income-source poverty decomposition for Indonesia. More commonly one finds in recent literature that sectoral decompositions of poverty are proxied by undertaking a standard poverty decomposition for groups defined by primary sectoral source of income, or other characteristics such as household size, group or location.[12]

[12] For example, Balisacan (1993) did such a study for the Philippines; Gustafsson and Makonnen (1993) explored principal income sources' effects on poverty incidence in Lesotho; Boateng et al. (1992) decomposed by location and group for Ghana; Kanbur (1990) decomposed poverty

This proxy method is difficult to justify where a typical farm household's income is diversified across a variety of activities, as is clearly the case in rural Mexico.

Following the notation of Foster, Greer, and Thorbecke (FGT) (1984), let $Y_d = (Y_{d1}, Y_{d2}, ..., Y_{dl})$ represent household incomes in increasing order, and let $z > 0$ denote the predetermined poverty line. The FGT poverty measure is defined by:

$$P(Y_d; z) = \frac{1}{nz^{\alpha}} \sum_{i=1}^{q} g_i^{\alpha} \quad (2.3)$$

where n is the total number of households, $q = q(Y_d; z)$ is the number of poor households, and $g_i = z - Y_{di}$ is the income shortfall (the gap between the household's income and the poverty line) of the ith (poor) household, and α is a parameter. This index satisfies the two axioms formulated by Sen (1976, 1979) for poverty measures to satisfy: (1) that a reduction in the income of a poor household, *ceteris paribus*, increases the poverty measure (monotonicity); and (2) that a pure transfer of income away from a poor household increases the poverty measure (the transfer axiom).

FGT present a decomposition of this poverty measure by population subgroup, and Reardon and Taylor (1996) decompose the FGT poverty coefficient by income source. To decompose $P(Y_d; z)$ by determinants of income, the sum of income across sources was substituted for Y_{di} in the FGT poverty index. This yields,

$$P(Y_d; z) = \frac{1}{nz^{\alpha}} \sum_{i=1}^{q} (z - \sum_{k=1}^{K} y_k)^{\alpha} \quad (2.4)$$

The impact of a small percentage change in remittances, e, on poverty, $dP(Y_d; z)/de$, is given by

$$\frac{dP(Y_d, e; z)}{de} = \frac{1}{nz^{\alpha}} \left[\sum_{i=1}^{q_0} -\alpha g_i(e) - \sum_{q-} g_i(e)^{\alpha} + \sum_{q+} g_i(e)^{\alpha} \right] \quad (2.5)$$

where q^* denotes the number of households in poverty both before and after the change in remittances, and $q- (q+)$ denotes the number of households that leave (enter) poverty as a result of

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incidence by degree of income diversification, region and group and Kakwani (1993) by region and household characteristics in Cote d'Ivoire.

the remittance change. Assuming remittances have a positive effect on income (that is, there are not household-to-migrant remittances that outweigh migrant-to-household transfers), the third term, $\sum_{q^+} g_i(e)^{\alpha}$, drops out, and the poverty effect is negative (i.e., poverty decreases), or at least is not positive. The extent of this poverty effect must be determined empirically. It hinges on whether or not poor households have access to remittance income.

Three variants of the FGT poverty index are used to estimate the impacts of changes in remittances on rural poverty:

The headcount measure (α=0, $P_H(Y_d; z) = \frac{q}{n}$) measures the incidence of poverty, i.e., the share of the population living below the poverty line.

The poverty gap (α=1, $P_G(Y_d; z) = \frac{1}{nz}\sum_{i=1}^{q}(z - Y_{di})$) measures the depth of poverty, that is, how far below the poverty line the average poor household's income falls.

The squared poverty gap (α=2, $P_{SG}(Y_d; z) = \frac{1}{nz^2}\sum_{i=1}^{q}(z - Y_{di})^2$), measures the severity of poverty and is sensitive to changes in the distribution of income among the poor (Adams and Page, 2003).

All Gini and poverty index decompositions presented below are for per-capita household income, in order to take into account differences in household size across regions and among households with access to different income sources.

2.3. Empirical Results

2.3.1 Income-Source Inequality Decompositions

Table 2.3 summarizes the contributions of income sources to per capita total income and income inequality in rural Mexico in 2002. Column 1 presents income-source shares. Migrant remittances represented 16 percent of average per-capita rural income in 2002. The vast majority of this remittance income (87 percent) came from migrants in the U. S. Wages were the largest income source, accounting for more than 50 percent. Of this, most (80 percent) was from non-agricultural employment. Family production activities accounted for just under 29 percent of rural per-capita income, and government transfers represented 4.5 percent.

Migrant remittances are unequally distributed across rural households (Column 2). The source Ginis for international and internal remittances are similar: 0.95 and 0.96, respectively.[13]

As indicated earlier, a high source Gini (G_k) does not imply that an income source has an unequalizing effect on total-income inequality. An income source may be unequally distributed yet favor the poor. This is the case for internal migrant remittances. The Gini correlation between internal remittances and the distribution of total per-capita income (R_k) is only 0.36, comparable to that of agricultural wages. Because of the low Gini correlation between internal-migrant remittances and total-income rankings, the percentage contribution of internal remittances to inequality (1.1 percent) is smaller than the percentage contribution to income (2.0 percent). Thus, internal remittances have a slight equalizing effect on the distribution of total rural income. A 10% increase in internal remittances, other things being equal, reduces the Gini coefficient of total income by 0.1 percent.

The Gini correlation between international migrant remittances and total income rankings is much higher (R=0.78). Because of this, international remittances have an unequalizing effect on rural incomes; a 10-percent increase in remittances from migrants abroad increases the Gini coefficient by 0.3 percent.

Government transfers are unequally distributed (G_k = 0.79). However, the Gini correlation between transfers and total income is low (R_k = 0.29), indicating that transfers favor the poor more than any other income source. Other things being equal, a 10-percent increase in government transfers is associated with a 0.3-percent decrease in the Gini coefficient of total income. In rural Mexico, these transfers include decoupled income payments to basic grain producers, under the PROCAMPO program, as well as needs-based transfers under PROGRESA.[14] Agricultural wages are the largest income equalizers in rural Mexico, while income from family production activities has the largest positive effect on inequality.

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[13] These source Ginis are high in part because they include zero remittances for some households.

[14] PROCAMPO was instituted in the context of a phase-out of price guarantees to basic grain producers. It represented a shift from price based support measures to direct income payments. PROGRESA provides payments to poor rural households, linked to enrollment of children in schools and local clinics.

Both the importance and the distributional impact of migrant remittances and other income sources differ across regions. In West-Central Mexico (Table 2.4a), which has the highest prevalence of international migration, remittances from international migrants have an *equalizing* effect on rural incomes, equivalent to that of government transfers. There, a 10-percent increase in foreign remittances decreases the total-income Gini by 0.3 percent. In this region, international migrant remittances represent nearly 16 percent of per-capita total income. The source Gini for international migrant remittances (0.87) is lower and the Gini correlation (0.50) is much lower in the west-central region than in rural Mexico as a whole. By contrast, in the lowest migration region of Southeastern Mexico, international migrant remittances constitute 6 percent of per-capita total income, and both the source Gini and the Gini correlation for this income source are high (0.98 and 0.87, respectively). Marginal changes in international remittances increase inequality in this region. In both regions, family production and non-agricultural wages have the most unequalizing effects on the rural income distribution, and agricultural wages are income equalizers.

Table 2.5 summarizes the estimated effects of 10-percent increases in international and internal migrant remittances and the percentages of households with migrants in each of the 5 census regions. Figures 2.2a-b illustrate the relationship between these two variables. Figure 2.2a is suggestive of an inverted-U-shaped relationship between migration and the distributional effect of remittances, in the case of international migration. The Gini elasticity of foreign remittances is positive and highest in the region in which just over 14 percent of households have family migrants abroad (the Center), it is lower in the region in which 20 percent of households have international migrants (the Northeast), and it is negative in the region in which 28 percent of households participate in international migration (West-Center). Bootstrapping was used to construct 95% confidence intervals around these elasticity estimates using the 'percentile method'.[15]

The elasticity of internal migrant remittances is close to zero in all five regions (Figure 2.2b), despite shares of households with internal migrants that range from 12 to 35 percent. Rural income inequality is much less sensitive to given percentage changes in internal remittances than to changes in international remittances. This is due both to the low (Gini) correlation between

[15] See Chernick (1999) for a discussion of the percentile method and other methods to obtain confidence intervals using the bootstrap.

internal remittances and the distribution of total income and the small share of internal remittances in total income of rural households.[16]

2.3.2 Effects of Migrant Remittances on Poverty

A poverty line, *z*, is required in order to estimate the effects of changes in migrant remittances on poverty. The poverty line that is used is the per-capita income required to purchase a basic basket of food and nonfood items in rural areas. It was estimated by the Mexican government (SEDESOL) at 28.1 pesos per day, including 15.4 pesos for food, 3.5 for basic health and education, and 9.8 for clothing, shelter, utilities, and transportation.[17] Impoverished individuals are those who were living in households in which the per-capita income per day was less than 28.1 pesos. Table 2.6 reports the share of the population living below the poverty line in each region and in all of rural Mexico in 2002. Overall, 58 percent of rural Mexicans live in households with per-capita incomes below the poverty line. The incidence of poverty ranges from 35 percent in the Northwest region to 81 percent in the South-Southwest.

To estimate the effect of migrant remittances on poverty, first are calculated the three variants of the FGT poverty measure, using Equation 3 with $\alpha = 0, 1$ and 2. Each of the two types of remittances were then decreased, in turn, by 10 percent. Households that did not receive

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[16] In two cases presented in Tables 2.3 and 2.4a income-source Gini coefficients are equal to 1.0 (both of these are for family production). This does not imply perfect income inequality, but rather, reflects the presence of some negative income values. Income-source Gini coefficients greater than 1.0 have been reported elsewhere in the literature (e.g., see Lerman and Yitzhaki, 1985). The Gini coefficient is a measure of dispersion, similar to a coefficient of variation. It is equal to the expected difference between two randomly drawn observations divided by the mean. One can view the mean as the expected difference between each observation and zero. If all observations are positive, zero is outside the range of observations, so the ratio is lower than one. However, if some observations are negative, zero is not outside the range of the group, and the ratio depends on the location of zero in the range. Wodon and Yitzhaki (2002, p. 79) argue that the ability to handle negative incomes is an advantage of the Gini coefficient over Atkinson's index.

[17] See http://www.sedesol.gob.mx/subsecretarias/prospectiva/medicion_pobreza

remittances were unaffected. The poverty effects of changes in remittances depend upon the extent to which remittances flow to poor (and, depending on the measure, very poor) households.

