EL COLEGIO DE MÉXICO
CENTRO DE ESTUDIOS ECONÓMICOS

MAESTRÍA EN ECONOMÍA

Trabajo de investigación para obtener el grado de Maestro en Economía

Precautionary savings in Mexico

Presenta

Guillermo Real Neri

Promoción 2018-2020

Asesor

Dr. Edwin van Gameren

Ciudad de México, Agosto 2020

≪This page is intentionally left blank. ≫

To Leonardo, Emilia,
Matías and Lara.

Acknowledgements

This work is the result of a great personal effort that would not have materialized without the unconditional support (physical, economic, emotional and moral) of those who know me, but especially those who know the innumerable difficulties I have gone through and they did not lose hope in me. This is why I thank you dedicating with all my heart this work and a few words:

To my parents Jesús and Socorro. Mom, you couldn't see this work done anymore, but I know that wherever you are, you always are and will be with me. Dad thanks for believing in me. Thank you both for always giving me one more opportunity, I think I will finally take advantage of it.

To my brother Mario. I know that together with mom you will continue taking care of me. Thank you for everything you taught me and the moments we shared. I miss you a lot.

To my children Leonardo, Emilia, Matias and Lara. You are (and always have been) my strength to keep going through the most difficult moments of my life. You are my greatest joy, I love you with all my strength and all my heart.

To my wife Fernanda. Without your support and understanding this work would not have been possible. Thanks for being when I needed you the most. I love you.

To COLMEX for giving me the opportunity to study a master's degree and to all its teachers for providing me with an excellent academic preparation, especially to Alejandro Castañeda, Eneas Caldiño and my thesis advisor Edwin van Gameren.

To my classmates and friends, especially Enrique Santiago and Juan A. Flores for all their support but above all for putting up with me for two long years. It was an honor and a pleasure to study with him.

Thank you so much!

Summary

The interest in trying to understand what factors produce a high level of savings among individuals and nations has been systematically present in the development of economic thought since the classical economists. J. Maynard Keynes established a simple and direct relationship between consumption (and therefore saving) and disposable income: people increase their consumption proportionally to the increase in their (disposable) income as a "fundamental psychological law". Around 1946, Kuzntes found evidence against the prediction of the Keynesian model. This led to the emergence of life cycle and permanent income theories that, from a perspective of individual decision-making, have until now formed the basis on which to try to answer these puzzles.

Leland (1968) was the first to speak of "the precautionary demand for savings" and points out that, under the assumptions of non-satiety, risk aversion and convex marginal utility, saving increases with income uncertainty. Hall (1978) presents the rational expectation hypothesis problem that confirms Leland's hypothesis that without the proposed assumptions, the uncertainty about income, consumption (and therefore saving) does not change, making it a random walk.

There is a large number of investigations that try to demonstrate the existence of precautionary savings. These studies differ in (1) the dependent variable; (2) the measure of uncertainty and the type of data (panel or cross section) and (3) in the control variables included in the regression and, therefore, there is a great variety of results, both for and against , on the existence of precautionary savings.

Until now there was only three empirical studies for Mexico, mainly focused on the macroeconomic perspective trying to explain the relation between private savings and the uncertainty caused by inflation. The results are contradictory because there are evidence supporting the existence of precautionary savings in Mexico but, at the same time, there is also evidence of a negative correlation between financial savings and inflation, which means that precaution is not a motive to saving.

The objective of this research work is to test the hypothesis of precautionary savings using the MxFLS. To achieve this, the theory of permanent income is used to build an

econometric model where it is first decomposed into its permanent and transitory parts. Subsequently, under the assumption that the average transitory income is equal to zero, the volatility of this income is estimated to incorporate it into an estimate of consumption. To prove the existence of precautionary savings in Mexico, the income volatility coefficient must be negative and significant.

The results of the econometric exercises strongly suggest the existence of precautionary reasons for saving. This is the first work in which these results are found for the case of Mexico. In addition, it is possible to point out that this precautionary reason is greater for households whose head is male and, finally, a clear relationship was found between the magnitude of the precautionary saving and the size of the town where the households reside, in particular, the saving precautionary is greater in larger cities.

Contents

List of Tables

Introduction

Friedman (1957) developed the Permanent Income Hypothesis (PIH) to describe the implications of agents' intertemporal consumption keeping in mind that people prefer to smooth their consumption throughout their lives. For this, it proposes to decompose current income into two parts: (1) permanent income (expected future income) and (2) transitory income (or unexpected). This decomposition has important implications for the intertemporal consumption decision taken by the agents and consequently with the savings pattern since, by definition, saving is the amount of income that remains after consumption and is a way to transfer present income to consume in the future. In particular, if agents observe an increase in their transitory income, the agents do not modify their current consumption decision, which implies that this additional income is completely saved, which ultimately generates an increase in wealth and, therefore, an increase in future consumption.

Because in this model agents make their consumption decisions considering their future income (which by definition is uncertain in nature), it is important to establish how agents act in the face of a change in their perception of the uncertainty about their future income. Leland (1968) coined the term precautionary savings to describe the situation in which agents decide to sacrifice a part of their current consumption (extra savings) in response to greater uncertainty about their future income. When agents anticipate the realization of a bad state of nature in which they will obtain lower incomes, they save a reserve as a precautionary measure in order to smooth their consumption, this is called precautionary savings.

The objective of the present work is to empirically demonstrate the existence of precautionary savings in Mexico using the permanent income hypothesis as a basis, exploiting for the first time for these purposes the Mexican Family Life Survey.

It is important to note that to date only three studies (Villagomez, 1998; Fuentes & Villagomez, 2001; Velandia Naranjo & van Gameren, 2016) on precautionary savings have been carried out in Mexico. The findings of these studies point to the absence of a precautionary reason in the savings of Mexican families. However, it is also important to point out some aspects that can influence the results. Firstly, two of them were carried out from a macroeconomic perspective, so there is the possibility that the heterogeneity of Mexican families could cancel the result. Second, the theoretical context suggests the use of panel-type data, however, only one of these studies used data of this type, although with the limitation that it only follows a population of 50 years and over. In this sense, the present work contributes to test the theory from a microeconomic perspective using a panel that allows tracking all kinds of families over a period of 10 years.

The results of the econometric exercises strongly suggest the existence of precautionary reasons for saving. This is the first work in which these results are found for the case of Mexico. In addition, it is possible to point out that this precautionary reason is greater for households whose head is male; a clear relationship was found between the magnitude of the precautionary saving and the size of the town where the households reside, in particular, the saving precautionary is greater in larger cities, contrary to what was found by Villagomez (1998) and Fuentes and Villagomez (2001), and finally, the magnitude of the precautionary motive is greater for households in which the head of the family is younger than 50 years than for those where it is greater which may explain the partial evidence found by Velandia Naranjo and van Gameren (2016).

The work is organized as follows. In chapter one, a review of the literature is made, beginning by describing the process as the theoretical framework developed historically, how the interest in precautionary savings arises compared to other reasons for saving, and how this theory suggests the use of some variables for the empirical test. This same chapter also reviews the empirical results at the international level and in the case of Mexico. In chapter two, the choice of the uncertainty variable on future income is justified and the construction of the econometric model is detailed. Chapter three details aspects of the survey, on the construction of the indexes of well-being and health, as well as the summary statistics of the panel. In chapter four, the results of the different exercises carried out are presented, and finally, in chapter five, it is concluded.

Chapter 1

Literature review

The objective of this chapter is briefly sketch the historical development of precautionary savings theory and the way in which it was empirically tested in order to identify the relevant aspects behind the precautionary motive to save[1]. There are theoretical models (two and multiple periods) that predicts an increase of savings when future income are subject to uncertainty. However, the empirical evidence about the magnitude of the precautionary savings is very wide.

1.1 Theoretical models

1.1.1 Savings in the Macroeconomic literature

The interest to try to understand which factors yield to a high level of savings among individuals and as well as nations has been present systematically in the development of the economic thinking since classics economists: Adam Smith believed in two fundamental laws of economic behaviour, one of them was the accumulation law in which savings play a central role in the capital creation; Malthus thought that savings in excess could reduce the demand generating a negative shock to the economy; Hobson considered that the unequal wealth distribution push the richer to save more just because they could not spend all their money. However, these classical authors focused on the macroeconomic perspective in their works, the role that they assigned to the individual in their arguments is virtually none (cf. Villagomez, 1998).

J. Maynard Keynes was the first trying to answer the fundamental question *Why do people save?* He proposed eight answers to the question —(among which the precautionary

[1] For a comprehensive review of the theoretical literature see Baiardi *et al.* (2019)

reason stands out as the first answer— (Browning & Lusardi, 1996) and established a simple and direct relationship between consumption (and therefore savings) and disposable income: individuals increase their consumption proportionally to the increase in their (disposable) income as a 'fundamental psychological law'. Although Keynes' theory dealt with the determination of aggregate demand and national income, became the dominant paradigm during 40's and 50's of last century.

However, around the end of World War II, Simon Kuznets published their estimations of aggregate consumption[2] and income since 1869 putting on the table three main findings against the prediction of the Keynesian model: (i) the average propensity to consume remain constant over the span of his data while at the same time average income grew tremendously; (ii) The average propensity to consume rises during recessions and declines during expansions; (iii) Individuals' average propensity to consume declines strikingly as one moves up the income ladder (Lundberg, 1971).

The empirical findings in the work of Kuznets motivated the emerge of new theories of consumption among them the Life Cycle Hypothesis developed by Modigliani and Brumberg. These authors focused on the process of wealth accumulation and decumulation over the adult stage of the life cycle. At any given age, both income and wealth will determine the levels of consumption and savings. Thus, during the early years of adulthood, the individuals borrows in order to acquire assets. As income increases and current needs tend to stabilize, these debts are liquidated and wealth is accumulated. During retirement, the individual use the accumulated wealth in order to maintain his consumption level (Kouri, 1986).

A little bit later, Milton Friedman (1957) published a theory which offers an alternative explanation of the behavioural explained by the life cycle theory. The main point of Friedman's criticism of this theory is that the horizon for consumption decisions planning may be longer than periodicity of income receipt, that is annual income is not the best predictor of annual consumption; a better explanation of current consumption may be permanent income. These theories constitute a paradigm shift: from then until now, theoretical and empirical developments consider consumption and saving as an intertemporal individual decision.

1.1.2 Precautionary motive (*vs* other motives) in the Microeconomic literature

Keynes' other seven answers list other reasons why people save. Among the relevants from the point of view that they have been taken up for their microeconomic study are: (1) the

[2] Discussed in more detail in the empirical section

motive of the life cycle that establishes that individuals save by anticipating a decrease in their income and an increase in their needs as they age; (2) the reason for intertemporal substitution establishes that individuals save to enjoy an appreciation of their resources and (3) the reason for precaution mentioned above in order to build a reserve against unforeseen contingencies.

Leland (1968) was the first to model "the precautionary demand for savings". In his seminal article, he model intertemporal consumption under risk and uncertainty in a two period model:

$$\begin{aligned}
&\text{Maximize } E[U(C_1, C_2)] \\
&\text{subject to :} \\
&C_1 = (1-k)I_1 \\
&C_2 = I_2 + (1+r)kI_1 \\
&E(I_2) = I_2^* \\
&E(I_2 - I_2^*)^2 = \sigma^2
\end{aligned} \tag{1.1}$$

where $U(C_1, C_2)$ is a utility function to consume in periods 1 and 2. I_1 is the fixed income in period 1, and I_2 is the random income in period 2. The last two restrictions describe the moments of the distribution of I_2 (i.e. the mean and variance of future income), and k is the control variable, which measure the savings rate. In this framework, Leland points out that, under the assumptions of non-satiation, risk aversion and convex marginal utility, savings (kI_1) increase with income uncertainty (σ^2).