Results of the poverty experiments are reported in Table 2.7. Overall, poverty decreases when migrant remittances go up. Nationally, the rural poverty effect is substantially greater for international remittances than for remittances from internal migrants using all three poverty measures. For example, the FGT index with $\alpha=2$ decreases by 0.53 percent as a result of a 10-percent increase in international remittances, compared with 0.30 percent for internal remittances. The headcount measure decreases by 0.39 percentage points when internal remittances increase, but by 0.77 percent in response to a rise in remittances from abroad.

Poverty elasticities of remittances from migrants abroad vary sharply across regions. The sensitivity of poverty to international remittances is greatest in the high migration, West-Center region, and it is smallest in the low migration, South-Southwest region. Other things being equal, a 10-percent increase in international remittances reduces poverty by 1.64 percent in the West-Center (according to the FGT index with $\alpha=2$), compared with only 0.11 percent in the South-Southwest. Based on the headcount measure, poverty decreases by 1.68 percent in the West-Center, but there is no change in poverty in the South-Southwest. The poverty gap measures reveal a similar pattern of greater sensitivity of poverty to remittances in regions in which a large percentage of households have international migrants. This is illustrated in Figure 2.3. The relationship between poverty impacts of remittances (for $\alpha=2$) and the extent of household participation in international migration is monotonically negative, and it is more pronounced than the relationship between remittance impacts on inequality and migration prevalence reported in Figure 2.2. As for the case of inequality, bootstrapped confidence intervals were calculated for the poverty elasticities.

These findings suggest that the ameliorative effect of international remittances on rural poverty increases with the prevalence of migration. They would appear to represent a poverty corollary to the argument advanced by Stark, Taylor and Yitzhaki (1986), illustrated in Figure 2.2, that the distributional effects of migration become more equal as increasing numbers of households gain access to foreign labor markets. In theory, the relationship between poverty elasticities and the prevalence of migration is no more obvious than the relationship between migration and inequality. It depends on the extent to which poor households gain access to migrant labor markets over time, which is an empirical question. It appears that, in the case of international

migration, the expansion of migration networks plays a critical role in shaping the impact of remittances on rural poverty.

2.4. Conclusions

Findings using nationally and regionally representative data from Mexico indicate that remittances from migrants abroad slightly increase rural income inequalities, while remittances from internal migrants are income equalizers. However, both types of remittances have an equalizing effect on incomes in high-migration areas. These findings reinforce the argument advanced in Stark, Taylor and Yitzhaki (1986) that expansion of migration has an initially unequalizing effect on the rural income distribution, but the diffusion of access to migration eventually makes the effect of remittances on rural incomes more equitable (or at least, less inequitable). This may explain inconsistencies in the estimated effects of remittances on income inequalities from existing studies, using data from economies with different levels of integration with migrant labor markets.

Despite their positive effect on inequality, international migrant remittances reduce rural poverty, by a greater amount than internal remittances. The ameliorative effect of remittances on poverty increases as economies become more integrated with migrant labor markets, as reflected in migration prevalence. There is no precedent in the literature to this finding, which holds in rural Mexico regardless of whether migration is to internal or foreign destinations.

These findings have a number of policy implications. Policies that restrict migration increase poverty, especially in regions where the prevalence of household participation in migration is high. On the other hand, measures that promote remittances or that enhance remittance multipliers on incomes in migrant-sending households can be an effective poverty-reduction tool. The impacts of these measures on poverty and inequality would appear to be most favorable in the highest migration regions.

Table 2.1. Migration Summary Statistics for Rural Mexico, by Region

gion	**Variable**	**Percentages**	**Sample Mean**	**Standard Deviation**	**Minimum**	**Maxim**
th-South East	Households with US migrants (%)	7.53%	-	0.26	-	-

	US Migrants per Household		0.10	0.42	0	3
	Households with Internal migrants (%)	34.95%	-	0.48	-	-
	Internal Migrants per Household		0.89	1.61	0	8
	Household Sample Size		372			
ıter	Households with US migrants (%)	14.52%	-	0.35	-	-
	US Migrants per Household		0.27	0.89	0	8
	Households with Internal migrants (%)	29.32%	-	0.46	-	-
	Internal Migrants per Household		0.70	1.48	0	8
	Household Sample Size		365			
ıter-West	Households with US migrants (%)	27.75%	-	0.45	-	-
	US Migrants per Household		0.62	1.29	0	7
	Households with Internal migrants (%)	30.06%	-	0.46	-	-
	Internal Migrants per Household		1.02	1.99	0	10
	Household Sample Size		346			
rthwest	Households with US migrants (%)	12.09%	-	0.33	-	-
	US Migrants per Household		0.23	0.79	0	9
	Households with Internal migrants (%)	22.42%	-	0.42	-	-
	Internal Migrants per Household		0.72	1.71	0	8

	Household Sample Size		339			
rtheast	Households with US migrants (%)	19.72%	-	0.40	-	-
	US Migrants per Household		0.54	1.43	0	9
	Households with Internal migrants (%)	11.67%	-	0.32	-	-
	Internal Migrants per Household		0.23	0.80	0	8
	Household Sample Size		360			
al	Households with US migrants (%)	16.22%	-	0.37	-	-
	US Migrants per Household		0.35	1.04	0	9
	Households with Internal migrants (%)	25.76%	-	0.44	-	-
	Internal Migrants per Household		0.71	1.58	0	10
	Household Sample Size		1782			

ce: ENHRUM, 2003

Table 2.2. Rural Mexico Household Income and Remittances, 2002

Total Net Income (average per household)	**South-South east**	**Center**	**West-Center**	**Northwest**	**Northeast**	
Pesos	27,400	48,285	52,353	87,841	54,351	
U.S. Dollars	2,740	4,828	5,235	8,784	5,435	
Migrant Remittances as % of Total Income	10.37%	16.25%	14.79%	4.85%	20.69%	
Internal	3.66%	3.26%	1.04%	1.20%	0.54%	

International	6.71%	12.99%	13.75%	3.64%	20.15%	

Sample size: 1,782

Source: ENHRUM,2003

Table 2.3. Gini Decomposition by Income Source: Mexico National Sample

Income Source	(1) Share in Total Income (S_k)	(2) Income Source Gini (G_k)	(3) Gini Correlation with Total Income Rankings (R_k)	(4) Share in Total-Income Inequality	(5) % Change in Gini from a 10% Change in Income Source	
Government Transfers	.045	0.79	0.29	.017	-0.280	(-0.323, -0.237)
U.S. Remittances	.140	0.95	0.78	.169	0.281	(0.079, 0.532)
Internal Remittances	.020	0.96	0.36	.011	-0.089	(-0.118, -0.062)
Family production	.288	1.00	0.75	.350	0.630	(0.299, 0.925)
Agriculture wages	.117	0.82	0.37	.057	-0.601	(-0.675, -0.528)
Non-agriculture wages	.390	0.80	0.78	.396	0.061	(-0.178, 0.337)
Total Income	1.000	0.61	1.00	1.000		

Source: Estimates from Mexico National Rural Household Survey, 2003.N = 1782 households.
All incomes are per-capita. Bootstrapped percentile confidence intervals in parentheses.

Table 2.4a. Gini Decomposition by Income Source: High Migration (West-Center) Region

Income Source	(1) Share in Total Income (S_k)	(2) Income Source Gini (G_k)	(3) Gini Correlation with Total Income Rankings (R_k)	(4) Share in Total-Income Inequality	(5) % Change in Gini from a 10% Change in Income Source
Government Transfers	0.047	0.84	0.25	0.019	-0.279
U.S. Remittances	0.159	0.87	0.50	0.133	-0.263
Internal Remittances	0.009	0.98	0.42	0.007	-0.019
Family production	0.231	1.00	0.72	0.320	0.880
Agriculture wages	0.110	0.83	0.20	0.035	-0.746
Non-agriculture wages	0.445	0.75	0.76	0.487	0.428
Total Income	1.000	0.52	1.00	1.000	

Source: Estimates from Mexico National Rural Household Survey, 2003. N = 346 households. All incomes are per-capita.

Table 2.4b. Gini Decomposition by Income Source: Low Migration (South-Southeast) Region

Income Source	(1) Share in Total Income (S_k)	(2) Income Source Gini (G_k)	(3) Gini Correlation with Total Income Rankings	(4) Share in Total-Income Inequality	(5) % Change in Gini from a 10% Change in Income

			(R_k)		Source
Government Transfers	0.083	0.60	0.19	0.015	-0.674
U.S. Remittances	0.064	0.98	0.87	0.086	0.224
Internal Remittances	0.038	0.93	0.42	0.024	-0.145
Family production	0.438	0.92	0.86	0.550	1.092
Agriculture wages	0.126	0.77	0.42	0.064	-0.610
Non-agriculture wages	0.252	0.86	0.77	0.265	0.114
Total Income	1.000	0.63	1.00	1.000	

Source: Estimates from Mexico National Rural Household Survey, 2003. N = 372 households. All incomes are per-capita.

Table 2.5. Inter-regional Comparison of Marginal Effects of Migrant Remittances on Inequality of Per-capita Total Income (Gini Elasticities)

Table 2.6. Incidence of Rural Poverty, National and by Region in 2002 using the Headcount Measure

Region	International Migration		Internal Migration	
	Percentage of Households with Migrants	**Effect of 10% Increase in Remittances on Gini of Total Per-capita Income**	**Percentage of Households with Migrants**	**Effect of 10% Increase in Remittances on Gini of Total Per-capita Income**
South-Southeast	7.530	0.224	34.950	-0.145
Northwest	12.090	-0.114	22.420	-0.044
Center	14.520	0.784	29.320	-0.170
Northeast	19.720	.0576	11.670	-0.018
West-Center	27.750	-0.263	30.060	-0.019
All Regions	16.220	0.281	25.760	-0.089