Hall (1978) introduce to the problem the rational expectation hypothesis, assuming a quadratic utility function, which confirm Leland statement that under this type of utility function "optimal saving would not be affected by the degree of uncertainty"(Leland, 1968, p. 467). However, his research put on the table the fact that the Permanent Income Hypothesis does not exactly capture consumption behavior.

Kimball (1990) think in this phenomena as the consumer's propensity to prepare to future uncertainty and develop a prudence theory analogue to the risk aversion theory by Pratt. When utility is additive separable the absolute prudence coefficient measure the strength of the precautionary savings: $\varphi = -\frac{u'''(\cdot)}{u''(\cdot)}$. Researches using this measure and the relative prudence coefficient are able to find evidence of precautionary savings. Kimball also define the Equivalent Precautionary Premium (EPP) as a proxy of the effect of uncertainty on consumption and savings –researches using EPP as the uncertainty measure also find evidence of precautionary savings (Carroll, 1994; Carroll & Samwick, 1998).

Carroll (1997) argues that savings are better described as buffer-stock if consumers with significant income uncertainty are impatient. When the consumer also face liquidity constraints (binding or with positive probability to be binding in the future) these constitute by itself a motive for precautionary savings (Carroll & Kimball, 2001). However, risk have no added precautionary savings effect for those who initially face liquidity constraints. Carroll and Kimball (2001, 2016) shows the complex relationship between precautionary savings and uncertainty, risk aversion, liquidity constraints, time preferences, permanent income, initial level of wealth among other factors.

Another branch of the precautionary savings theory begun with the seminal works of Sandmo (1970) and Rothchild & Stiglitz (1971) where the main source of uncertainty is considered to come from the interest rate. In this literature, precautionary savings depend on the magnitude of the relative prudence index (which is nothing more than the aforementioned absolute prudence index adjusted for wealth) (Li, 2012; Liu & Menegatti, 2017). Baiardi (2014) consider labour and interest rate risks –the recent literature considering the presence of multiple risks (contemporaneous and background) is growing– in this framework precautionary savings not only depends on prudence,but on cross-prudence and on the size and the sign of the correlation between them.

The most usual theoretical model to estimate the existence and magnitude of precautionary savings is a problem of intertemporal maximization where the individual (household) has to decide how much of his income he spends to consume today and how much he saves to be able to consume in the future (A. Deaton, 1991; Lusardi, 1993):

$$\begin{aligned} &\underset{C_{t+j}}{\text{Max}} \quad E_t\left[\sum_{j=0}^{\infty}(1+\delta)^{-j}U(C_{t+j})\right] \\ &\text{S.t.} \quad \sum_{j=0}^{\infty}\frac{1}{(1+r)^j}E_t(C_{t+j}) = A_t + \sum_{j=0}^{\infty}\frac{1}{(1+r)^j}E_t(Y_{t+j}) \end{aligned} \tag{1.2}$$

where E_t is the expectation conditional on the available information at time t, $U(\cdot)$ is the instantaneous utility function, C_t denotes consumption in period t, A_0 is the initial wealth, Y_t is the monetary income at time t and for simplicity I assume that the subjective discount factor is equal to the non-stochastic interest rate r.

In general two forms of the utility function are used: constant relative risk aversion (CRRA) – $U(C) = (1-\gamma)^{-1}C^{1-\gamma}$ — and the constant absolute risk aversion (CARA) — $U(C) = -\theta^{-1}e^{-\theta C}$. Depending on the shape of the utility function, savings does not depend on the uncertainty or savings depend on uncertainty but not on the wealth levels or savings depend on both uncertainty and on the wealth levels (i.e. the precautionary motive is different for poor and rich).

As it was said before, life-cycle or permanent income models fail to explain the "consumption puzzles" but the precautionary savings theory can explain the excess of smoothness of consumption, the excess of sensitivity (Zeldes, 1989) and the persistent growth of consumption (A. Deaton, 1987). In addition, Weil (1993) state out that consumers prudence is reinforced by larger income risk, stronger risk aversion, weaker distaste for intertemporal substitution (i.e. weaker desire for consumption smoothing), higher interest rates and the persistence of income shocks (it also increase precautionary savings). In order to address the consumption puzzles, habit formation (actual consumption depends on past consumption) is included in models of precautionary savings but the evidence in this modified models is not conclusive.

1.1.3 Relevant dependent variables

The researches trying to demonstrate the existence of precautionary savings differ each other on three main aspects: (i) dependent variable; (ii) uncertainty measure; and (iii) the controls[3].

The most common dependent variables used are: consumption (level and/or growth) –expected negative relation–, savings (level and/or growth on savings rate) and wealth (which is by definition the accumulation of savings or possessions over time), but other authors also has been used wealth-to-income ratio –expected positive relation. This variety in the use of dependent variables reflects the different edges from which the problem of intertemporal maximization can be addressed.

Regarding uncertainty measures, it is important to note that, contrary to the dependent variables, there is no consensus on which to use or how to approximate it. Theoretically , the relation is between the expected future consumption growth and the conditional variance of the consumption growth rate but the latter is endogenous so its approximated with other variables trying to capture uncertainty on future income growth. Usually the choice of the uncertainty variable mostly depends on the type of data[4].

A wide variety of uncertainty measures –objective or subjective, for example: estimated income variability, variability of consumption/expenditure, belief of being unemployed and unemployment rate to mention some– not based on theory are widely used in empirical exercises to prove the existence and magnitude of precautionary savings. Several authors consider that a good measure of the uncertainty of labor income may be income volatility or

[3] Another important recent branch of this literature is concern in finding an estimate of the coefficient of relative risk aversion

[4] The advantages of macroeconomic data are (i) availability, (ii) time dimension (iii) it's possible compare countries, regions, or areas. However, the aggregate measures of uncertainty may not be a good indicator of the uncertainty faced by individuals. Micro data are very heterogeneous because it comes from surveys generally not designed to address this specific issue

the standard deviation of the percentage change in the value of wealth (Zeldes, 1989; Carroll, Hall, & Zeldes, 1992a; Lusardi, 1993). In both cases there is strong evidence supporting the existence of precautionary savings in the UK (Guariglia & Rossi, 2002) and the US (Kazarosian, 1997; Carroll & Samwick, 1998).

Precautionary savings also depend on both individual characteristics. For example, age, sex, education (may be negatively correlated with the intertemporal substitution preferences), income (decomposed into permanent and transitory components), past consumption (to capture habit formation), family size (composition), existence/number of children, dependent children (adulthood), number of income recipients (precautionary savings may depend on the family structure), race, marital status, health (unhealthy people may save more than healthy ones, taking into account the public health system), occupation (self-employed its expected to save mare because their income is more variable, also could be selection-bias), financial literacy, etc.

1.2 Empirical findings

1.2.1 International evidence

Precautionary savings theory has been tested at both micro and macro level with no conclusive results. Moreover, among those studies finding evidence of the existence of precautionary savings, there's no consensus about the magnitude of the precautionary motive for savings nor how to measure uncertainty. As noted in the previous section When the marginal utility is increasing and convex, uncertainty affects consumption decisions generating precautionary savings. With this in mind, below is a brief review of the most relevant empirical works to show the reader the variety of approaches that have been used to test this theory[5].

Among the studies that have found evidence in favor of precautionary savings are those carried out by Hall and Mishkin (1982), Campbell (1987), Zeldes (1989), Caballero (1990), Deaton (1991), Carroll (1994), among others. In general, papers that directly test the effect of future income uncertainty on consumption or savings rates using microdata tend to provide robust results about the existence of precautionary savings. Caballero (1990) and Weil (1993) show that the magnitude of precautionary savings increases as the variance of the income generating process increases and its persistence increases.

Bande and Rivero (2013) use the Great Recession to test whether there is evidence of precautionary savings in Spain. The recession was followed by an increase in the private

[5] For a detailed revision see Lugilde et. al. (2019)

savings rate in Europe, especially in Spain. This increase in the savings rate in Spain coincides with an unprecedented increase in the unemployment rate. The authors note that this relationship is seen more clearly for Spain than in the rest of Europe, which suggests a positive relationship between the unemployment rate and the private savings rate.

The authors use regional data from 17 regions of Spain for the period 1980 - 2007. The analysis is of a macroeconomic nature. The authors approximate the uncertainty measure by taking the square of the transitory income, so they first fit an ARMA model to the GDP to decompose the income into its permanent and transitory components.

In a static version of the model, the authors found significant evidence at 10% of the existence of precautionary savings, however, when changing the measure of uncertainty for the unemployment rate, the evidence became stronger and when they combined the measures of uncertainty, only significant the unemployment rate. Therefore, evidence in favor of precautionary savings in Spain.

Carrol (1994) uses data from the United States to test, on the one hand, if the theoretical predictions of the PIH model are verified and, secondly, the precautionary saving hypothesis. For the first exercise Carroll finds that current consumption is strongly related to predictable changes in current income but is not related to predictable changes in lifetime income.

When it comes to precautionary savings, Carroll finds that the degree of uncertainty in future income induces agents to consume less (i.e. evidence of precautionary savings) using standard deviation and variance of income and the equivalent precautionary premium as uncertainty measures. The author uses two data sources for his analysis the Consumers Expenditure Survey (CEX) and the Panel Study of Income Dynamics (PSID) using the econometric technique called Two Sample Two-Stages Least Squares (TS2SLS), which allows estimation of the first stage of a 2SLS in one sample and estimation of the second stage on a different sample.

Their results show that by taking any of the 3 uncertainty measures, the coefficient is negative, although it is only significant for the EPP. suggesting that an increase in one standard deviation in uncertainty reduces consumption by 3 to 5 percent.

Benito (2006) tests the hypothesis of precautionary savings for British households using the risk of losing their job as a measure of uncertainty. It is important to note that the consumption measure that it uses is consumption in food. Although to broaden the scope, the proposal to postpone the purchase of durable goods as a function of the loss of employment is also studied.

The paper uses two approaches to consider the role of job insecurity. In the first, a question from the survey about the belief of becoming unemployed for the next 12 months is exploited, while in the second, an estimate is made of the probability of moving to unemployment (in the same period of time).

The paper uses the British Households Panel Survey (BHPS) for the years between 1992 and 1998. The author finds that the insecurity effect of keeping employment has significant and negative effects on current consumption: an increase of one percentage point in the probability of losing a job translates in a reduction of household consumption of 0.7%. Furthermore, they find that the effect is greater for young households based on observable characteristics such as education level, union membership, age, health, sex, size of workplace among others.

An important exercise in the empirical literature is to estimate the coefficient of relative risk aversion (Deidda, 2013; Blundell, Etheridge, & Stoker, 2014; Baiardi, Manera, & Menegatti, 2013; Dynan, 1993) under the assumption of CRRA utility functions, applying the second-order Taylor approximation of the Euler equation:

$$E_t\left(\frac{C_{t+1}-C_t}{C_t}\right) = EIS\left(\frac{r-\delta}{1+r}\right) + \frac{\rho}{2}E_t\left[\left(\frac{C_{t+1}-C_t}{C_t}\right)^2\right] \tag{1.3}$$

where $EIS \equiv -U'/(U''C_t)$ is the inverse of the coefficient of relative risk aversion, $\rho = -(U'''/U'')C_t$ i the coefficient of relative prudence, and the second moment of the expected consumption growth its a measure of the expected consumption risk. The size of ρ determines the strength of precautionary savings.