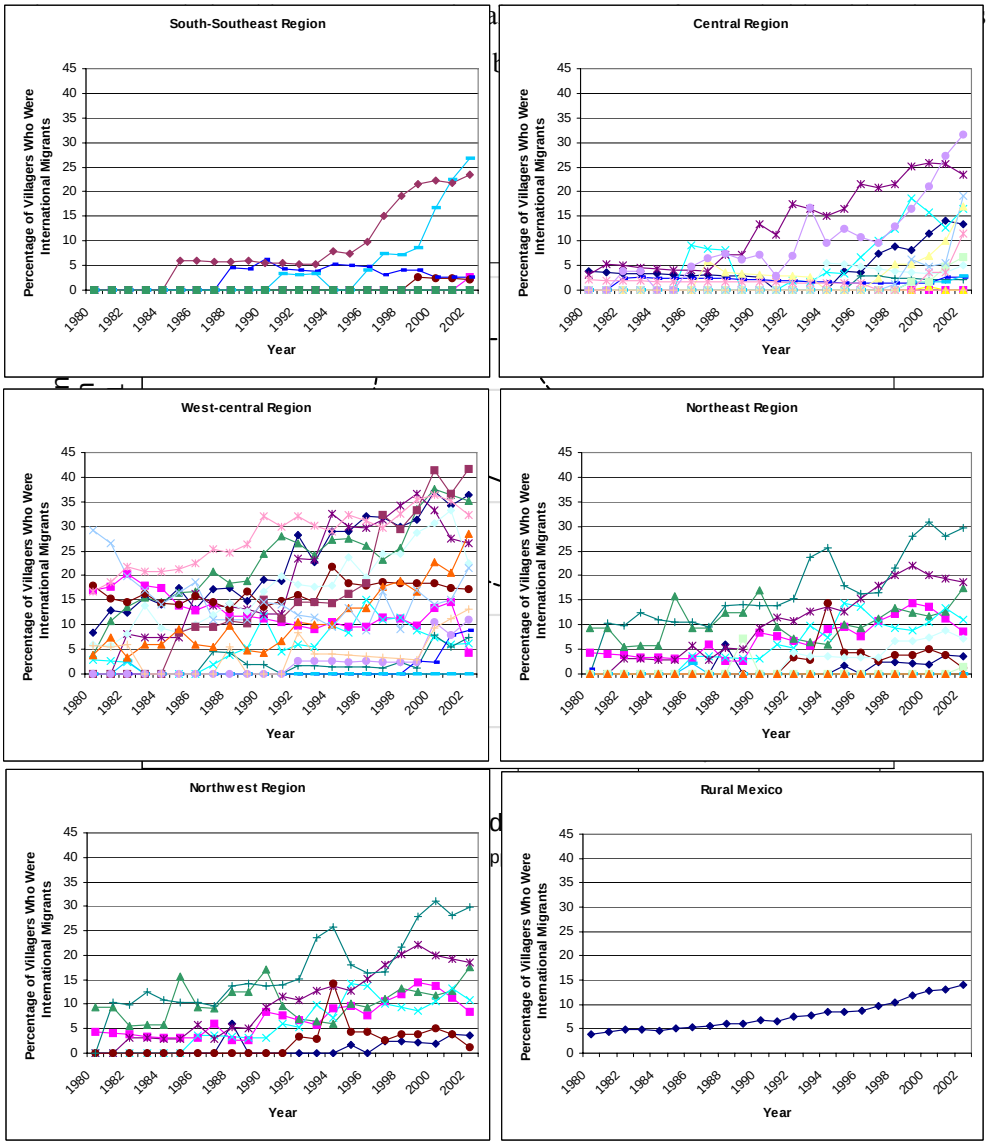
Region	Percentage of Rural Population in Impoverished Households Using Poverty Line Constructed from Cost of Basic Basket of…		
	Food	**Food, Basic Health, and Education**	**Food, Basic Health, Education, Clothing, Shelter, Utilities and Transportation**
South-Southeast	0.62	0.69	0.81
Center	0.36	0.45	0.63
West-Center	0.30	0.36	0.52
Northwest	0.20	0.25	0.35
Northeast	0.38	0.43	0.58
All Regions	0.38	0.44	0.58

Table 2.7. Rural Poverty Impacts of a 10% Increase in Migrant Remittances

Region	**International Migrants**				**Internal Migrants**			
	% of House-holds with Migrants	**% Change in Poverty Resulting from a 10% Increase in Remittances Using FGT Index**			% of House-holds with Migrants	**% Change in Poverty Resulting from a 10% Increase in Remittances Using FGT Index**		
		α=0 (Headcount)	**α=1 (Poverty Gap)**	**α=2 (Squared Poverty Gap)**		**α=0 (Headcount)**	**α=1 (Poverty Gap)**	**α=2 (Squared Poverty Gap)**
South-Southeast	7.53	0.00%	-0.11%	-0.11%	34.95	-0.33%	-0.41%	-0.45%
Northwest	12.09	-0.85%	-0.30%	-0.31%	22.42	0.00%	-0.16%	-0.13%
Center	14.52	-1.30%	-0.35%	-0.33%	29.32	-0.87%	-0.61%	-0.67%
Northeast	19.72	-0.48%	-0.58%	-0.51%	11.67	-0.48%	-0.10%	-0.08%

West-Center	27.75	-1.68%	-1.65%	-1.64%	30.06	0.00%	-0.05%	-0.05%
Rural Mexico	16.22	-0.77%	-0.53%	-0.53%	25.76	-0.39%	-0.30%	-0.30%

Figure 2.1. Trends in International Migration, By Village and Region of Rural Mexico, 1980-2002



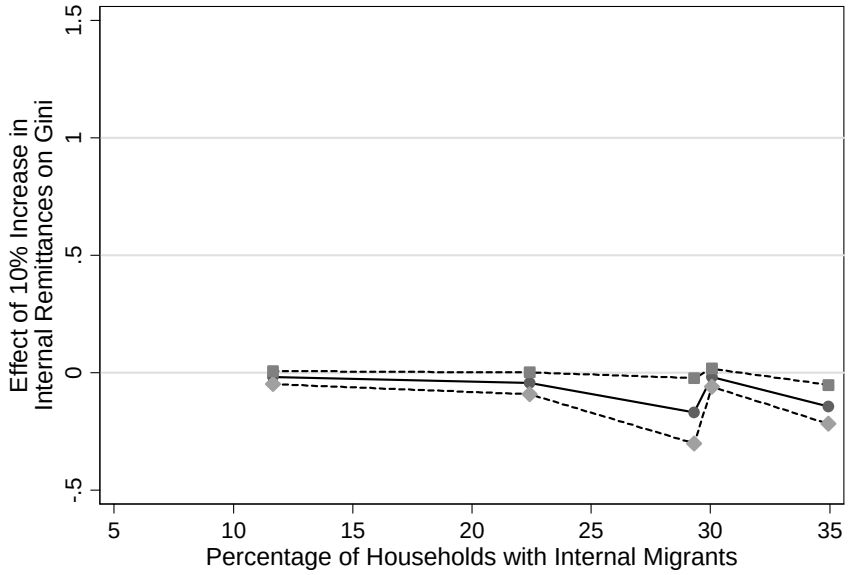
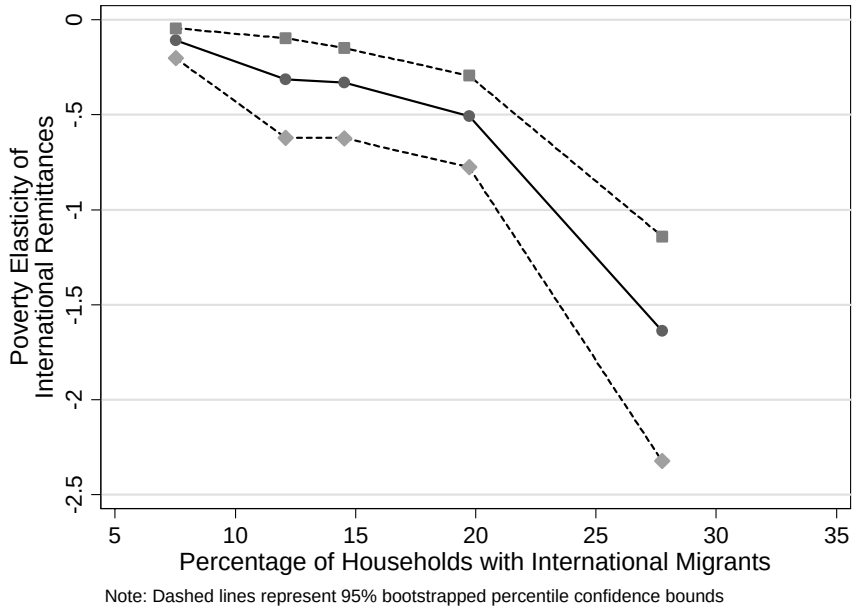
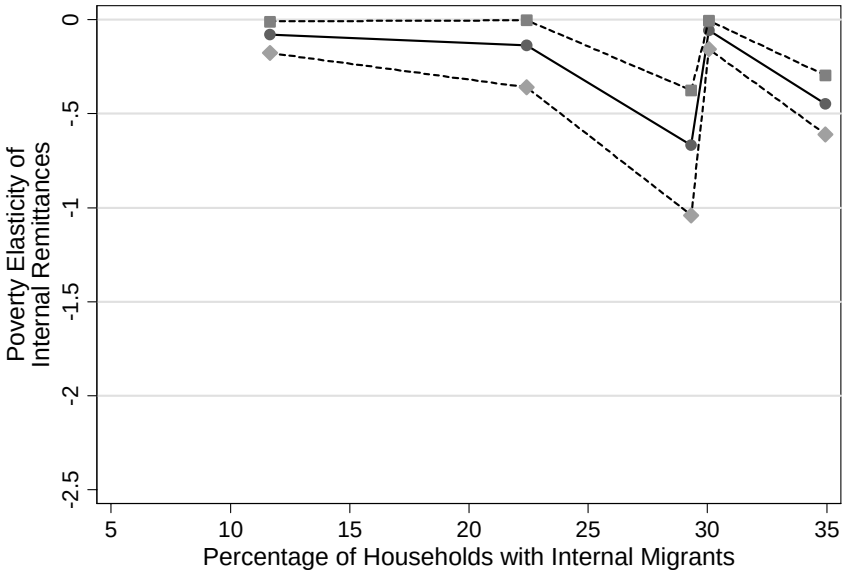


Figure 2.3. Relationship Between Poverty Elasticity of Migrant Remittances and Regional Percentage of Households with International Migrants (FGT Index, α=2)

(a) International Migration



(b) Internal Migration



Note: Dashed lines represent 95% bootstrapped percentile confidence bounds

Chapter 3

Does Migration Reshape Expenditures in Rural Households? Evidence from Mexico

The impact of migration on expenditure patterns in rural migrant-sending households has received considerable attention in the literature because of its ramifications for economic growth and demand linkages in rural economies. A key question that researchers have addressed is what impact, if any, households' receipt of remittance income has on productive investments, which are considered to be a driver of growth in rural areas and a potential creator of local economic alternatives to migration. Empirical research on expenditures in migrant-sending households often has contributed to a pessimistic view of the impact of migration on development in migrant-sending areas. Most studies conclude that remittances are consumed instead of invested and thus are not put to productive uses in migrant-sending areas (for reviews, see Chami, Fullenkamp and Jahjah, 2003; Taylor et al., 1996; Durand and Massey, 1992; and Papademetrious and Martin, 1991).[18] However, other researchers find the opposite (e.g., Massey, et al., 1987; for a detailed review see Taylor, et al., 1996).

[18] Rempel and Lobdell (1978), reporting on a survey of 50 remittance-use studies for the International Labour Office, concluded that "most of the money remitted is used for increased consumption, education and better housing". Lipton (1980) likewise concluded that investment is

Two approaches dominate empirical research on migration and expenditures. The first is based on remittance use surveys, which ask remittance-receiving households what goods and services they spent their remittances on. These studies suffer from a number of limitations. Most importantly, they ignore the fungibility of household income from diverse sources. The ways in which remittances, themselves, are spent may tell us little about remittances' effect on the array of goods and services that households purchase. When migrants send home remittances, this income becomes part of household budgets and thus may simultaneously alter the complete set of household expenditures. Remittance-use studies make the mistake of assuming that household income is not fungible. Because of this, they provide little insight into the ways in which remittances actually influence expenditure patterns in remittance-receiving households.

A second, more recent set of studies uses an econometric approach, adding remittance income as an explanatory variable in a system of household demand equations. That is, demand is modeled as a function of not only income, prices, and socio-demographic variables but also the amount of remittance income households receive. Examples include Adams (2005, 1998, and 1991) and Alderman (1996). An advantage of this approach is that it is consistent with widely used consumer demand models, which assume that income from diverse sources is pooled into a common household budget constraint. At the same time, it allows for the possibility that migrant remittances have an independent effect on expenditure patterns. For example, a $1 increase in income from remittances may have a different effect on expenditures than a $1 increase in farm income. Remittances may interact with other variables, including total expenditures and household socio-demographic characteristics, as illustrated clearly in Adams (2005).

This approach has several disadvantages, as well. First, migration may affect household expenditures in ways that remittances do not adequately capture, as described below. In fact, it is extremely difficult to separate *remittance* from *migration* effects on expenditures. Moreover, it is not obvious why one would want to do this. Second, migrant remittances may be endogenous, reflecting migrants' earnings as well as their remittance behavior (e.g., see Lucas and Stark, 1985). For example, a variable like education or information from migrants may affect both household

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a low-priority use of remittances in migrant-sending villages and that "everyday [consumption] needs often absorb 90 percent or more of a village's remittances". One study cited in Chandavarkar (1980:39) concluded that remittances are "frittered away in personal consumption, social ceremonies, real estate, and price-escalating trading".

expenditures and remittances. Econometrically, a key question is whether remittances are measures with error, and if so, whether the error is correlated with the errors in the expenditure system. If so, failure to control for the endogeneity of remittances is likely to result in biased estimates of *remittance* effects on expenditures. Third, empirical studies show that migration is a selective process.[19] Households that participate in migration and receive remittances differ fundamentally from those that do not (e.g., see chapter 1). Because of this, it is important to control for the determinants of migration when estimating impacts of migration on household expenditures. The effects of households' selection into or out of migration may be confounded with the effects of remittances on expenditures. For example, a finding that remittances are negatively associated with household investments could actually reflect that households with high propensities to invest have a low propensity to migrate.

This research argues and offers empirical evidence that migration reshapes village household expenditure patterns in direct and indirect ways that existing models do not adequately address. The modeling approach we employ controls for the endogeneity of household migration decisions while testing for differences in expenditure patterns between migrant and non-migrant households. This model is estimated for both international and internal migration. The data to estimate the model are from the Mexico National Rural Household Survey of 2003 (see introduction).

Findings from the econometric analysis reveal that expenditure patterns differ significantly between migrant and non-migrant households, sometimes in surprising ways. This is true for both international and internal migration. Other things (including total expenditures) being equal, compared with otherwise similar households without migrants, households with international migrants have large marginal budget shares for investments, health, and consumer durables and small marginal budget shares for food and housing. Households with internal migrants have relatively large marginal budget shares for health, housing, services and education and small marginal budget shares for supermarkets, consumer durables, and investments. Both types of migration interact with a variety of household characteristics to shape expenditure patterns in complex ways that have not been adequately captured by past models.

The rest of the chapter proceeds as follows. Section 3.1 describes potential linkages between remittances and expenditure in migrant households. Models of household expenditures to estimate

[19] This does not necessarily imply that migration selects positively with respect to human capital, wealth, or other variables; e.g., see Borjas (1989) and Hatton and Williamson (2004).

impacts of migration on demand are presented in section 3.2. The empirical model is outlined in section 3.3. Data and results are presented in sections 3.4 and 3.5, respectively. And section 3.6 offers the conclusions.

3.1 Remittances and Expenditures in Migrant Households

Empirical research on expenditures in migrant-sending households often has contributed to a pessimistic view of the impact of migration on development in migrant-sending areas. Most studies conclude that remittances are consumed instead of invested and thus are not put to productive uses in migrant-sending areas (for reviews, see Chami, Fullenkamp and Jahjah, 2003; Taylor et al., 1996; Durand and Massey, 1992; and Papademetrious and Martin, 1991). This past research on remittance use offers a partial and possibly distorted view of how remittances influence demand, due to the fungibility of income. Moreover, it often rests on arbitrary definitions of what constitutes productive investments. For example, schooling often is absent from the list of productive investments. This probably is because expenditures on educating family members usually do not create direct, immediate employment and income linkages within migrant-sending economies. Housing expenditures are not considered productive investments in many studies, despite their potentially important effects on family health and their direct stimulus to village construction activities. By contrast, expenditures on farm machinery generally are regarded as productive investments, in spite of the fact that machinery is not produced within the village economy and may even displace labor in village production and produce negative income linkages.

Reported use of remittances for productive investments at times can be significant. In their review of studies carried out in Mexico, for example, Durand and Massey (1992) found that the relative share of remittances spent on production, although always under 50 percent, fluctuated considerably from place to place and often reached substantial levels. Remittances enabled many communities to overcome capital constraints to finance public works projects such as parks, churches, schools, electrification, road construction, and sewers (Reichert, 1981; Massey et al., 1987; Goldring, 1990). Other studies report that remittances have been critical to the capitalization of migrant-owned businesses. Escobar and Martinez (1990), for example, found that 31 percent of migrants surveyed in Guadalajara used U.S. savings to set up a business. Massey et al. (1987), in their survey of the same city, put the figure at 21 percent; and in a survey of businesses located in three rural Mexican communities, Cornelius (1990) found that 61 percent

were founded with U.S. earnings. A number of studies from other world regions echo these findings. (For a detailed review, see Taylor, et al., 1996.)

Under the right circumstances, then, a significant percentage of migrant remittances and savings may be devoted to productive enterprises. Rather than concluding that migration inevitably leads to dependency and a lack of development, it is more appropriate to ask why productive investment occurs in some communities and not in others. Durand and Massey (1992:27) conclude that, in Mexico, "the highest levels of business formation and investment occur in urban communities, rural communities with access to urban markets, or rural communities with favorable agricultural conditions."

Pessimistic findings of past research may be attributable in part to poor research designs that do not consider the direct and indirect ways in which remittances may affect rural household expenditures. Recent empirical models have been designed to overcome this problem.

3.2 Estimating Impacts of Migration on Demand

Most models of household expenditures assume that households allocate their budgets across expenditure categories so as to maximize utility obtained from the consumption of goods and services, either presently or, in the case of investment expenditures, in the future.[20] With the exception of a nascent empirical literature on intra-household resource allocation models, most consumer models assume that households pool their income. This leads them to ignore income-source effects. The solution to such a consumer model is a set of expenditure functions of the following form:

$$e_{hi} = f(\underline{P_h}, Y_h, Z_h) + u_{hi} \quad (3.1)$$

where the subscripts h and i refer to household and expenditure category, respectively; e_{hi} denotes expenditure on good i by household h; $\underline{P_h}$ is a vector of prices faced by the household; Y_h

[20] This budget may be assumed to be exogenous or fixed, as in the standard consumer model, or it may be an endogenous outcome of household labor allocations and/or production choices, as in an agricultural household model (Singh, Squire and Strauss, 1986). Analysis of investments along with consumption demand generally requires a dynamic formulation of these models, inasmuch as the economic returns from investments are realized in the future.

is household income; Z_h represents other variables influencing marginal utilities and constraints on household behavior, and u_{hi} is an error term that is assumed to be approximately normally distributed with mean zero and a variance of σ^2. In the standard consumer model, for a household with *K* diverse sources of income (possibly including remittances), income is the pooled sum of income from these sources:

$$Y_h = \sum_{k=1}^{K} y_{hk} \quad (3.2)$$

Combining equations (3.1) and (3.2), it is evident that a marginal change in income from a given source *k* (say, remittances) has the same effect on expenditures as a marginal change in any other income source:

$$\frac{\partial e_{hi}}{\partial y_{hk'}} = \frac{\partial f(\underline{P_h}, Y_h, Z_h)}{\partial Y_h} \frac{\partial Y_h}{\partial y_{hk'}} = \frac{\partial f(\underline{P_h}, Y_h, Z_h)}{\partial Y_h} \quad (3.3)$$

Other things being equal, an increase in remittances from migrants shifts remittance-receiving households' budget constraints outward by the amount of the remittance transfer. This raises (decreases) the demand for normal (inferior) goods. In this model, the influence of migrant remittances is assumed to be limited to indirect effects operating through total income; income-source effects are ruled out.

Recent studies by Adams (2005, 1998, and 1991), Zarate-Hoyos (2004) and Alderman (1996) add a new explanatory variable to the right-hand-side of equation 3.1: household income from migrant remittances R_h, where R_h is also included in Y_h. That is,

$$e_{hi} = f(\underline{P_h}, E_h, Z_h, R_h) + u'_{hi} \quad (3.4)$$

where as in most demand studies, total expenditures E_h are used in lieu of income. The marginal effect of a change in remittance income, $y_{hk'}$, on household *h*'s expenditure on good *i* is thus:

$$\frac{\partial e_{hi}}{\partial y_{hk'}} = \frac{\partial f(\underline{P_h}, Y_h, Z_h)}{\partial E_h} + \frac{\partial f(\underline{P_h}, Y_h, Z_h)}{\partial y_{hk'}} \quad (3.5)$$

This is the same as $\frac{\partial f(\underline{P_h}, Y_h, Z_h)}{\partial E_h}$ only if there are no direct effects of remittances on expenditures. In practice, a dummy variable indicating households' receipt of remittances, rather than the level of remittances, is used. Following this approach and including interactions between the remittance-receipt variable and other variables in equation 3.4, Adams found evidence that the spending behavior of rural Guatemalan households with remittances was significantly different than that of households without remittances. Specifically, households with remittance income spent less on consumption goods than otherwise similar households without remittance income, dispelling the notion that remittances are "conspicuously consumed." This implies that the second term on the right hand side of equation 3.5 is nonzero. Similar results are reported in Adams (1998, 1991) and Alderman (1996), using data from other less developed countries.

The finding that the receipt of remittances influences expenditure patterns naturally raises the question, "Why?" Equation 3.4 suggests two possible explanations. First, the receipt of remittances may correlated with *other* determinants of demand, i.e., prices ($\underline{P_h}$, which may include household shadow prices for nontradables and transaction costs for tradables) and/or other variables , Z_h. Alternatively, both remittances and expenditures may be influenced by variables not included in equation 3.4. The most obvious candidate is migration itself, which is highly selective on household characteristics that also may influence expenditures.