1.2.2 Evidence from Mexico

Until now there are only three empirical studies for Mexico, two of them focused on the macroeconomic perspective trying to explain the relation between private savings and the uncertainty caused by inflation. The results are contradictory because there are evidence supporting the existence of precautionary savings in Mexico but, at the same time, there is also evidence of a negative correlation between financial savings and inflation, which means that precaution is not a motive to saving.

Villagomez (1998) try to explain the fall in the private savings rate in Mexico (macroeconomic approach) at the beginning of the 90's due to a reduction of the liquidity constraints in a Life-Cycle framework. An important assumption of these models is that individuals can borrow or lend any amount at a fixed interest rate as long as they end with no debts or wealth, i.e. perfect capital mobility. If the capital market experience credit quantitative rationing due to asymmetric information between borrowers and lenders or differential interest rates there are liquidity constraints that deviate individuals consumption from their optimal path.

Villagomez consider two types of representative consumers, a fraction λ facing liquidity constraints and the others acting according to the Permanent Income Hypothesis under rational expectations. To estimate the impact of the financial liberalization during the late 80's the author include in the model an interaction term between a dummy variable (zero before the liberalization) and λ. The regression was estimated using instrumental variables and the results confirms the relevance of the liquidity constraints (around 50 % of the total population), it also shows there are a positive and significant correlation between the reduction in the liquidity constraints and the fall in the private savings rate. These conclusions are opposed in relation to the existence of precautionary savings in Mexico.

Fuentes and Villagomez (2001) using a Mexican households synthetic panel –constructed from the National Survey of Households Income and Expenditure (ENIGH)– from 1984 to 1996 in a standard version of Modigliani's model. The authors point out that with this kind of surveys, it's difficult observe consumption (i.e. expenditure is different than consumption) so they defined consumption in two ways. Expenditure in: (1) non-durable goods, education, health, imputed rent and transfers; (2) including durable goods, capital and house. They took income as the monetary income plus non-monetary income. They consider population between 15 and 65 years old. Due to the dataset construction their estimations carry on a linear combination of three simultaneous effects (concerning with: (i) the economy cycle; (ii) generation differences; and (iii) life-cycle). To analysed them separately they uses a decomposition technique proposed by Deaton (1991). To identify the lower income population they used four approaches: (i) split the sample into urban and rural areas; (ii) accordingly to the ownership of financial assets; (iii) by income percentiles; and (iv) accordingly to their education level (because it is well known that this variable is a good approximation to the permanent income).

Their data show an increasing saving rate belong the period until 1996 when the financial crises affect the household savings negatively. They also show that aggregate savings rate reach the minimum between 30 to 50 years (i.e. approximate at the middle of the labor life – contrary to the theoretic prediction–). When they used the areas approach to identify low income population they find larger cohort effects and an increasing saving rate along the life-cycle to those living in rural areas. When they used the financial assets ownership approach they find exactly the opposite (this estimation is not robust because the small number of observations and due to the endogeinity between the financial assets ownership and the savings rate). When they used income percentile, the cohort effect suggest that those below the 20th percentile save more near the end of their labour life, also the generational effects are opposite than expected: older cohorts save more than younger cohorts (may be due to a selection bias). For the exercise using schooling level, the cohort effect is not monotone decreasing and the age effect show that for those with low scholar level the savings rate reach the minimum at 35 years old and then is increasing until 60 years while for the most educated people the savings rate are always increasing. These results are opposite than those predicted by the life-cycle model (U-shape vs inverted U-shape). The authors consider this is because the possible existence of both liquidity constraints and precautionary savings.

Finally, Velandia Naranjo and van Gameren (2016) is the only empirical study made form the microeconomic perspective. They consider that lower rates of (1) insurance coverage and (2) entitlement to a retirement pension may result in a greater uncertainty about the future (relative to other countries with better social protection systems), situation that may cause the emergence of precautory motive to save. They estimate a relation between accumulated wealth (financial and total net wealth) and uncertainty to see if there's precautionary wealth (accumulation of precautionary savings) component.

If there's a positive relation between risk and accumulated wealth, uncovered population must have greater accumulated wealth than those covered. They used the Mexican Health and Aging Study 2003 (MHAS) that allows them to include different liquidity assets in the measures of wealth. They also control for others potential motives to wealth accumulation. To account for the fact that risk may affect individuals differently according with their wealth level the authors run a quantile instrumental variable regressions. However, they don't find a robust negative relationship between wealth and uncertainty. They find higher positive savings among those with insurance in the median and the upper quartile and no effect in the two firts quartiles.

Chapter 2

Econometric Framework

The objective of this section is to establish a theoretical framework for the econometric analysis, thus I will explain how I expect uncertainty affect consumption and therefore saving decisions and also I will explain the way in which I incorporate uncertainty into the analysis.

2.1 A measure of uncertainty

As it was said before, Leland (1968) and Modigliani (2019) shown that under some properties of the utility function, an increase in the uncertainty in future income translates in a reduction of current consumption, i.e. into a precautionary savings. To test empirically this hypothesis the first issue to address is to determine the measure of uncertainty.

In both of the theoretical models, the path of consumption is described by an Euler equation relating the expected future consumption growth with their variance. Carroll (1992b) state that this cant be estimated because the variance of the consumption growth may be determined simultaneously with the accumulation of wealth. Other researchers have proposed to use the unemployment rate as a proxy of the uncertainty of the future income (Deaton, 2011).

Since the vast majority of consumers get their income from labor, the risk of future unemployment could be a good measure of uncertainty, however, the the characteristics of the Mexican labor market, especially the high degree of informal labor, suggest a high degree of substitution between the formal and informal markets, that is, a person who loses a formal job can join the informal market almost immediately, reducing the fall in their income, which implies that unemployment (aside from being a more appropriate measure for a macroeconomic approach to the problem) is not a good measure in the case of Mexico, a better measure would be the informality rate as Velandia Naranjo and van Gameren (2016) somehow tried to control.

However, because in this work the analysis will be carried out at the household level, informality is also not a good measure to measure income uncertainty, therefore, in this work I will use the income volatility technique mentioned above that although it is a measure that is not theory based, it allows avoid the endogeneity indicated above, since this occurs in the volatility of the variance of consumption. Specifically, I will consider the standard Permanent Income Hypothesis to test the existence and the magnitude of the precautionary savings motive from the variability of the transitory component of monetary income.

2.2 Estimation Strategy

Given the above, in this work a two-stage strategy will be used. In the first stage, the income will be decomposed into its permanent and transitory parts, for which the following regression will be estimated:

$$Y_{i,t} = \mathbf{X'_{i,t}}\beta + \varepsilon_{i,t} \tag{2.1}$$

where $Y_{i,t}$ denotes the logarithm of the monetary income for household i at round t, $\mathbf{X'_{i,t}}$ it is a set of control variables at the household level (size of the locality of residence, index of well-being, the household head's sex, age, education, health index, condition of insurance, condition of occupation) and a term for each household (which has to be determined with statistical tests if it should be fixed or random) and ε_t is the error term. In this context, the transitory income is equal to the estimated errors, so under the assumptions of the classical regression model, its first two central moments (see equation 1.1) are $E(\hat{\varepsilon_{i,t}}) = 0$ and $E(\hat{\varepsilon_{i,t}}^2) = \hat{\sigma}^2_{i,t}$, the latter being the one used as the measure of uncertainty and it is assumed to be variant over time and between households.

As it was said before, a sufficient condition in order to have precautionary savings is the convexity of the marginal utility so I will assume that the utility function takes the form of a Constant Relative Risk Aversion (CRRA). So under these assumptions (and taking the second order Taylor approximation to linearize) the regression that will be estimated in the second stage of the econometric strategy is:

$$C_{i,t} = \mathbf{X'_{i,t}}\gamma + \mathbf{Y_{i,t}}\alpha_1 + \hat{\varepsilon_{\mathbf{i,t}}}^{\mathbf{2}}\alpha_2 + \eta_{i,t} \tag{2.2}$$

where $C_{i,t}$ stands for the logarithm of consumption of household i at round t, $\mathbf{X'_{i,t}}$ it is the same set of control variables used in the first stage, $\mathbf{Y_{i,t}}$ is the logarithm of monetary income as mentioned above, $\hat{\varepsilon_{i,t}}^2$ is the volatility of the transitory monetary income estimated in the first stage and $\eta_{i,t}$ is the error term.

Chapter 3

Data

The theoretical literature suggest the use of panel data, however, until relatively recently Mexico did not have an adequate panel to test the precautionary saving hypothesis. In this research, the 3 rounds of the Mexican Family Life Survey (MxFLS) will be exploited for the first time for these purposes.

3.1 The Mexican Family Life Survey (MxFLS)

The MxFLS is the result of a joint collaboration between the best academic institutions in Mexico and whose main objective is to have a multi-thematic and longitudinal database. So far, 3 monitoring rounds have been carried out, including the baseline survey each of them with information at the individual, household and community levels. During the first survey carried out in 2002, interviews were conducted with 8,400 households throughout the country. The subsequent rounds were carried out during 2005-2006 and 2009-2012, respectively.

All longitudinal-section survey faces attrition problems derived from (1) the lack of answers and / or (2) the sociodemographic changes in the original sample. To solve these problems, the MxFLS does a natural refreshment of the sample, incorporating individuals who are added to the original households, however, I consider only interviewed households in the three rounds (7,332) which constitutes nearly the 87 % of the original sample.

The survey allows inferences to be made about the Mexican population at the national, urban-rural and regional levels. For these purposes, each book of the survey has cross-sectional and longitudinal expansion factors (except for the basal round), however, the survey documentation does not indicate how to mix these weights when using data from different books. There is the possibility of adjusting the existing factors based on the response rate, however, it is an exercise that goes beyond the scope of this work, so it is important to note that the expansion factors were omitted in all the estimates made under the consideration that there is a large enough sample.

Because the survey contains information at the individual and household level on the same aspects, significant inconsistencies result. To solve this problem, the decision was made to carry out the analysis at the household level, but where possible, individual information (only family members was considered) was used to construct the variables at the desired level, however, it is worth noting that this procedure did not always result in better quality information, so in these cases the aggregate information was taken. At the end of this exercise, a database with 80 constructed variables was obtained.

3.2 Wealth and health indexes construction

Because in the database there are multiple variables (self-reported and observed by the interviewer) related to the characteristics of the home (number of rooms, material of floors, walls and ceilings, etc.) and also on the state of health of the individuals, it was decided to group these variables into indexes by means of multiple correspondence analysis, in order to reduce the number of controls.

The construction of the household well-being index was carried out for each of the rounds of the interview and a set of 15 variables including telephone tenure, type of property of the house, if the house has a kitchen, number of rooms to sleep, source of the drinking water, possession of a toilet, type of house, if the house has electricity, floor material, wall and roof, among others (see Table A1 for a summary statistics of these variables) was used for this, resulting in a total of 31 dimensions. The analysis was carried out using principal normalization and only the first dimension was taken. For the first round, this first dimension explains around 69.38 % of the inertia, for the second round 72.11 % and for the third round only 41.31 % (see Table A2 for details).