The vector of prices, $\underline{P_h}$, in equation 3.4 is not limited to market prices. It also may contain unobserved "shadow prices" for household nontradables (e.g., see Strauss, 1986 and de Janvry, Fafchamps and Sadoulet, 1991). These shadow prices are endogenous and influenced by household decisions, potentially including migration. Remittances are the outcome of household integration with outside labor markets, via migrants, but migration also links village households to new markets, societies and cultures. Family migrants may facilitate households' integration with distant markets for consumption and investment goods, lowering transaction costs and effectively altering prices confronting the household. Investing time in migration is a prerequisite for receiving remittances. The loss of family labor to migration may make family time on the farm more scarce, increasing the opportunity cost of time (or the family "shadow wage"). In a Becker (1965)-type model, a decrease in prices of goods combined with an increase in the shadow wage, other things being equal, would induce the household to substitute purchased for home-produced goods and to shift from more to less time-intensive home produced goods.

Constraints on household expenditures include not only income but also information, uncertainty and risk aversion, and preferences. If migrants provide households with information, this may have various effects on expenditures, for example, by broadening the consumption set, creating a demand for new traits (e.g., nutrition), or altering household production technologies (i.e., "better" ways of producing goods at home). Information from migrants in this way may loosen human capital constraints on household production, investment, and consumption activities, while perhaps influencing preferences, as well.

Even if migrants did not contribute to income, their contact with an economy and society foreign to the village might influence village preferences and demands. Consumption is shaped, at least in part, by reference groups and identities. As rural farmers are brought into the global economy—both through their participation in wage work and increasing reliance on remittances from other family members, and through their increased consumption of non-local commodities—their expenditure patterns change, reflecting both the influence of new cultural standards and a reorganization of finances within the family farm.

If the household is risk-averse and remittances are not perfectly correlated with other income sources, the effect of remittances on consumption and investments in an uncertain world is likely to be different than the effect of income with different risk profiles. For example, households would be expected to allocate income from a risky source, like crop production, more conservatively than income from remittances, if the latter are viewed as being more certain. Differences in the effects of income from different sources in this case would reflect the influence of risk and uncertainty on household utility from various consumption and investment choices. Even if the variability of migration income is greater than the variability of farm income, income from migration nevertheless may reduce total household income risk through a low (or perhaps negative) correlation with farm income.

Remittance income may be perceived as more or less transitory than income from other sources. A permanent flow of remittances may encourage households to invest in goods whose use and upkeep require additional purchases in the future (e.g., fuel for a new vehicle). Income from migrants also may be controlled by different household members than income from other sources. In this case, a non-unitary household model might predict differences in marginal expenditures across income sources, reflecting the preferences and influence within the household of those who receive income from a given source (e.g., see McElroy, 1990; Schultz, 1990; Udry, 1996).

3.2.1 The Endogeneity of Migration

The allocation of family labor to migration generally is a prerequisite to receiving migrant remittances. Migration is highly selective of individuals, households and communities. Variables that "explain" migration also may be correlated with household expenditure patterns. Households with migrants may be fundamentally different from those without migrants with respect to their expenditures as well as their labor allocation. Even if remittances were exogenous (i.e., R_h and u'_{hi} were uncorrelated in equation 3.4), the expected expenditure on good *i* by a household with migrants (and thus remittances) would be given by:

$$E(e_{hi} / M_{hi} = 1) = Ef(\underline{P_h}, E_h, Z_h, R_h) + E(u'_{hi} / M_{hi} = 1) \quad (3.6)$$

That is, expenditures by migrant households are conditional upon the decision to participate in migration ($M_{hi} = 1$). Conversely, the expected expenditures by nonmigrant households are conditional upon nonmigration. The conditional errors $E(e_{hi} / M_{hi})$ cannot be assumed to be zero, because unobserved variables affecting migration may be correlated with expenditures.

In short, three econometric concerns emerge from a review of recent estimates of remittance effects on household expenditures. First, remittances are not predetermined; rather, they are endogenous outcomes shaped by some of the same variables that may influence expenditures, including migration, itself. Second, including remittances in the expenditure equations will not necessarily control for the range of effects that migration may have on expenditures. Third, migration is endogenous. It is shaped by variables that also may influence the ways in which households spend their income. Are households with a high ex-ante probability of migration more or less likely to use their income for productive investments? Are these households more integrated with outside markets for goods as well as for labor, in ways that might affect how they spend their income? In the case of consumption expenditures and investments that are "lumpy," there is an additional econometric issue of censorship; that is, many households have zero expenditure on certain items. Examples of this include housing and other investments and spending on consumer durables. The modeling approach proposed below attempts to address these concerns.

3.3 Empirical Model

The application involves a simultaneous-equation model in which the dependent variables, household expenditure shares, are censored by unobserved latent variables influencing the decision

to spend income on given consumption and investment goods, and they also depend on the decision of whether or not to participate in migration. Expenditure by household *h* on good *i* is observed (i.e., $e_{hi} > 0$) only if the household's total desired expenditure on the item exceeds some threshold. This threshold will depend on the lumpiness of the good (e.g., one cannot buy a car for less than a certain amount) as well as the opportunity cost (the satisfaction or utility that the household would enjoy by spending this threshold amount on some other item). Both the decision to spend income on a specific category of goods and the amount spent depend on the variables in equation 3.1 $(\underline{P_h}, E_h, Z_h)$, as well as on migration. Assuming that the stochastic errors are approximately normal with zero means and a finite variance-covariance matrix that is constant over all observations—that is, iid—the system of expenditure equations can be estimated using Lee's (1978) generalization of Amemiya's (1974) two-step estimator to a simultaneous-equation model. Lee demonstrated that the estimators resulting from this procedure are asymptotically more efficient than other two-stage estimators, namely, those proposed by Heckman (1978) and Nelson and Olson (1978). A number of studies employ a censored regression approach to model demand systems without testing for migration effects. These include Heien and Wessells (1990), Shonkwiler and Yen (1999), Lazaridis (2003) and Jabarin (2005).

In the first stage, a probit is estimated for participation in each expenditure category. The dependent variable in each probit is equal to 1 if $e_{hi} > 0$ and zero otherwise. The right-hand variables include $\underline{P_h}, E_h$ and Z_h (defined above), E_h is also interacted with M_h, where $M_h = 1$ if the household participates in migration and 0 otherwise. (M_h is endogenous; construction of an instrument for this variable is discussed below). The probits are used to calculate a set of inverse-Mills ratios, one for each expenditure category in which censorship is likely to be a problem:

$$IMR_{hi} = -\phi(X_h)/\Phi(X_h) \quad (3.7)$$

where $\phi(X_h)$ denotes the standard normal density function and $\Phi(X_h)$ denotes the normal distribution function, and X_h is a vector containing $\underline{P_h}, E_h, Z_h$ and their interactions with M_h.

In the second step, the inverse-Mills ratios are included as right-hand variables in the corresponding expenditure equations. We estimated the expenditure system using the Almost Ideal Demand System (AIDS) method, extended to include the migration interactions described above (Deaton and Muellbauer, 1980). Prices were not available for all expenditure categories, most of which are not homogeneous. The unrestricted regressions are of the form:

$$e_{hi} / E_h = \alpha_i + \beta_{1i} \ln(E_h) + \beta_{2i} Z_h + \beta_{3i} M_h + \beta_{4i} \ln(E_h) M_h + u'_{hi} \quad (3.8)$$

where e_{hi} / E_h is the share of household *h's* expenditure on good *i*, and α_i, β_{ki}, *k=1,...,4*, are parameters. This functional form displays a number of advantages for these purposes. It is flexible enough to allow expenditure patterns to change with total expenditure level. It permits participation in migration to shift the intercept, the marginal propensity to spend income, and the marginal effect of other variables on expenditures on each category of goods. It also controls for the endogeneity of migration and censorship for some (lumpy) expenditure categories. Finally, it has attractive properties from a theoretical point of view, e.g., restrictions are easily imposed so that it conforms to adding-up, homogeneity, and symmetry properties derived from the standard demand theory (Lazaridis, 2003). The restricted regression is of the form:

$$e_{hi} / E_h = \alpha_i + \beta_{1i} \log(E_h) + \beta_{2i} Z_h + u''_{hi} \quad (3.9)$$

Because the equation system given by (3.9) is nested within (3.8), a test for differences in demand between migrant and nonmigrant households can be implemented by forming the statistic $2(L^R - L^U)$, where L^R, L^U are the values of the log-likelihood function corresponding to the restricted and unrestricted systems, respectively. Under the null hypothesis that demand patterns are the same for migrant and nonmigrant households, this statistic is distributed as χ^2_{df} with degrees of freedom equal to the number of restrictions in 3.9.

Instruments for migration were obtained from probit regressions of M_h on household characteristics Z_h and the number of household members involved in each migration type (international and internal) in 1990, 12 years prior to the time at which household expenditures are observed. The latter were the key identifying variables used to obtain the migration instruments. The predicted probabilities of migration obtained from these probits, rather than observed migration, were used in the expenditure system estimation.

The system of expenditure equations was estimated jointly for the full household sample using three-stage least squares to exploit the information contained in the cross-equation error correlations. To improve efficiency, we estimated the system using iterative three-stage least squares. Both an "unrestricted" and a "restricted" expenditure system were estimated. The unrestricted system includes the migration variable and its interactions with the logarithm of total expenditure $(\underline{P_h}, E_h)$. The restricted system omits the migration variable and its interactions. A

log likelihood test was used to test whether expenditure patterns are significantly different for migrant and non-migrant households, taking into account both migration and its interactions with the logarithm of total expenditure in the demand system.

3.4 Data

Data to estimate the model are from the Mexico National Rural Household Survey (ENHRUM, see introduction). Data from this survey make it possible to quantify migration and remittances at the household level, as well as to test for influences of these variables on household consumption and investment expenditures.

Detailed data were gathered on migration in 2002 by the household head, the spouse of the household head, all other individuals living in the household, and all sons and daughters of either household head, regardless of where they resided at the time of the survey. Twenty six percent of households in the sample had at least one internal migrant in 2002; they averaged 2.7 internal migrants each. Sixteen percent participated in international migration, with an average of 2.2 international migrants each. Remittances from international migrants are an important income source, comprising an average of 11 percent of household total income. Although the number of internal migrants is higher than the number of international migrants, remittances from internal migrants represent a smaller share of household total income—1.7 percent.

Different types of expenditures have different periodicity, and this was taken into account when gathering expenditure information on the survey. Separate sections of the survey form were designed for annual expenditures (household durable goods, housing investments, farm machinery, taxes, health, education, etc.) and monthly and weekly expenditures (utilities, consumption expenditures in markets, butcher shops, from traveling vendors, etc.). For intermittent expenditures (e.g., at butcher shops, tortillerias, markets, etc.), households were asked whether or not they spent money on a given good at some time in 2002, and if so how often, where, and how much each time. Consumption of home-produced goods (e.g., maize) was calculated as output minus sales minus intermediate use (e.g., use of maize as animal feed).