For the construction of the health index, only 4 self-reported variables are used: how is their health, if they stopped their activities due to illness, how was their health a year ago and how do they think their health is compared to that of other people of the same age and sex (see Table A4 for a summary statistics of these variables) in order to maximize the number of observations on which the analysis is performed. In addition, this index is calculated for each of the household members for whom there is information but the value of the household was imputed to whole household. Out of a total of 5 dimensions, only the first one is considered. The inertia explained by this dimension for the first round is 71.13 %, for the second 41.9 % and for the third 64.28 % (see Table A5 for details).

Since the analysis can be understood as a generalization of the principal component analysis (where dichotomous and categorical variables are analyzed instead of continuous), the construction of both indexes was performed normalizing by the main component and the weights (see Tables A3 and A6 for details) were rescaled so that these were contained in the interval $[0, 1]$.

3.3 Income and Consumption construction

Because the consumption and income variables are fundamental for this research, some lines will be used to explain how they were constructed from questions from the MxFLS.

Following Villagomez's (1998) considerations to infer consumption from spending data, the consumption variable in this work includes household spending on: food (inside and outside the home), transportation, tobacco and alcoholic beverages, articles personal, household cleaning supplies and entertainment.

With respect to income, only the monetary income of the main activity was considered, which in most cases was wages and salaries, in some other cases, this monetary income corresponds to the profits of non-agricultural businesses and finally, for the The rest of the cases this income corresponds to the earnings of agricultural and rural businesses.

Table 3.1 shows the summary statistics of the variables already mentioned as well as other explanatory variables. As it can be seen 80 % of the households are headed by men, the average age of the heads of the household is almost 51 years. It is also important to note that despite the fact that on average 1.5 household members work only 40 % of households are insured, this may have an impact on precautionary savings decisions. Finally, it is also important to note that the volatility of income is much greater than that of consumption, which possibly indicates, first, that households smooth their consumption and, second, it is possible for households to act rationally in the face of the volatility of their income. .

Table 3.1. Summary statistics of relevant variables

Variable		Mean	Std. Dev.	Observations
Wealth index	overall	0.2046655	0.1933933	N = 21996
	between		0.1357755	n = 7332
	within		0.1377231	T = 3
Male Household Head	overall	0.8008729	0.3993529	N = 21996
	between		0.3993711	n = 7332
	within		0	T = 3
Age of Household Head	overall	50.83252	15.1315	N = 20456
	between		15.16999	n = 7332
	within		3.188616	T = 2.78996
Health index	overall	0.9174636	0.0603941	N = 21614
	between		0.0266683	n = 7332
	within		0.0542563	T = 2.9479
With insurance condition	overall	0.4000185	0.4899131	N = 21614
	between		0.4020395	n = 7332
	within		0.280691	T = 2.9479
Working household members	overall	1.532109	1.143059	N = 21614
	between		0.9123988	n = 7332
	within		0.6898676	T = 2.9479
Log of consumption	overall	7.401173	1.97893	N = 21996
	between		1.284347	n = 7332
	within		1.505579	T = 3
Log of Income	overall	5.800247	3.809416	N = 21996
	between		2.695806	n = 7332
	within		2.691642	T = 3
	Observations	Round 1	Round 2	Round 3
Locality size	1 $(> 100,000)$	2,697	2,774	2,648
	2 $(15,000 - 99,000)$	679	737	743
	3 $(2,500 - 15,000)$	800	899	718
	4 $(< 2,500)$	3,156	2,922	3,210

Chapter 4

Results

This chapter presents the way in which it was determined if the model to be estimated should contain fixed, random or none effects. Later, the results of the regressions for the complete sample and for different sub-samples are presented: by sex, size of locality and age groups. The results obtained in the different econometric exercises suggest the existence of precautionary savings in Mexico.

4.1 Random *v.s.* Fixed effects

Because the data is panel-type, the first issue to be resolved is determining whether the aforementioned model should be estimated by fixed effects or random effects, for which reason the Sargan-Hansen and Breush-Pagan lagrange multiplier tests were performed in order to determine what is the best specification.

A test of fixed vs. random effects can also be seen as a test of overidentifying restrictions. The fixed effects estimator uses the orthogonality conditions that the regressors are uncorrelated with the idiosyncratic error ε_{it}. The random effects estimator uses the additional orthogonality conditions that the regressors are uncorrelated with the group-specific error u_i (the "random effect"). These additional orthogonality conditions are overidentifying restrictions.

The Sargan-Hansen test is implemented using the artificial regression approach described by Arellano (1993) and Wooldridge (2010), in which a random effects equation is reestimated augmented with additional variables consisting of the original regressors transformed into deviations-from-mean form. Under conditional homoskedasticity, this test statistic is asymptotically equivalent to the usual Hausman fixed-vs-random effects test; with a balanced panel, the artificial regression and Hausman test statistics are numerically equal. These tests were carried out for both stages of the econometric strategy with the full sample, obtaining the following results for the first stage both Sargan-Hansen ($\chi^2(7) = 126.47$) and the Breusch-Pagan ($\chi^2(1) = 198.09$) indicate that the best specification of the model is with random effects. These result are verified in the second stage (Sargan-Hansen ($\chi^2(9) = 111.65$) and the Breusch-Pagan ($\chi^2(1) = 92.15$)). For the rest of the econometric exercises, it was only possible to estimate the Breusch-Pagan test due to the limited observations, the statistical values are presented at the end of each of the results tables.

From the foregoing, it can be concluded with considerable certainty that the best model is the random effects, however, the results of the regressions will be presented under the three models (random effects, fixed and pooled effects) to verify the sensitivity of the results.

4.2 First stage: Income uncertainty measure

Tables A7 to A15 shows the results of the first stage under the 3 specifications (random effects, fixed effects and OLS) for different samples (complete, by sex of the head of the household, by size of locality and by age of the head of the household). As can be seen, in most econometric exercises the coefficients reflect the expected sign and are significant.

Considering the complete sample (Table A7), the regression coefficients are quite similar between the random and grouped effects specifications, while for the model considering fixed effects, the coefficients even have the opposite sign. It is worth noting that the variables that are consistently significant are the sex of the head of the household (indicating that the income is higher if the head is male), age of the head of the household (noting that as age increases, a lower income), educational level of the head of the household (the higher the educational level, the higher the income), health (better self-perceived health, higher income) and occupation status (higher income for the employed), which is logical.

For the sub-samples by sex of household head (Tables A8 and A9) the first difference that stands out is that for households headed by a man the size of the locality where they reside is important to explain their level of income, while for households headed by women no, however, it can also be seen that one more year of schooling translates into higher income for female households than for male households.

Tables A10 - A13 show the results for sub-samples by size of locality. As can be seen, the health index is an important variable in determining household income only in large cities. On the contrary, the sex of the head of the household is important in all locality sizes except in large cities, which is logical considering that in these policies to reduce discrimination have been successfully implemented.

Finally, Tables A14 and A15 show the results for the sub-samples by age group. As can be seen, the size of the locality is not a relevant variable to explain the household income of any of the age groups. In both age groups, income has a positive correlation both with sex and with the education of the head of the household, although the correlation between income and sex is greater if the head of the household is younger than 50 years, while the correlation between the income and education is higher for households whose head is over 50 years.

4.3 Econometric models

Table 4.1 shows the results of the second stage regression for the full sample in which the existence and magnitude of the precautionary saving can be inferred. As mentioned above, precautionary savings are nothing more than extraordinary savings (that is, a decrease in consumption) made by households in the face of an increase in uncertainty, therefore, it can be affirmed that an increase of one standard deviation in the volatility of monetary income reduces current household consumption by 5.78 % in Mexico there is precautionary saving. It is worth noting that in all three specifications the coefficients are highly significant and, in addition, quite close in terms of their magnitude, which in no other empirical work for Mexico had been found.

4.3.1 Female *v.s.* Male Households

In this context it is important to find out if the behavior of the households is different depending on the sex of the head of the household. Tables 4.2 and 4.3 show the results of this exercise that had not been carried out in the previous literature for the case of Mexico.

The first thing that is important to note is that in both cases, there is strong evidence to affirm that, regardless of the sex of the head of the family, Mexican households make precautionary savings (despite the fact that households with a female head of household represent only 20 % of the sample). The second relevant fact is that male-headed households have higher precautionary savings (an increase of one standard deviation in income volatility represents a decrease in current consumption of 7.06 %) than female-headed households (the reduction in consumption is 2.92%), fact that it may be little intuitive but it can be explained by the fact that culturally in Mexico men are in charge of bringing income to the home, even when there is no longer a relationship between parents.

4.3.2 Urban *v.s.* Rural areas

The results are presented in Tables 4.4-4.7 separating the sample for the different sizes of the locality where the households reside. Villagomez (1998) carried out a similar exercise dividing the sample into rural and urban areas in order to differentiate the impact of precautionary savings between rich households (living in urban areas) and poor households (living in rural areas).

As can be seen, there is robust evidence to point out that, regardless of the size of the locality of residence, Mexican households save precautionarily. Furthermore, the magnitudes of the coefficients allow establishing a direct relationship between the level of precautionary savings and the size of the locality, that is, the greater the size of the locality where the household resides, the greater the level of precautionary savings they make.

This result seems to contradict the theoretical predictions if one thinks that the households that reside in smaller localities tend to dedicate themselves to agricultural activities that present greater volatility in their income, however, it is reasonable to suppose, first, that a greater competition for jobs work can increase income volatility in urban areas and, secondly, for these households it is more difficult to re-channel their income to meet their needs and fulfill their obligations, unlike households that reside in rural areas, which is why it is reasonable to suppose that they have to foresee more.

4.3.3 Age groups

Finally, Tables 4.8 and 4.9 present the results of the exercise considering two age groups of the heads of the household in order to be able to compare with the results obtained by Velandia Naranjo and Van Gameren(2016).

For this exercise, the sample was divided into two groups according to the age of the head of the family. In the first group, households whose head of household is under 50 years of age were considered, and in the second group, those households whose head was over 50 years.

In this exercise, robust evidence in favor of the existence of precautionary savings in Mexico can be seen again, so it is possible to affirm that, regardless of the age of the head of the household, Mexican households make precautionary savings, a result that agrees with the partial evidence on the existence of precautionary savings in Mexico found by Velandia Naranjo and Van Gameren(2016).

Additionally, it can be seen that the level of these savings is almost double for young households (an increase of one standard deviation in the uncertainty about future income translates into a reduction of almost 9.28 % in current consumption) than for older households (precautionary savings of 4.82% compared to a similar increase) which implies that younger households are better prepared (better understand the consequences) to face difficult situations.

Table 4.1. Log Consumption

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Consumption	
Income volatility	-0.0289***	-0.0225***	-0.0284***
	(0.00212)	(0.00324)	(0.00234)
Locality between 15 and 100 thousand	0.107***	0.153	0.103***
	(0.0384)	(0.0975)	(0.0336)
Locality between 2.5 and 15 thousand	0.197***	0.0960	0.187***
	(0.0354)	(0.123)	(0.0304)
Locality less than 2.5 thousand	0.299***	-0.0257	0.298***
	(0.0262)	(0.104)	(0.0313)
Wealth	-1.005***	-0.984***	-1.028***
	(0.0677)	(0.0743)	(0.0535)
Sex of Household Head	0.141***		0.140***
	(0.0277)		(0.0259)
Age of Household Head	-0.0203***	-0.0185***	-0.0202***
	(0.00108)	(0.00330)	(0.00112)
Education of Household Head	0.141***	0.215***	0.132***
	(0.00595)	(0.0134)	(0.00598)
Health	1.450***	1.606***	1.346***
	(0.179)	(0.189)	(0.152)
Insurance	0.707***	0.519***	0.718***
	(0.0414)	(0.0511)	(0.0493)
Working household members	0.705***	0.528***	0.695***
	(0.0441)	(0.0618)	(0.0479)
Log Income	0.0289***	0.0258***	0.0300***
	(0.00367)	(0.00469)	(0.00371)
Constant	5.830***	5.663***	5.954***
	(0.188)	(0.185)	(0.151)
Observations	21,504	21,504	21,504
R-squared		0.118	0.169
Number of Households	7,332	7,332	
Robust standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Sargan-Hansen statistic	103.38	$\chi^2(11)$	P-value = 0.000
Breusch-Pagan LM	88.04	$\chi^2(1)$	P-value = 0.000

Table 4.2. Log Consumption (Female Household Head)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Consumption	
Income volatility	-0.0146***	-0.00472	-0.0152***
	(0.00376)	(0.00501)	(0.00281)
Locality between 15 and 100 thousand	0.222***	0.0417	0.218***
	(0.0774)	(0.198)	(0.0676)
Locality between 2.5 and 15 thousand	0.102	-0.345	0.106*
	(0.0904)	(0.276)	(0.0624)
Locality less than 2.5 thousand	0.371***	0.184	0.365***
	(0.0620)	(0.210)	(0.0503)
Wealth	-1.214***	-1.036***	-1.256***
	(0.140)	(0.189)	(0.0891)
Age of Household Head	-0.0168***	-0.00933*	-0.0168***
	(0.00157)	(0.00566)	(0.00217)
Education of Household Head	0.114***	0.157***	0.109***
	(0.0120)	(0.0233)	(0.00828)
Health	1.474***	1.768***	1.337***
	(0.519)	(0.461)	(0.440)
Insurance	0.447***	0.420***	0.448***
	(0.0627)	(0.100)	(0.0556)
Working household members	0.473***	0.194*	0.487***
	(0.105)	(0.114)	(0.0747)
Log Income	0.0363***	0.0263***	0.0385***
	(0.00802)	(0.00880)	(0.00857)
Constant	5.746***	5.215***	5.902***
	(0.496)	(0.532)	(0.390)
Observations	4,259	4,259	4,259
R-squared		0.107	0.184
Number of Households	1,460	1,460	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	7.98	$\chi^2(1)$	P-value = 0.002

Table 4.3. Log Consumption (Male Household Head)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Consumption	
Income volatility	-0.0353***	-0.0283***	-0.0344***
	(0.00306)	(0.00382)	(0.00286)
Locality between 15 and 100 thousand	0.0908**	0.213	0.0868**
	(0.0399)	(0.134)	(0.0373)
Locality between 2.5 and 15 thousand	0.239***	0.202	0.225***
	(0.0498)	(0.133)	(0.0402)
Locality less than 2.5 thousand	0.294***	-0.0952	0.295***
	(0.0317)	(0.154)	(0.0294)
Wealth	-0.928***	-0.953***	-0.949***
	(0.0648)	(0.0859)	(0.0674)
Age of Household Head	-0.0226***	-0.0228***	-0.0224***
	(0.00127)	(0.00405)	(0.00143)
Education of Household Head	0.150***	0.233***	0.141***
	(0.00653)	(0.0139)	(0.00586)
Health	1.476***	1.589***	1.376***
	(0.172)	(0.198)	(0.212)
Insurance	0.851***	0.578***	0.866***
	(0.0537)	(0.0672)	(0.0616)
Working household members	0.791***	0.611***	0.775***
	(0.0559)	(0.0688)	(0.0569)
Log Income	0.0279***	0.0265***	0.0287***
	(0.00327)	(0.00620)	(0.00428)
Constant	6.026***	5.849***	6.140***
	(0.173)	(0.227)	(0.183)
Observations	17,245	17,245	17,245
R-squared		0.123	0.162
Number of Households	5,872	5,872	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	82.57	$\chi^2(1)$	P-value = 0.000

Table 4.4. Log Consumption
(Greater than 100 thousand inhabitants)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Consumption	
Income volatility	-0.0518***	-0.0547***	-0.0509***
	(0.00384)	(0.00574)	(0.00386)
Wealth	-0.869***	-1.426***	-0.824***
	(0.251)	(0.266)	(0.194)
Sex of Household Head	0.121**		0.126***
	(0.0561)		(0.0460)
Age of Household Head	-0.0336***	-0.0411***	-0.0332***
	(0.00242)	(0.00704)	(0.00256)
Education of Household Head	0.183***	0.321***	0.171***
	(0.00860)	(0.0196)	(0.00957)
Health	1.438***	1.451***	1.409***
	(0.265)	(0.329)	(0.282)
Insurance	1.343***	1.028***	1.359***
	(0.0862)	(0.109)	(0.0974)
Working household members	1.337***	1.300***	1.317***
	(0.0836)	(0.125)	(0.0880)
Log Income	0.0184**	0.00781	0.0201***
	(0.00795)	(0.00770)	(0.00618)
Constant	5.811***	5.878***	5.858***
	(0.272)	(0.391)	(0.309)
Observations	7,852	7,852	7,852
R-squared		0.184	0.192
Number of Households	2,934	2,934	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	24.93	$\chi^2(1)$	P-value = 0.000

Table 4.5. Log Consumption
(Between 15 and 100 thousand inhabitants)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Consumption	
Income volatility	-0.0296***	-0.0330**	-0.0289***
	(0.00806)	(0.0138)	(0.00724)
Wealth	-1.447***	-1.398***	-1.400***
	(0.249)	(0.381)	(0.252)
Sex of Household Head	0.144		0.144
	(0.0990)		(0.0911)
Age of Household Head	-0.0208***	-0.0100	-0.0206***
	(0.00314)	(0.0111)	(0.00388)
Education of Household Head	0.134***	0.161***	0.132***
	(0.0173)	(0.0287)	(0.0157)
Health	1.710***	1.686***	1.703***
	(0.535)	(0.633)	(0.535)
Insurance	0.612***	0.249*	0.648***
	(0.142)	(0.145)	(0.133)
Working household members	0.649***	0.683**	0.642***
	(0.160)	(0.294)	(0.145)
Log Income	0.0183*	0.0204**	0.0185**
	(0.0105)	(0.00990)	(0.00835)
Constant	6.032***	5.874***	6.008***
	(0.539)	(0.674)	(0.551)
Observations	2,101	2,101	2,101
R-squared		0.085	0.168
Number of Households	905	905	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	4.87	$\chi^2(1)$	P-value = 0.0136

Table 4.6. Log Consumption
(Between 2.5 and 15 thousand inhabitants)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Consumption	
Income volatility	-0.0246***	-0.0321***	-0.0222***
	(0.00849)	(0.0109)	(0.00679)
Wealth	-1.540***	-1.833***	-1.535***
	(0.248)	(0.353)	(0.185)
Sex of Household Head	0.248**		0.242***
	(0.106)		(0.0849)
Age of Household Head	-0.0201***	-0.0213*	-0.0197***
	(0.00367)	(0.0117)	(0.00300)
Education of Household Head	0.116***	0.159***	0.109***
	(0.0235)	(0.0459)	(0.0164)
Health	1.041	1.429**	0.824
	(0.677)	(0.577)	(0.538)
Insurance	0.646***	0.703***	0.607***
	(0.131)	(0.188)	(0.109)
Working household members	0.637***	0.847***	0.575***
	(0.168)	(0.235)	(0.138)
Log Income	0.0282***	0.0129	0.0316***
	(0.00953)	(0.0154)	(0.00992)
Constant	6.466***	6.284***	6.689***
	(0.711)	(0.827)	(0.523)
Observations	2,381	2,381	2,381
R-squared		0.113	0.186
Number of Households	1,016	1,016	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	2.58	$\chi^2(1)$	P-value = 0.054

Table 4.7. Log Consumption
(Less than 2.5 thousand inhabitants)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Consumption	
Income volatility	-0.0122***	-0.0120**	-0.0127***
	(0.00282)	(0.00545)	(0.00251)
Wealth	-0.960***	-0.826***	-1.058***
	(0.0493)	(0.0836)	(0.0611)
Sex of Household Head	0.104***		0.112***
	(0.0353)		(0.0411)
Age of Household Head	-0.0148***	-0.0149***	-0.0147***
	(0.00129)	(0.00489)	(0.00121)
Education of Household Head	0.0896***	0.105***	0.0822***
	(0.00847)	(0.0183)	(0.00749)
Health	1.271***	1.503***	1.065***
	(0.255)	(0.262)	(0.271)
Insurance	0.336***	0.186***	0.359***
	(0.0370)	(0.0576)	(0.0470)
Working household members	0.289***	0.250***	0.304***
	(0.0528)	(0.0956)	(0.0479)
Log Income	0.0303***	0.0253***	0.0330***
	(0.00508)	(0.00643)	(0.00542)
Constant	6.413***	6.316***	6.625***
	(0.245)	(0.220)	(0.257)
Observations	9,170	9,170	9,170
R-squared		0.067	0.156
Number of Households	3,453	3,453	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	64.66	$\chi^2(1)$	P-value = 0.000

Table 4.8. Log Consumption (Household Head Age under 50 years)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Consumption	
Income volatility	-0.0464***	-0.0336***	-0.0463***
	(0.00629)	(0.00506)	(0.00632)
Locality between 15 and 100 thousand	0.0261	0.174	-0.000300
	(0.0554)	(0.154)	(0.0442)
Locality between 2.5 and 15 thousand	0.218***	0.0544	0.209***
	(0.0413)	(0.196)	(0.0452)
Locality less than 2.5 thousand	0.209***	-0.198	0.198***
	(0.0407)	(0.176)	(0.0368)
Wealth	-0.971***	-1.265***	-0.966***
	(0.0957)	(0.121)	(0.0894)
Sex of Household Head	0.165***		0.161***
	(0.0486)		(0.0509)
Age of Household Head	-0.0385***	-0.0378***	-0.0383***
	(0.00306)	(0.00731)	(0.00337)
Education of Household Head	0.174***	0.229***	0.165***
	(0.0114)	(0.0200)	(0.0103)
Health	2.830***	2.406***	2.736***
	(0.290)	(0.310)	(0.325)
Insurance	1.237***	0.796***	1.249***
	(0.143)	(0.0951)	(0.146)
Working household members	1.045***	0.718***	1.052***
	(0.116)	(0.0911)	(0.118)
Log Income	0.0258***	0.0236***	0.0272***
	(0.00519)	(0.00512)	(0.00365)
Constant	4.933***	5.549***	5.047***
	(0.254)	(0.294)	(0.300)
Observations	10,902	10,902	10,902
R-squared		0.127	0.157
Number of Households	4,413	4,413	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	52.19	$\chi^2(1)$	P-value = 0.000

Table 4.9. Log Consumption (Household Head Age over 50 years)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Consumption	
Income volatility	-0.0241***	-0.0132***	-0.0241***
	(0.00274)	(0.00436)	(0.00254)
Locality between 15 and 100 thousand	0.164**	0.166	0.169***
	(0.0673)	(0.190)	(0.0536)
Locality between 2.5 and 15 thousand	0.196***	0.0564	0.186***
	(0.0647)	(0.246)	(0.0660)
Locality less than 2.5 thousand	0.391***	0.197	0.395***
	(0.0479)	(0.195)	(0.0416)
Wealth	-1.076***	-0.986***	-1.136***
	(0.0880)	(0.116)	(0.0813)
Sex of Household Head	0.136***		0.138***
	(0.0435)		(0.0414)
Age of Household Head	-0.0150***	-0.0135***	-0.0148***
	(0.00131)	(0.00449)	(0.00113)
Education of Household Head	0.137***	0.212***	0.128***
	(0.00983)	(0.0221)	(0.00675)
Health	0.991***	1.446***	0.846***
	(0.240)	(0.279)	(0.184)
Insurance	0.538***	0.405***	0.548***
	(0.0431)	(0.0661)	(0.0479)
Working household members	0.626***	0.356***	0.626***
	(0.0583)	(0.0854)	(0.0581)
Log Income	0.0287***	0.0264***	0.0299***
	(0.00509)	(0.00684)	(0.00479)
Constant	5.999***	5.492***	6.161***
	(0.244)	(0.335)	(0.177)
Observations	10,602	10,602	10,602
R-squared		0.113	0.176
Number of Households	4,426	4,426	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	27.95	$\chi^2(1)$	P-value = 0.000

Chapter 5

Conclusions

Until now the empirical studies for Mexico focused on the macroeconomic perspective trying to explain the relation between private savings and the uncertainty caused by inflation. The results are contradictory because there are evidence supporting the existence of precautionary savings in Mexico but, at the same time, there is also evidence of a negative correlation between financial savings and inflation, which means that precaution is not a motive to saving.