Expenditure data from the survey were aggregated into three consumption categories, four types of investment, and one "other" (miscellaneous) expenditure category. The consumption categories include food , except for those purchased in supermarkets; consumer durables (furniture, appliances, etc.); and expenditures in supermarkets. Expenditures in supermarkets were isolated from expenditures on other nondurables because of their increasing importance in Latin America

and elsewhere; see Reardon and Berdegué (2002).[21] The investment categories include health, housing, education, and other investments (hereafter referred to simply as "investments"). The category of "other" is constituted primarily of expenditures on miscellaneous services; for detailed information on expenditure categories see Table 3.1. (In the rest of this paper we refer to this category simply as "services.") These consumption and investment categories are exhaustive; that is, they add up to total household expenditures. There is a high degree of congruity between our total expenditure and total income estimates. Total income was estimated separately from expenditures, using detailed data on household-farm production, wage work, and migration.[22] Average per-capita income in the full sample was 15,766 pesos, while average total expenditure per capita was 14,965 pesos.[23]

Household expenditures are summarized in Table 3.2. The top panel presents average budget shares for each household group. The bottom panel compares expenditure levels and total expenditures. The largest expenditure shares for nonmigrant households are for food (0.42), services (0.18), and consumer durables (0.10). Approximately 23% of expenditures by nonmigrant households were on health, education, housing and other investments. The largest of these was education (0.09) and other investments (0.06), followed by health (0.05) and housing (0.04).

Compared with households that did not have migrants, households with international migrants have a larger share of total expenditures on food (0.37), services (0.27), consumer durables (0.08),

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[21] The expenditure module for the survey was designed so as to avoid double-counting of expenditures on durables and nondurables purchased in supermarkets. Thus, the sum of these three expenditure categories represents total expenditure on consumption goods.

[22] We calculated net incomes from twelve sources: crop, livestock, nonagricultural (composed of handicrafts, village nonfarm enterprises, small-scale food processing, and various other home-based production activities), commerce, service, natural resource extraction, wage labor (agricultural and nonagricultural), and migration (internal and international), as well as from public transfers (PROCAMPO subsidies for basic grain producers and PROGRESA welfare payments). This list of incomes is exhaustive; the sum of income from the twelve sources equals household total net income.

[23] The exchange rate at the time of the survey was approximately 10 pesos per U.S. dollar.

investments (0.07), and health (0.07); smaller shares on supermarkets (0.03), and education (0.06); and similar shares on housing (0.03). Internal migrant households spend larger shares on food (0.41), services (0.26), consumer durables (0.07), education (0.07); lower shares on, health (0.06), supermarkets (0.05); and a similar share on housing (0.03).

The bottom panel of Table 3.2 reveals that, in absolute terms, households with international migrants have per-capita total expenditures that are 26 percent higher than those of nonmigrant households. They spend more income on consumer durables and food as well as on investments, health, and services. By contrast, internal migrant households have per-capita total expenditures that are 2 percent lower than those of nonmigrant households, and their expenditures on most categories of goods are lower, as well. A notable exception is investments, on which internal migrant households spend an average of 44 percent more than nonmigrant households.

It is not clear whether these differences in expenditure levels or shares are due to household migration status or whether they are the result of differences in other variables, including total expenditures and socio-demographic characteristics. For example, even though international migrant households spend more income on consumer goods, their marginal budget share for these goods may be either higher or lower than that of nonmigrant households. It is possible that increases in income and expenditures result in greater increases in consumption expenditures in nonmigrant than in migrant households. Econometric analysis is required to compare expenditure patterns of migrant households with those of otherwise similar households without migrants.

Household migration and socio-demographic variables hypothesized to influence expenditures (the Z_h in our econometric model) are summarized for each of the three household groups in Table 3.3. The household socio-demographic characteristics in this model include: household size (averaging 4.05 for nonmigrant households, 3.80 for households with international migrants, and 3.75 for households with internal migrants); number of children (0.64, 0.37 and 0.36, respectively); age of the household head (44, 56 and 59 years); landholdings (4.42, 7.69, and 4.57 hectares, respectively); the education of the household head (5.17, 3.30 and 2.93 years); and the number of household members at each schooling level (6, 9, and 10 or more years of completed schooling). The model also includes two indicators of access to outside markets. The first is an index of the frequency of transport availability between the village and commercial centers with which villagers transact. The higher the value of this index, the greater the frequency of transport and number of outside communities with which the village is linked via regularly scheduled transportation. Table 3.3 shows that on average migrant households have somewhat greater

access to transport, as measured by this variable, than nonmigrant households. The second market-access variable is a dummy variable equal to 1 if the village in which the household is situated is inaccessible to outside markets during weather shocks and 0 if the village maintains access to outside markets throughout the year. There is little difference in the average for this variable across the three household groups. Finally, the model includes a set of 4 regional dummy variables (northwest, northeast, central, and west-central; the default region is the southeast).

3.5 Results

The results of probit regressions used to obtain the migration instruments are summarized in Appendix 3.1. The migration probit results suggest that the 1990 migration instruments have significant predictive power for explaining the potentially contaminated 2002 migration variables. The results of the probit regressions used to obtain inverse-Mills ratios to correct for censorship in the demand-system estimation appear in Appendix 3.2. Although these are not the primary focus of this paper, they confirm that the log of total expenditures and some demographic variables have a statistically significant effect on the probability of observing household expenditures for all categories of goods. The frequency of transport variable, a proxy for the cost of transacting with outside markets, is also positive and significant in most cases. The international migration instrument is significant in four of the seven included expenditure equations, and interaction terms involving this migration variable are also significant in many cases. The internal migration variable is statistically significant in two of the expenditure probits, and several interactions involving internal migration are also significant.

The results of the three-stage least squares estimation of the unrestricted expenditure system using Lee's estimator appear in the Table 3.4. A likelihood ratio test easily rejects the null hypothesis that the effects of all migration interaction terms are zero for both migration types.[24]

The regression results reveal that both types of migration influence expenditure patterns in two ways. First, migration significantly shifts the intercept of the expenditure equation in some cases (e.g., international migration in the equations for expenditure shares of consumer durables, food, education, and investment; and internal migration in the equations for consumer durables, food, and investment). Second, it alters the marginal propensity to consume, as reflected in the

[24] The χ^2 statistic (degrees of freedom) corresponding to the null hypothesis that all migration effects are nil is equal to 156.12(28), significant at well below the .01 level.

parameters multiplying the migration-expenditure interaction terms. (These are significant for international migration in the equations for expenditures on food, consumer durables, education, and investments and for internal migration in the equations for consumer durables, food, and investments).

The central question of this paper is: "How does migration influence household expenditures, other things being equal?" Table 3.5 attempts to answer this question, in two ways. First, it reports marginal budget shares on each expenditure type for households without migrants, households with international migrants, and households with internal migrants. These were obtained from the estimated unrestricted demand system given in equation 8. The general formula for the marginal budget shares is:

$$\partial e_{hi} / \partial E_h = \hat{\alpha}_i + (\hat{\beta}_{1i} + \hat{\beta}_{4i} M_h)(1 + \ln(E_h)) + \hat{\beta}_{2i} Z_h + \hat{\beta}_{3i} M_h \quad (3.10)$$

In this formula, "^" refers to an estimated parameter. The marginal budget share for non-migrants is evaluated by setting the migration variables M_h in Equation 3.10 equal to zero, thereby eliminating all migration effects from the system.[25] The marginal budget shares for a given class of migrants (international or domestic) were calculated by setting the corresponding migration variables equal to 1.0 and the migration terms for the other migration class to 0. All other variables in the system were set equal to their means. For each household type, the marginal budget shares add up to 1.0.

It is important to keep in mind that the econometric analysis makes it possible to compare marginal budget shares between households with migrants and *otherwise similar* households without migrants. The findings reported in Table 3.5 control for all of the explanatory variables included in the expenditure system and described in Table 3.3.

Marginal budget shares for nonmigrant households, other things being equal, are highest for food (0.38), services (0.16), consumer durables (0.12), and investments (0.10), followed by housing (0.07), education (0.06), supermarkets (0.06), health (0.04), *ceteris paribus* (see Column A in Table 3.5). These marginal budget shares are the baseline for determining the impact of

[25] The restricted regressions were not used for this purpose because, given the rejection of the null hypothesis that the effect of the migration terms is zero, the restricted parameter estimates for *other* variables in the system are likely to be biased.

international and internal migration on household expenditure patterns, controlling for the variables in Table 3.3.

Households with international migrants have a considerably larger marginal budget share for investments (0.21, compared with 0.10) than otherwise similar nonmigrant households (see Column B of Table 3.5). That is, controlling for other variables in the equation system, including total expenditures, households with U.S. migrants spend 11 cents more of their marginal dollar on investments than do households without migrants. The marginal budget share for consumer durables is also higher in U.S. migrant households (0.22, compared with 0.12). Other things being equal, marginal budget shares are higher in U.S. migrant households than in nonmigrant households for services (0.22, compared with 0.16),. Marginal budget shares for food, supermarkets, education, and housing are lower in U.S. migrant households than in nonmigrant households.

Households with internal migrants have a marginal budget share for investments that is lower than that of nonmigrant households (0.06, compared with 0.10). However, marginal budget shares in internal migrant households are larger for services (0.30,compared with 0.16), health (0.06, compared with 0.04) and housing (0.08, compared with 0.07). Households with internal migrants have a considerably lower marginal budget share for consumer durables, supermarkets, and investments. These differences in marginal budget shares result in sharply different levels of expenditures on specific items for migrant and nonmigrant households. Holding other variables, including total expenditures, constant, households with international migrants spend 110 percent more of their income on investments, 85 percent more on consumer durables, 38 percent more on services, 2 percent more on health and less on food, housing, education and supermarkets. Internal migrants spend 28 percent more income on health, 87 percent more on services, 3 percent more on education, 9 percent more on housing and less on consumer durables, supermarkets and investments than otherwise similar households without migrants. The international migration group spend 62 percent less on housing that do nonmigrant households with similar incomes and socio-demographic characteristics. In short, if households with international migrants appear to spend a large amount of their income on consumption and housing, this is not because of their migration status; rather, it is due to their higher total income and other characteristics that differentiate migrant and nonmigrant households.

The inverse-Mills ratio is significant in four of the demand equations, those for supermarkets, health, education and investments. These categories include a high percentage of zero

expenditures (78%, 37%, 42% and 47%, respectively). For the other categories, censorship does not appear to be a significant concern when estimating expenditure demands.

3.6 Conclusions

In this paper we have presented an empirical model to test for and quantify differences in expenditure demands between migrant and nonmigrant households using new household data from rural Mexico. The modeling approach we propose is more general than standard consumer models, remittance-use studies, and recent work extending consumer models by including direct remittance effects. It controls for both censorship in demands and the endogeneity of migration while offering a comprehensive test of migration's effects on expenditure patterns. Our findings indicate that migration reshapes household demands in ways that are independent of total income. Three key insights emerge from this analysis.