The objective of this research is to contribute to this literature by performing an analysis of precautionary savings at individual households following them over a longer period of time. The MxFLS, a panel survey with three observation points between 2002 and 2010 permits such an analysis. To achieve this, the theory of permanent income is used to build an econometric model where it is first decomposed into its permanent and transitory parts. Subsequently, under the assumption that the average transitory income is equal to zero, the volatility of this income is estimated to incorporate it into an estimate of consumption. To prove the existence of precautionary savings in Mexico, the income volatility coefficient must be negative and significant.

The results of the econometric exercises strongly suggest the existence of precautionary reasons for saving. For the first time for Mexico there are results on the existence and magnitude of precautionary savings according to the sex of the head of the household, in particular, in both cases the existence of precautionary savings is confirmed and its magnitude is greater in households whose head is male (fact that can be explained by cultural issues).

For the first time, there are also results for four categories of locality size and it was possible to clearly identify a direct relationship between the level of precautionary savings and the locality size. These results contrast with those obtained by Villagomez (1998), firstly because of the number of categories considered, and secondly, it is possible that the households that live in the cities face more complex situations that lead them to be more cautious.

Finally, it is also the first time that results are available for young and old homes. This exercise is consistent with the results obtained in the rest of the estimates and allows us to conclude that young households save twice as precautionaryly as old households. This result complements the partial evidence obtained by Veladia Naranjo and van Gameren (2016).

Despite this, there are considerations that could not be incorporated into the analysis. First, as mentioned above, the survey had a variety of expansion factors, however, it was not possible to include them in this work because the documentation of the survey does not indicate how to do it and, the construction of unified factors is beyond the scope of this study, however, it undoubtedly constitutes an opportunity to expand this research in the future.

Secondly, future research it would be important to verify the soundness of the results in at least three aspects: (1) to reinforce the estimates with a single-stage technique where the dependent variable may be consumption, saving and / or wealth; (2) Control for income heteroskedasticity, possibly performing a percentile regression; (3) Improve the construction of the relevant variables to incorporate their dynamics and (4) try to construct an informality measure or access to low-quality, low-cost health services to see if these are relevant variables in the determination of precautionary savings in Mexico.

Appendix

Table A1. Summary statistics (variables used for the wealth index)

		Round 1		Round 2		Round 3	
Variable	Category	Freq.	Percent	Freq.	Percent	Freq.	Percent
Telephone	0 (Has)	5,285	62.61	4,596	54.47	6,068	59.93
	1 (Do not have)	3,156	37.39	3,841	45.53	4,057	40.07
	Total	**8,441**	**100**	**8,437**	**100**	**10,125**	**100**
Kitchen	0 (Has)	747	8.85	611	7.38	845	9.14
	1 (Do not have)	7,693	91.15	7,668	92.62	8,403	90.86
	Total	**8,440**	**100**	**8,279**	**100**	**9,248**	**100**
Electricity	0 (Has)	148	1.75	131	1.59	313	3.39
	1 (Do not have)	8,287	98.25	8,130	98.41	8,907	96.61
	Total	**8,435**	**100**	**8,261**	**100**	**9,220**	**100**
House ownership	1 (Paying it)	492	5.83	444	5.36	1	508
	2 (Own and fully paid)	5,397	63.95	5,772	69.7	6,207	67.11
	3 (Own on communal land)	764	9.05	516	6.23	525	5.68
	4 (Borrowed or assigned without payment)	955	11.32	939	11.34	1,306	14.12

Continued on next page

Table A1 – *Continued from previous page*

Variable	Category	Round 1		Round 2		Round 3	
		Freq.	Percent	Freq.	Percent	Freq.	Percent
	5 (Rented)	767	9.09	558	6.74	599	6.48
	6 (Other)	65	0.77	52	0.63	104	1.12
	Total	**8,440**	**100**	**8,281**	**100**	**9,249**	**100**
Source of drinking water	1 (Water jugs)	4,283	50.75	4,965	59.96	6,009	64.98
	2 (Tap water inside the house)	3,218	38.13	2,429	29.33	2,121	22.93
	3 (Tap water outside the house)	395	4.68	470	5.68	654	7.07
	4 (Pipe water)	60	0.71	37	0.45	51	0.55
	5 (Haulage)	444	5.26	373	4.5	384	4.15
	6 (Other)	40	0.47	7	0.08	29	0.31
	Total	**8,440**	**100**	**8,281**	**100**	**9,248**	**100**
Type of toilet	1 (Toilet)	6,127	72.61	6,428	77.64	7,317	79.11
	2 (Latrine)	1,497	17.74	1,214	14.66	1,195	12.92
	3 (Black hole or pit)	288	3.41	326	3.94	443	4.79
	4 (No service)	526	6.23	311	3.76	294	3.18
	Total	**8,438**	**100**	**8,279**	**100**	**9,249**	**100**
Drainage	1 (Tubed public drain)	4,864	57.64	5,086	61.48	5,944	64.4
	2 (Septic tank)	1,064	12.61	1,272	15.38	1,092	11.83
	3 (Open drain to the street)	330	3.91	280	3.38	468	5.07

Continued on next page

Table A1 – *Continued from previous page*

Variable	Category	Round 1		Round 2		Round 3	
		Freq.	Percent	Freq.	Percent	Freq.	Percent
	4 (Drain to the property)	1,901	22.53	1,441	17.42	1,496	16.21
	5 (Drain to river or canal)	190	2.25	165	1.99	172	1.86
	6 (Other)	89	1.05	29	0.35	58	0.63
	Total	**8,438**	**100**	**8,273**	**100**	**9,230**	**100**
	1 (Public collection service)	5,911	70.06	6,500	78.54	7,346	79.52
	2 (Throw it in the public garbage can)	274	3.25	252	3.04	417	4.51
	3 (Throw it into the river or vacant lot)	255	3.02	115	1.39	118	1.28
Garbage	4 (Burning inside the home)	1,058	12.54	783	9.46	472	5.11
	5 (Burning outside the home)	862	10.22	582	7.03	822	8.9
	6 (Buries it within the land of the house)	51	0.6	28	0.34	20	0.22
	7 (Buries it out of the home ground)	12	0.14	9	0.11	12	0.13

Continued on next page

Table A1 – *Continued from previous page*

Variable	Category	Round 1 Freq.	Round 1 Percent	Round 2 Freq.	Round 2 Percent	Round 3 Freq.	Round 3 Percent
	8 (Other)	14	0.17	7	0.08	31	0.34
	Total	**8,437**	**100**	**8,276**	**100**	**9,238**	**100**
Cooking fuel	1 (Firewood)	972	11.55	955	11.54	1,137	12.32
	2 (Coal)	37	0.44	44	0.53	48	0.52
	3 (Petroleum)	39	0.46	38	0.46	113	1.22
	4 (Gas)	7,259	86.27	6,925	83.7	7,726	83.7
	5 (Does not use fuel)	66	0.78	92	1.11	80	0.87
	6 (Other)	41	0.49	220	2.66	127	1.37
	Total	**8,414**	**100**	**8,274**	**100**	**9,231**	**100**
House type	1 (Movil House)	3	0.04	74	0.9	42	0.46
	2 (premises used as a house)	8	0.09	28	0.34	56	0.61
	3 (Roof room)	12	0.14	52	0.63	85	0.92
	4 (Room or house in neighborhood)	177	2.1	220	2.66	144	1.56
	5 (Apartment in building)	173	2.05	157	1.9	160	1.74
	6 (House alone that shares walls)	1,966	23.33	2,438	29.53	3,358	36.42
	7 (House alone that does not share walls)	6,037	71.65	5,236	63.42	5,285	57.31

Continued on next page

Table A1 – *Continued from previous page*

		Round 1		Round 2		Round 3	
Variable	Category	Freq.	Percent	Freq.	Percent	Freq.	Percent
	8 (Other)	50	0.6	51	0.62	91	0.99
	Total	**8,426**	**100**	**8,256**	**100**	**9,221**	**100**
Floor material	1 (Wood, mosaic, tile, carpet)	3,272	38.8	3,011	36.45	3,748	40.65
	2 (Firm cement)	4,123	48.89	4,270	51.69	4,684	50.8
	3 (ground floor)	1,014	12.02	967	11.71	746	8.09
	4 (Other)	25	0.3	12	0.15	42	0.46
	Total	**8,434**	**100**	**8,260**	**100**	**9,220**	**100**
Walls material	1 (Concrete, brick, tabicon, block)	6,741	79.93	6,789	82.19	7,868	85.34
	2 (Adobe)	935	11.09	767	9.29	553	6
	3 (Wood)	410	4.86	371	4.49	420	4.56
	4 (Asbestos sheet, metal sheet, fiberglass, plastic, mica)	104	1.23	144	1.74	187	2.03
	5 (Embarro or Bajareque)	66	0.78	67	0.81	50	0.54
	6 (Carrizo, bambu, palma, tejamanil)	50	0.59	37	0.45	40	0.43

Continued on next page

Table A1 – *Continued from previous page*

Variable	Category	Round 1		Round 2		Round 3	
		Freq.	Percent	Freq.	Percent	Freq.	Percent
	7 (Cardboard wall)	46	0.55	35	0.42	24	0.26
	8 (Waste material)	17	0.2	14	0.17	13	0.14
	9 (Stone)	38	0.45	29	0.35	19	0.21
	10 (Other)	27	0.32	7	0.08	46	0.5
	Total	**8,434**	**100**	**8,260**	**100**	**9,220**	**100**
Roof material	1 (Joist and polyurethane, joist and vault)	915	10.85	907	10.98	1,013	10.99
	2 (Concrete, partition, partition, block or concrete slab)	4,865	57.68	5,122	62.01	5,990	64.97
	3 (Roof tile)	371	4.4	301	3.64	344	3.73
	4 (Asbestos sheet)	695	8.24	750	9.08	669	7.26
	5 (Reed, bamboo or roof)	245	2.9	111	1.34	94	1.02
	6 (Sheet metal, fiberglass, plastic or mica)	742	8.8	622	7.53	732	7.94
	7 (Palm, shingle or wood)	159	1.89	150	1.82	140	1.52

Continued on next page

Table A1 – *Continued from previous page*

		Round 1		Round 2		Round 3	
Variable	Category	Freq.	Percent	Freq.	Percent	Freq.	Percent
	8 (Cardboard sheet)	407	4.83	275	3.33	169	1.83
	9 (Waste material)	12	0.14	8	0.1	17	0.18
	10 (Other)	24	0.28	14	0.17	52	0.56
	Total	**8,435**	**100**	**8,260**	**100**	**9,220**	**100**
Rooms for sleep		8,440	2.04* (1.00)	8275	2.17* (1.44)	9227	2.13* (1.27)

* Mean. Standard errors in parenthesis.

Table A2. Multiple Correspondence Analisys (Wealth index)

	Round 1		Round 2		Round 3	
Dimension	Inertia	Percent	Inertia	Percent	Inertia	Percent
dim 1	0.0786485	69.38	0.0663606	72.11	0.0613215	41.31
dim 2	0.0070854	6.25	0.004503	4.89	0.0528021	35.57
dim 3	0.0038588	3.4	0.0022212	2.41	0.0096651	6.51
dim 4	0.0018428	1.63	0.0019585	2.13	0.0016369	1.1
dim 5	0.0013802	1.22	0.0010592	1.15	0.00098	0.66
dim 6	0.0011364	1	0.0007131	0.77	0.0008204	0.55
dim 7	0.0006233	0.55	0.0006654	0.72	0.0006872	0.46
dim 8	0.0004711	0.42	0.0004908	0.53	0.000478	0.32
dim 9	0.0003794	0.33	0.0003746	0.41	0.0003466	0.23
dim 10	0.0003151	0.28	0.0002745	0.3	0.0002971	0.2
dim 11	0.000283	0.25	0.0002584	0.28	0.0001979	0.13
dim 12	0.0002091	0.18	0.0002299	0.25	0.0001619	0.11
dim 13	0.0001509	0.13	0.000152	0.17	0.0001161	0.08
dim 14	0.0001274	0.11	0.0001391	0.15	0.0001084	0.07
dim 15	0.0000983	0.09	0.0001026	0.11	0.000089	0.06
dim 16	0.0000838	0.07	0.0000938	0.1	0.0000603	0.04
dim 17	0.0000648	0.06	0.0000609	0.07	0.0000579	0.04
dim 18	0.0000459	0.04	0.0000476	0.05	0.0000516	0.03
dim 19	0.000032	0.03	0.0000419	0.05	0.0000403	0.03
dim 20	0.0000276	0.02	0.0000331	0.04	0.0000305	0.02
Total	0.1133512	100	0.0920237	100	0.1484356	100

First 20 dimensions displayed. Total correspond to all dimensions

Table A3. Weights of the Wealth index variables

Variable	Categories	Round 1	Round 2	Round 3
Telephone	0 (Has)	0.205	0.211	0.134
	1 (Do not have)	-0.343	-0.244	-0.171
Kitchen	0 (Has)	0.403	0.471	0.43
	1 (Do not have)	-0.039	-0.037	-0.042
Electricity	0 (Has)	0.936	0.821	0.901
	1 (Do not have)	-0.017	-0.013	-0.03
House ownership	1 (Paying it)	-0.384	-0.329	-0.243
	2 (Own and fully paid)	-0.023	-0.016	-0.03
	3 (Own on communal land)	0.474	0.495	0.314
	4 (Borrowed or assigned without payment)	0.131	0.103	0.102
	5 (Rented)	-0.27	-0.215	-0.142
	6 (Other)	0.477	-0.091	1.613
Source of drinking water	1 (Water jugs)	-0.229	-0.185	-0.126
	2 (Tap water inside the house)	0.113	0.125	0.056
	3 (Tap water outside the house)	0.622	0.664	0.59
	4 (Pipe water)	0.363	0.301	0.425
	5 (Haulage)	0.739	0.773	0.494
	6 (Other)	0.735	0.813	2.783

Continued on next page

Table A3 – *Continued from previous page*

Variable	Categories	Round 1	Round 2	Round 3
Type of toilet	1 (Toilet)	-0.224	-0.178	-0.122
	2 (Latrine)	0.544	0.586	0.38
	3 (Black hole or pit)	0.565	0.593	0.675
	4 (No service)	0.761	0.758	0.499
Drainage	1 (Tubed public drain)	-0.285	-0.24	-0.149
	2 (Septic tank)	0.085	0.128	0.066
	3 (Open drain to the street)	0.442	0.511	0.236
	4 (Drain to the property)	0.535	0.559	0.349
	5 (Drain to river or canal)	0.541	0.578	0.411
	6 (Other)	0.412	0.345	2.349
Garbage	1 (Public collection service)	-0.211	-0.153	-0.095
	2 (Throw it in the public garbage can)	0.1	0.055	0.033
	3 (Throw it into the river or vacant lot)	0.476	0.637	0.354
	4 (Burning inside the home)	0.562	0.655	0.355
	5 (Burning outside the home)	0.543	0.646	0.455

Continued on next page

Table A3 – *Continued from previous page*

Variable	Categories	Round 1	Round 2	Round 3
	6 (Buries it within the land of the house)	0.594	0.468	0.343
	7 (Buries it out of the home ground)	0.38	0.516	0.433
	8 (Other)	0.629	0.016	4.491
Cooking fuel	1 (Firewood)	0.833	0.78	0.546
	2 (Coal)	0.493	0.516	0.614
	3 (Petroleum)	-0.09	0.103	-0.035
	4 (Gas)	-0.113	-0.106	-0.094
	5 (Does not use fuel)	0.14	0.147	0.153
	6 (Other)	-0.322	0.336	4.866
House type	1 (Movil House)	-0.069	-0.136	0.281
	2 (premises used as a house)	-0.318	-0.051	0.751
	3 (Roof room)	0.103	-0.091	0.677
	4 (Room or house in neighborhood)	-0.187	-0.043	0.264
	5 (Apartment in building)	-0.512	-0.41	-0.251
	6 (House alone that shares walls)	-0.119	-0.11	-0.08
	7 (House alone that does not share walls)	0.054	0.064	-0.002
	8 (Other)	0.285	0.443	2.061

Continued on next page

Table A3 – *Continued from previous page*

Variable	Categories	Round 1	Round 2	Round 3
Floor material	1 (Wood, mosaic, tile, carpet)	-0.331	-0.304	-0.218
	2 (Firm cement)	0.059	0.031	0.03
	3 (ground floor)	0.814	0.803	0.732
	4 (Other)	0.874	0.421	3.808
Walls material	1 (Concrete, brick, tabicon, block)	-0.162	-0.133	-0.106
	2 (Adobe)	0.502	0.409	0.295
	3 (Wood)	0.849	0.896	0.882
	4 (Asbestos sheet, metal sheet, fiberglass, plastic, mica)	0.626	0.483	0.316
	5 (Embarro or Bajareque)	1.098	1.13	0.786
	6 (Carrizo, bambu, palma, tejamanil)	1.015	1.23	0.709
	7 (Cardboard wall)	0.781	0.803	0.637
	8 (Waste material)	0.899	0.793	0.785
	9 (Stone)	0.534	0.604	0.6
	10 (Other)	0.81	0.757	3.732

Continued on next page

Table A3 – *Continued from previous page*

Variable	Categories	Round 1	Round 2	Round 3
Roof material	1 (Joist and polyurethane, joist and vault)	-0.242	-0.195	-0.116
	2 (Concrete, partition, partition, block or concrete slab)	-0.226	-0.184	-0.15
	3 (Roof tile)	0.529	0.543	0.707
	4 (Asbestos sheet)	0.284	0.285	0.2
	5 (Reed, bamboo or roof)	0.503	0.53	0.412
	6 (Sheet metal, fiberglass, plastic or mica)	0.513	0.558	0.392
	7 (Palm, shingle or wood)	0.621	0.516	0.305
	8 (Cardboard sheet)	0.762	0.865	0.677
	9 (Waste material)	0.911	0.965	0.681
	10 (Other)	0.483	0.835	3.362
Rooms for sleep	1	0.263	0.259	0.176
	2	-0.067	-0.045	-0.083
	3	-0.2	-0.181	-0.065
	4	-0.251	-0.209	-0.096
	5	-0.269	-0.289	-0.114

Continued on next page

Table A3 – *Continued from previous page*

Variable	Categories	Round 1	Round 2	Round 3
	6	-0.367	-0.236	-0.07
	7	-0.273	-0.26	-0.106
	8	0.161	-0.112	0.171
	9	-0.482	0.47	-0.243
	10	-0.099	0.314	0.285

Table A4. Summary statistics (variables used for the health index)

		Round 1		Round 2		Round 3	
Variable	Category	Freq.	Percent	Freq.	Percent	Freq.	Percent
Health status	1 (Very good)	936	4.73	1,580	7.67	1,995	8.5
	2 (Good)	9,199	46	10,180	49.44	10,597	45.15
	3 (Regular)	8,592	43.39	7,984	38.78	9,798	41.75
	4 (Bad)	1,002	5.06	798	3.88	988	4.21
	5 (Very bad)	73	0.37	47	0.23	91	0.39
	Total	19,802	100	20,589	100	23,469	100
Stopped activities	1 (Yes)	1,768	8.93	1,517	7.37	2,201	9.38
	3 (No)	18,036	91.07	19,078	92.63	21,268	90.62
	Total	19,804	100	20,595	100	23,469	100
Health status a year ago	1 (Much better)	531	2.68	798	3.88	737	3.14
	2 (Better)	4,361	22.02	4,429	21.55	4,965	21.16
	3 (Equal)	12,653	63.89	13,301	64.73	15,084	64.27
	4 (Worst)	2,201	11.11	1,978	9.63	2,598	11.07
	5 (Much worst)	57	0.29	43	0.21	85	0.36
	Total	19,803	100	20,549	100	23,469	100
Health status compared to other people of the same sex and age	1 (Much better than others)	836	4.22	952	4.63	1,190	5.07
	2 (Better than others)	5,938	29.98	5,525	26.84	6,902	29.41
	3 (Equal than others)	11,680	58.98	12,702	61.71	13,750	58.59
	4 (Worst than others)	1,308	6.6	1,361	6.61	1,567	6.68
	5 (Much worst than others)	42	0.21	42	0.2	59	0.25
	Total	19,804	100	20,582	100	23,468	100

Table A5. Multiple Correspondence Analisys (Wealth index)

	Round 1		Round 2		Round 3	
Dimension	Inertia	Percent	Inertia	Percent	Inertia	Percent
dim 1	0.170164	71.13	0.13048	41.9	0.204805	64.28
dim 2	0.026637	11.14	0.12629	40.55	0.044642	14.01
dim 3	0.013486	5.64	0.015989	5.13	0.030309	9.51
dim 4	0.010751	4.49	0.005945	1.91	0.013397	4.2
dim 5	0.001075	0.45	0.001872	0.6	0.004399	1.38
Total	0.239218	100	0.311414	100	0.318596	100

Table A6. Weights of the health index variables

Variable	Category	Round 1	Round 2	Round 3
Health status	1 (Very good)	0.258	0.007	0.276
	2 (Good)	0.199	0	0.183
	3 (Regular)	-0.087	0.018	-0.115
	4 (Bad)	-1.068	0.087	-1.115
	5 (Very bad)	-1.883	0.104	-2.608
Stopped activities	1 (Yes)	-0.742	0.07	-0.767
	3 (No)	0.075	0.011	0.079
Health status a year ago	1 (Much better)	0.239	0.008	0.261
	2 (Better)	0.109	0.005	0.122
	3 (Equal)	0.098	0.009	0.096
	4 (Worst)	-0.775	0.067	-0.766
	5 (Much worst)	-1.923	-0.021	-2.633
Compared to other people of the same sex and age	1 (Much better than others)	0.151	-0.024	0.233
	2 (Better than others)	0.115	-0.048	0.113
	3 (Equal than others)	0.042	0.025	0.057
	4 (Worst than others)	-1.077	0.089	-0.877
	5 (Much worst than others)	-2.012	0.096	-2.434