First, migration has complex effects on household expenditures. Past studies, which focus on remittance use or include remittances as explanatory variables in household demand models, capture one (albeit potentially important) component of these migration effects. Migration, in addition to contributing to household income, links village households to new markets, societies and cultures; it may induce changes in consumption technologies and induce a substitution of purchased for home-produced goods in response to lost labor and other effects; and it may alter households' information set, risk profile, and preferences in ways that affect marginal utilities of consumption and investment. In practice, it is difficult to identify *remittance* effects distinct from *migration* effects on expenditures. No attempt is made to do so in this paper.

Second, migration, like expenditures, is an endogenous choice. Studies that fail to control for the endogeneity of migration (or remittances) risk yielding parameter estimates that are biased and potentially misleading.

Third, as noted by other researchers, it is critical to control for other household characteristics, including total expenditures, when studying the expenditure effects of migration. Migration influences expenditures directly as well as indirectly, via its interactions with total expenditures and other household variables. For example, a simple comparison of households with and without migrants reveals that the former spend more income on housing, consumption, and investments. However, migrant households also have higher income than nonmigrant households, on average, and their socio-demographic characteristics differ, as well. It is not clear, a priori, whether

differences in average expenditures between migrant and nonmigrant households are due to migration or to these differences in income and other variables.

The findings from the econometric analysis reveal that, compared with otherwise similar households without migrants, as total expenditures in households with migrants increase, the share of income used for investments also increases, while the share spent on consumption falls. This is especially true for international migration. This finding does not support the view that households with migrants disproportionately spend their income on consumption. It is consistent with the findings reported by Adams (2005) based on a different modeling approach and data from rural Guatemala.

An overarching conclusion of this research is that criticisms of migration for not stimulating productive investments may be misplaced; they may be more a result of modeling and data limitations than actual differences in expenditure patterns between migrant and nonmigrant households. As rural incomes increase, expenditure patterns change. This is true regardless of whether the income gains are from migration or other sources. The key question that should be of interest to researchers and policy makers is whether expenditure patterns change differently for households that participate in migration, and if so, why. This requires a more complex modeling approach than has been used in past research exploring the impacts of remittances on expenditures. Migration's potential impacts include influences besides those of remittances; expenditure patterns in migrant households must be compared with those in *otherwise similar* households without migrants while controlling for the endogeneity of migration choices. These findings reveal that migration does indeed significantly influence expenditure patterns in rural areas, but not in the ways that most past studies of remittance use predict. In particular, the propensity to invest appears to be considerably larger for households with migrants.

Table 3.1. Expenditure Categories

Category	Description	Examples
Food	Purchased food Non purchased food	Tortillas, meat, milk, vegetables, fruit Food from own agricultural production (e.g. maize)

Durables	Consumer goods durables	Furniture, clothing, toys
Supermarkets	Any expenditure in supermarkets	Any kind of good purchased in supermarkets
Health	Health expenses	Hospitalization, doctor fees, medicine
Education	Educational expenses	Uniforms, transport, registration fees, school supplies, accommodations
Housing	Housing expenses and house repairs	Annual payment for housing (rent, mortgage) and house construction or repair
Investments	Annual value of new productive assets purchased and repair of old assets	Purchase of farm machinery, farm tools, machinery refurbishment and repair
Other	Household services Transport	Electricity, gas, water, telephone, passenger transportation (except for schooling), gasoline

Table 3.2. Average Budget Shares, Expenditure Levels, and Total Expenditures, by Household Migration Status

Expenditure Category	Households Without Migrants (A)	Households With U.S. Migrants (B)	Households With Internal Migrants (C)	Percentage Difference U Migrants Ver Non Migrants (D)	
Panel A. Expenditure Shares					

Food	0.421	0.374	0.407	-11.087
Consumer Durables	0.105	0.085	0.071	-18.574
Supermarkets	0.063	0.035	0.049	-44.746
Health	0.046	0.072	0.056	56.411
Education	0.088	0.060	0.070	-31.508
Housing	0.038	0.030	0.027	-19.502
Investments	0.058	0.076	0.060	30.665
Other	0.182	0.268	0.261	47.060
Sum	1.000	1.000	1.000	NA
Panel B. Average Expenditure Levels and Total Expenditures (per-capita, pesos)				
Food	4896.051	5795.913	4105.437	18.379
Consumer Durables	1705.760	2005.779	1260.054	17.589
Supermarkets	1146.767	679.869	860.595	-40.714
Health	715.717	1218.447	915.563	70.242
Education	999.135	808.220	686.090	-19.108
Housing	1037.266	905.257	665.929	-12.727
Investments	1963.797	2777.995	2828.898	41.460
Other	2251.691	4478.926	3318.171	98.914
Total Expenditures (pesos)	14716.180	18670.410	14640.740	26.870

Source: Analysis of ENHRUM data

Table 3.3. Means and Standard Deviations of Explanatory Variables in the Expenditure System, by Household Migration Status

Variable	**Households Without Migrants**		Households With International Migrants		Household Migrant	
	Mean	SD	Mean	SD	Mean	
Household size	4.049	1.954	3.795	2.011	3.748	
Number of children	0.636	0.932	0.372	0.759	0.366	
Age of Household head	43.801	15.012	56.271	13.129	59.441	
Schooling of Household head	5.168	3.870	3.302	3.043	2.928	
Number of household members with six years of schooling	1.646	1.368	2.708	1.516	2.450	
Number of household members with nine years of schooling	0.746	0.987	1.021	1.221	0.888	
Number of household members with ten or more years of schooling	0.402	0.822	0.417	0.843	0.496	
Landholdings	4.416	26.330	7.692	32.184	4.571	
Frequency of Transport	7.873	5.990	8.375	5.211	9.300	
Inaccessibility During Weather Shocks (Dummy)	0.127	0.334	0.146	0.354	0.156	

Source: Analysis of ENHRUM data

Table 3.4. Results of Three-Stage Least Squares Estimation of Expenditure System Using Lee's Estimator

Variable	Expenditure Category (Equation)

	Food	Durables	Super-markets	Health	Education	Housing	
	(1)	(2)	(3)	(4)	(5)	(6)	
Log of Expenditure	-0.05973	0.02058	-0.00090	-0.00786	-0.01862	0.03141	
	(-5.78)***	(4.21)***	(-0.15)	(-1.60)	(-3.55)***	(5.74)***	
Household Size	0.00757	0.00379	-0.00098	-0.00243	0.01222	-0.00608	
	(2.20)**	(2.46)**	(-0.53)	(-1.59)	(4.76)***	(-4.02)***	
Number of children	-0.00059	0.00742	-0.00224	-0.00150	-0.01439	-0.00277	
	(-0.09)	(2.44)**	(-0.62)	(-0.47)	(-4.31)***	(-0.99)	
Age of Household head	0.00001	-0.00068	0.00028	0.00075	-0.00027	-0.00042	
	(0.02)	(-2.53)**	(0.98)	(3.20)***	(-0.97)	(-1.78)*	
Schooling of Household head	-0.00571	0.00205	0.00057	0.00087	-0.00007	-0.00042	
	(-2.90)***	(2.39)**	(0.55)	(1.02)	(-0.08)	(-0.53)	
Number of household members with six grades of schooling	0.00451	0.00028	0.00116	0.00081	-0.00680	0.00329	
	(0.90)	(0.13)	(0.44)	(0.36)	(-2.54)**	(1.61)	
Number of household members with nine grades of schooling	-0.00490	0.00132	0.00405	-0.00377	-0.00183	0.00140	
	(-0.81)	(0.50)	(1.27)	(-1.45)	(-0.60)	(0.56)	
Number of household members with ten or more grades of schooling	-0.03661	0.00302	0.00256	-0.00250	0.02544	-0.00615	
	(-4.71)***	(0.89)	(0.62)	(-0.75)	(6.77)***	(-1.92)*	
Landholdings	0.00003	0.00012	-0.00014	0.00005	-0.00010	0.00004	
	(0.11)	(1.23)	(-1.15)	(0.49)	(-0.90)	(0.41)	
International Migration Probability (p1)	0.89101	-0.60435	0.09137	0.04377	0.40833	-0.01302	
	(2.10)**	(-3.29)***	(0.41)	(0.24)	(2.01)**	(-0.07)	
Log of Expenditure * p1	-0.09644	0.06202	-0.00986	-0.00376	-0.03590	-0.00268	

	(-2.42)**	(3.60)***	(-0.47)	(-0.22)	(-1.88)*	(-0.16)
Internal Migration Probability (p2)	-0.65430	0.76899	0.15017	-0.15429	-0.10474	0.04421
	(-2.26)**	(6.04)***	(0.98)	(-1.22)	(-0.75)	(0.37)
Log of Expenditure * p2	0.06069	-0.08014	-0.01506	0.01457	0.00935	-0.00332
	(2.16)**	(-6.50)***	(-1.02)	(1.19)	(0.70)	(-0.29)
Inverse Mills Ratio	----	0.03858	-0.05663	-0.06668	-0.04910	0.00808
	----	(1.58)	(-12.84)***	(-4.78)***	(-6.27)***	(0.89)

t-statistics in parentheses, *** significant at 1%; ** significant at 5%; * significant at 10%

Table 3.5. Comparison of Marginal Budget Shares and Expenditure Levels by Household Migration Status

Appendix

Appendix 3.1 Results of Probit Regressions for Migration

Expenditure Category	Households Without Migrants (A)	Households With U.S. Migrants (B)	Households With Internal Migrants)	Percentage Difference, U.S. Migrants Versus No Migrants (D)	Percentage Difference, Internal Migrants Versus No Migrants (E)
Food	0.384	0.175	0.382	-54.484	-0.485
Durables	0.122	0.225	0.023	84.730	-80.715
Supermarkets	0.059	0.038	0.037	-35.940	-36.899
Health	0.043	0.044	0.055	2.037	27.636
Education	0.060	0.059	0.062	-2.145	3.180
Housing	0.070	0.026	0.076	-62.363	9.045
Investments	0.099	0.207	0.064	109.625	-35.111
Other	0.164	0.226	0.307	38.366	87.697
Sum	1.000	1.000	1.000		

Instruments

Variable	International Migration	Internal Migration
Household Size	0.1191	0.1913
	(7.70)***	(13.08)***

Schooling of Household head	-0.0367	-0.0139
	(-2.67)***	(-1.07)
Age of Household head	0.0838	0.0263
	(4.52)***	(1.62)
Age of Household head squared	-0.0007	0.0000
	(-4.46)***	(-0.17)
Number of children	-0.0243	-0.1551
	(-0.47)	(-3.28)***
Landholdings	0.0017	-0.0018
	(1.32)	(-0.72)
Wealth Index	0.1569	-0.0347
	(5.57)***	(-1.34)
Wealth Index-squared	-0.0057	-0.0095
	(-0.56)	(-1.16)
Inaccessibility During Weather Shocks (Dummy)	0.3604	0.0622
	(2.89)***	(0.54)
Nonagricultural Enterprise in Village (Dummy)	-0.0193	-0.0258
	(-0.19)	(-0.28)
Frequency of Transport	-0.0029	0.0177
	(-0.37)	(2.60)***
Number of Family Members at U.S. Migrant Destination in 1990	0.6280	0.1424
	(7.45)***	(1.57)
Number of Family Members at Internal Migrant Destination in 1990	0.0009	0.2186
	(0.01)	(3.16)***

Region 2	0.1500	-0.3335
	(1.04)	(-2.82)***
Region 3	0.3161	-0.3883
	(2.10)**	(-2.92)***
Region 4	-0.1036	-0.2494
	(-0.63)	(-1.83)*
Region 5	0.2984	-0.7560
	(1.91)*	(-5.30)***
Constant	-4.1008	-2.8928
	(-7.87)***	(-6.28)***

t-statistics in parentheses, *** significant at 1%; ** significant at 5%; * significant at 10%

Appendix 3.2 Results of First-stage Probit Regressions to Obtain Inverse Mills Ratios

ıble	Expenditure Category (Equation)						
	Durables	Super-markets	Health	Education	Housing	Invest-ments	Other
Expenditure	0.4009	0.4587	0.2652	0.3020	0.5184	0.4749	0.4714
	(4.11)***	(5.71)***	(4.04)***	(4.10)***	(7.10)***	(7.00)***	(0.62)
old Size	0.1174	-0.1018	-0.0016	0.7780	-0.0554	-0.0579	-2.6219
	(2.14)**	(-2.35)**	(-0.05)	(16.42)***	(-1.48)	(-1.69)*	(-1.84)*
r of children	0.0907	0.0071	0.2231	-0.1625	-0.0875	0.0644	3.5640
	(0.85)	(0.10)	(3.61)***	(-2.45)**	(-1.39)	(1.11)	(1.90)*
Household head	-0.0145	0.0010	-0.0014	-0.0114	-0.0080	-0.0016	-0.1742
	(-2.61)***	(0.19)	(-0.35)	(-2.42)**	(-1.79)*	(-0.39)	(-1.44)
ng of Household head	-0.0046	0.0549	-0.0066	0.0323	0.0133	-0.0058	0.0217

	(-0.18)	(2.86)***	(-0.40)	(1.68)*	(0.77)	(-0.35)	(0.07)
r of household members with les of schooling	-0.0187	0.1380	0.0609	-0.4369	0.0602	0.1043	1.3187
	(-0.26)	(2.14)**	(1.21)	(-7.27)***	(1.09)	(2.07)**	(1.64)
r of household members with ades of schooling	-0.1009	0.1315	-0.0472	-0.4769	0.0043	0.2068	2.4203
	(-1.01)	(1.77)*	(-0.76)	(-6.55)***	(0.07)	(3.31)***	(1.63)
r of household members with more grades of schooling	0.0490	0.0248	0.0613	-0.2555	-0.1636	0.2141	0.0395
	(0.38)	(0.30)	(0.79)	(-2.83)***	(-1.95)*	(2.65)***	(2.17)**
ldings	0.0084	-0.0107	-0.0058	0.0031	0.0001	0.0310	0.1734
	(0.68)	(-2.04)**	(-1.17)	(0.70)	(0.02)	(3.54)***	(0.66)
ncy of Transport	0.0246	0.0468	0.0253	0.0227	0.0161	0.0081	0.1514
	(1.71)*	(4.17)***	(2.85)***	(2.19)**	(1.71)*	(0.93)	(1.05)
sibility During Weather Shocks y)	-0.2413	0.0656	-0.0604	-0.2577	-0.1030	-0.1805	-0.1661
	(-1.06)	(0.32)	(-0.40)	(-1.47)	(-0.62)	(-1.21)	(-0.80)
ional Migration Probability	-7.9771	12.8876	-0.6848	8.2183	2.8392	-12.3545	-78.4101
	(-1.77)*	(2.88)***	(-0.18)	(2.04)**	(0.72)	(-3.12)***	(-1.07)
Expenditure * p1	0.5543	-0.6526	-0.0198	-0.1037	-0.4376	0.7860	8.2587
	(1.54)	(-1.80)*	(-0.06)	(-0.31)	(-1.36)	(2.43)**	(1.26)
old Size * p1	-0.1329	0.0071	-0.0089	-0.5949	0.0347	0.1518	0.9347
	(-0.76)	(0.04)	(-0.07)	(-3.83)***	(0.25)	(1.22)	(0.28)
r of children * p1	0.7797	0.3411	0.4867	0.1572	0.0424	-0.5884	-16.2842
	(0.99)	(0.78)	(1.19)	(0.37)	(0.11)	(-1.58)	(-1.50)
Household head * p1	0.0192	-0.0838	0.0188	-0.0775	0.0329	0.0607	0.3113
	(0.60)	(-3.05)***	(0.82)	(-3.07)***	(1.38)	(2.73)***	(0.64)
ng of Household head * p1	0.3076	0.0063	0.0306	-0.0150	0.1994	0.1530	-1.7493

	(1.96)**	(0.06)	(0.33)	(-0.14)	(1.99)**	(1.62)	(-0.87)
r of household members with les of schooling * p1	0.2060	-0.3963	0.0449	-0.2399	-0.3059	-0.1189	-2.0607
	(1.00)	(-1.92)*	(0.27)	(-1.23)	(-1.78)*	(-0.81)	(-0.41)
r of household members with ades of schooling * p1	0.1074	-0.3385	-0.1069	0.3993	-0.2074	-0.3320	9.4131
	(0.31)	(-1.25)	(-0.46)	(1.56)	(-0.87)	(-1.43)	(1.47)
r of household members with more grades of schooling * p1	-0.4184	0.0248	-0.2536	-0.1129	-0.0703	0.1619	0.0307
	(-0.92)	(0.08)	(-0.84)	(-0.33)	(-0.23)	(0.51)	(0.34)
ldings * p1	0.0450	0.0173	0.0137	-0.0097	0.0000	0.0331	-0.3890
	(0.94)	(1.66)*	(1.08)	(-0.98)	(0.00)	(0.88)	(-1.40)
ncy of Transport * p1	0.0531	-0.0983	0.0433	0.0038	0.0152	0.0000	-1.4198
	(0.85)	(-1.52)	(0.91)	(0.07)	(0.31)	(0.00)	(-1.78)*
sibility During Weather (Dummy) * p1	-0.7579	2.7534	-0.1189	-0.5671	1.3362	0.4359	-3.7461
	(-0.76)	(2.73)***	(-0.15)	(-0.64)	(1.65)*	(0.59)	(-0.54)
Migration Probability (p2)	2.9082	-7.3829	-2.8149	-0.3481	-2.1028	4.8754	-6.7730
	(1.08)	(-2.19)**	(-1.12)	(-0.13)	(-0.74)	(2.03)**	(-0.30)
Expenditure * p2	-0.2602	0.6951	0.2381	0.1082	0.2529	-0.3295	0.3615
	(-1.13)	(2.41)**	(1.08)	(0.46)	(1.00)	(-1.56)	(0.24)
old Size * p2	-0.0581	-0.0115	-0.0694	-0.4384	-0.0910	-0.0153	4.7608
	(-0.48)	(-0.09)	(-0.79)	(-3.83)***	(-0.84)	(-0.17)	(1.68)*
r of children * p2	-0.2428	0.1233	-0.6842	0.1448	-0.0861	0.0137	-6.0942
	(-0.59)	(0.38)	(-2.64)***	(0.51)	(-0.30)	(0.06)	(-1.23)
Household head * p2	-0.0038	0.0285	0.0111	-0.0011	-0.0125	-0.0181	0.1920
	(-0.22)	(1.57)	(0.84)	(-0.07)	(-0.78)	(-1.40)	(0.72)
ng of Household head * p2	-0.0459	-0.1991	-0.0678	0.0526	-0.1889	-0.0174	0.1572
	(-0.59)	(-2.42)**	(-1.19)	(0.75)	(-2.44)**	(-0.30)	(0.15)

r of household members with les of schooling * p2	-0.0064	-0.0058	0.0475	0.4698	0.2584	-0.1078	-2.4016
	(-0.04)	(-0.03)	(0.38)	(3.05)***	(1.73)*	(-0.86)	(-1.23)
r of household members with ades of schooling * p2	0.1545	0.0661	0.2697	0.3042	0.3511	-0.1926	-8.9245
	(0.65)	(0.30)	(1.61)	(1.62)	(1.95)*	(-1.17)	(-1.64)
r of household members with more grades of schooling * p2	0.0685	0.3481	0.0788	0.4584	0.1795	-0.5556	0.0307
	(0.23)	(1.52)	(0.37)	(1.85)*	(0.71)	(-2.52)**	(0.34)
ldings * p2	-0.0198	0.0115	-0.0032	-0.0149	-0.0256	-0.0065	-0.3357
	(-0.67)	(0.77)	(-0.26)	(-1.09)	(-1.87)*	(-0.25)	(-0.65)
acy of Transport * p2	-0.0416	-0.0945	-0.0432	-0.0351	-0.0137	0.0034	-0.5642
	(-1.10)	(-2.55)**	(-1.55)	(-1.10)	(-0.42)	(0.12)	(-1.17)
sibility During Weather (Dummy) * p2	1.3742	-2.2026	0.8418	1.5172	-0.4876	-0.0171	-1.1883
	(1.95)*	(-2.92)***	(1.75)*	(2.72)***	(-0.87)	(-0.04)	(-0.05)
2	0.2173	-1.2832	0.3791	0.0447	-0.5043	0.0982	0.0973
	(1.27)	(-6.41)***	(3.30)***	(0.33)	(-3.80)***	(0.87)	(0.91)
3	-0.1391	-0.2925	-0.1739	0.1215	-0.0729	-0.1298	0.0343
	(-0.69)	(-1.74)*	(-1.30)	(0.77)	(-0.50)	(-0.96)	(0.39)
4	-0.1264	0.7883	-0.1767	0.1143	0.1041	-0.5776	2.7012
	(-0.74)	(5.61)***	(-1.50)	(0.83)	(0.81)	(-4.74)***	(1.34)
5	-0.2841	0.1681	0.0466	-0.3212	-0.4514	-0.6163	4.0690
	(-1.42)	(0.97)	(0.33)	(-1.92)*	(-2.88)***	(-4.30)***	(1.22)
nt	-2.3735	-6.3440	-2.7488	-4.2829	-5.4770	-4.8081	8.8640
	(-2.32)**	(-7.33)***	(-3.98)***	(-5.47)***	(-7.12)***	(-6.78)***	(0.92)

t-statistics in parentheses, *** significant at 1%; ** significant at 5%; * significant at 10%

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