Table A7. Income Decomposition

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Income	
Locality between 15 and 100 thousand	-0.191**	-0.889***	-0.169**
	(0.0875)	(0.196)	(0.0852)
Locality between 2.5 and 15 thousand	0.155**	-0.494**	0.158**
	(0.0766)	(0.238)	(0.0681)
Locality less 2.5 thousand	0.0867*	-1.090***	0.114**
	(0.0448)	(0.189)	(0.0509)
Wealth	0.0527	-0.181	0.0788
	(0.106)	(0.193)	(0.112)
Sex of Household Head	0.344***		0.342***
	(0.0551)		(0.0558)
Age of Household Head	-0.0401***	-0.0420***	-0.0402***
	(0.00150)	(0.00539)	(0.00135)
Education of Household Head	0.138***	0.190***	0.134***
	(0.00712)	(0.0159)	(0.00873)
Health	1.439***	1.329***	1.418***
	(0.304)	(0.438)	(0.323)
Insurance	1.217***	0.771***	1.278***
	(0.0555)	(0.0853)	(0.0396)
Working household members	1.334***	1.280***	1.337***
	(0.0194)	(0.0331)	(0.0207)
Constant	2.481***	3.638***	2.478***
	(0.284)	(0.478)	(0.316)
Observations	21,504	21,504	21,504
R-squared		0.188	0.325
Number of Households	7,332	7,332	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Sargan-Hansen statistic	138.99	$\chi^2(9)$	P-value = 0.000
Breusch-Pagan LM	196.1	$\chi^2(1)$	P-value = 0.000

Table A8. Income Decomposition (Female Household Head)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Income	
Locality between 15 and 100 thousand	-0.410**	-1.553***	-0.370***
	(0.178)	(0.402)	(0.143)
Locality between 2.5 and 15 thousand	0.0125	-0.768	0.0192
	(0.156)	(0.498)	(0.207)
Locality less 2.5 thousand	-0.0584	-1.092**	-0.0428
	(0.117)	(0.462)	(0.121)
Wealth	-0.257	-0.656*	-0.209
	(0.270)	(0.372)	(0.253)
Age of Household Head	-0.0337***	-0.0328***	-0.0338***
	(0.00246)	(0.0107)	(0.00217)
Education of Household Head	0.164***	0.211***	0.161***
	(0.0174)	(0.0290)	(0.0159)
Health	1.605**	1.434	1.603*
	(0.769)	(0.894)	(0.942)
Insurance	0.784***	0.560***	0.815***
	(0.125)	(0.168)	(0.104)
Working household members	1.767***	1.661***	1.773***
	(0.0649)	(0.0808)	(0.0495)
Constant	1.772**	2.614***	1.751*
	(0.692)	(0.927)	(0.903)
Observations	4,259	4,259	4,259
R-squared		0.256	0.409
Number of Households	1,460	1,460	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	37.46	$\chi^2(1)$	P-value = 0.000

Table A9. Income Decomposition (Male Household Head)

VARIABLES	(1) Random Effects	(2) Fixed Effects Log Income	(3) OLS
Locality between 15 and 100 thousand	-0.116	-0.718***	-0.0991
	(0.100)	(0.270)	(0.0775)
Locality between 2.5 and 15 thousand	0.206**	-0.415	0.209***
	(0.0911)	(0.254)	(0.0802)
Locality less 2.5 thousand	0.129*	-1.077***	0.159***
	(0.0697)	(0.178)	(0.0568)
Wealth	0.138	-0.0570	0.155
	(0.150)	(0.153)	(0.142)
Age of Household Head	-0.0406***	-0.0451***	-0.0407***
	(0.00174)	(0.00420)	(0.00132)
Education of Household Head	0.129***	0.182***	0.125***
	(0.0110)	(0.0208)	(0.0103)
Health	1.365***	1.279***	1.340***
	(0.405)	(0.402)	(0.416)
Insurance	1.314***	0.820***	1.380***
	(0.0466)	(0.0847)	(0.0559)
Working household members	1.245***	1.195***	1.247***
	(0.0255)	(0.0420)	(0.0231)
Constant	3.006***	3.955***	3.003***
	(0.378)	(0.422)	(0.393)
Observations	17,245	17,245	17,245
R-squared		0.174	0.296
Number of Households	5,872	5,872	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	147.1	$\chi^2(1)$	P-value = 0.000

Table A10. Income Decomposition
(Greater than 100 thousand inhabitants)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Income	
Wealth	0.818***	0.694	0.836**
	(0.316)	(0.471)	(0.332)
Sex of Household Head	0.130		0.135
	(0.0887)		(0.105)
Age of Household Head	-0.0460***	-0.0538***	-0.0459***
	(0.00293)	(0.00958)	(0.00212)
Education of Household Head	0.131***	0.200***	0.125***
	(0.0125)	(0.0228)	(0.00979)
Health	0.789	0.541	0.845
	(0.590)	(0.582)	(0.595)
Insurance	1.559***	1.023***	1.617***
	(0.0844)	(0.0986)	(0.0627)
Working household members	1.424***	1.382***	1.426***
	(0.0323)	(0.0604)	(0.0276)
Constant	3.053***	3.631***	2.993***
	(0.551)	(0.599)	(0.569)
Observations	7,852	7,852	7,852
R-squared		0.239	0.354
Number of Households	2,934	2,934	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	55.44	$\chi^2(1)$	P-value = 0.000

Table A11. Income Decomposition
(Between 15 and 100 thousand inhabitants)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Income	
Wealth	-0.186	-0.728	-0.0361
	(0.474)	(0.701)	(0.574)
Sex of Household Head	0.485**		0.494***
	(0.219)		(0.174)
Age of Household Head	-0.0410***	-0.0257	-0.0412***
	(0.00582)	(0.0197)	(0.00457)
Education of Household Head	0.138***	0.0860*	0.137***
	(0.0290)	(0.0449)	(0.0216)
Health	1.262	0.537	1.310
	(1.258)	(1.210)	(1.210)
Insurance	1.161***	0.377	1.278***
	(0.160)	(0.287)	(0.146)
Working household members	1.307***	1.382***	1.317***
	(0.0702)	(0.115)	(0.0657)
Constant	2.475**	3.655***	2.348**
	(1.171)	(1.351)	(1.182)
Observations	2,101	2,101	2,101
R-squared		0.148	0.295
Number of Households	905	905	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	30.84	$\chi^2(1)$	P-value = 0.000

Table A12. Income Decomposition
(Between 2.5 and 15 thousand inhabitants)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Income	
Wealth	-0.264	-0.595	-0.230
	(0.393)	(0.400)	(0.365)
Sex of Household Head	0.439**		0.445***
	(0.194)		(0.166)
Age of Household Head	-0.0404***	-0.0140	-0.0417***
	(0.00331)	(0.0145)	(0.00507)
Education of Household Head	0.148***	0.178***	0.142***
	(0.0283)	(0.0499)	(0.0295)
Health	1.777*	1.120	1.858
	(1.015)	(1.140)	(1.215)
Insurance	1.077***	0.911***	1.090***
	(0.170)	(0.259)	(0.129)
Working household members	1.281***	1.405***	1.270***
	(0.0673)	(0.0998)	(0.0646)
Constant	2.402**	2.296**	2.398**
	(0.957)	(1.134)	(1.155)
Observations	2,381	2,381	2,381
R-squared		0.216	0.332
Number of Households	1,016	1,016	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	35.79	$\chi^2(1)$	P-value = 0.000

Table A13. Income Decomposition
(Less than 2.5 thousand inhabitants)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Income	
Wealth	-0.101	-0.354**	-0.0598
	(0.146)	(0.179)	(0.136)
Sex of Household Head	0.495***		0.494***
	(0.0944)		(0.0936)
Age of Household Head	-0.0364***	-0.0418***	-0.0360***
	(0.00213)	(0.00767)	(0.00182)
Education of Household Head	0.144***	0.170***	0.145***
	(0.0168)	(0.0325)	(0.0165)
Health	1.850***	1.995***	1.758***
	(0.530)	(0.502)	(0.517)
Insurance	0.869***	0.412***	0.953***
	(0.0765)	(0.134)	(0.0710)
Working household members	1.258***	1.174***	1.270***
	(0.0303)	(0.0538)	(0.0322)
Constant	2.174***	2.876***	2.203***
	(0.521)	(0.564)	(0.475)
Observations	9,170	9,170	9,170
R-squared		0.142	0.299
Number of Households	3,453	3,453	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	61.74	$\chi^2(1)$	P-value = 0.000

Table A14. Income Decomposition (Household Head Age under 50 years)

VARIABLES	(1) Random Effects	(2) Fixed Effects Log Income	(3) OLS
Locality between 15 and 100 thousand	-0.203*	-0.797***	-0.198*
	(0.118)	(0.304)	(0.117)
Locality between 2.5 and 15 thousand	0.130	-0.460	0.135
	(0.0989)	(0.381)	(0.0982)
Locality less 2.5 thousand	0.0130	-1.061***	0.0206
	(0.0790)	(0.312)	(0.0668)
Wealth	0.00487	-0.728***	0.0588
	(0.164)	(0.218)	(0.154)
Sex of Household Head	0.384***		0.379***
	(0.0896)		(0.0844)
Education of Household Head	0.110***	0.173***	0.107***
	(0.0131)	(0.0242)	(0.0129)
Health	2.334***	1.914***	2.349***
	(0.586)	(0.697)	(0.459)
Insurance	1.673***	1.188***	1.713***
	(0.0636)	(0.115)	(0.0689)
Working household members	1.321***	1.255***	1.324***
	(0.0314)	(0.0586)	(0.0307)
Constant	1.344**	2.956***	1.313***
	(0.532)	(0.637)	(0.419)
Observations	10,902	10,902	10,902
R-squared		0.170	0.253
Number of Households	4,413	4,413	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	52.46	$\chi^2(1)$	P-value = 0.000

Table A15. Income Decomposition (Household Head Age over 50 years)

	(1)	(2)	(3)
	Random Effects	Fixed Effects	OLS
VARIABLES		Log Income	
Locality between 15 and 100 thousand	-0.164	-1.297***	-0.129
	(0.122)	(0.339)	(0.120)
Locality between 2.5 and 15 thousand	0.154	-1.125***	0.151
	(0.126)	(0.390)	(0.102)
Locality less 2.5 thousand	0.164*	-1.308***	0.206***
	(0.0912)	(0.286)	(0.0698)
Wealth	0.233	0.369	0.166
	(0.180)	(0.243)	(0.176)
Sex of Household Head	0.259***		0.266***
	(0.0693)		(0.0777)
Education of Household Head	0.151***	0.190***	0.148***
	(0.0163)	(0.0221)	(0.00990)
Health	0.822*	0.978*	0.740
	(0.486)	(0.512)	(0.481)
Insurance	0.801***	0.461***	0.848***
	(0.0749)	(0.115)	(0.0722)
Working household members	1.335***	1.308***	1.340***
	(0.0281)	(0.0423)	(0.0301)
Constant	3.110***	4.255***	3.145***
	(0.432)	(0.653)	(0.499)
Observations	10,602	10,602	10,602
R-squared		0.203	0.369
Number of Households	4,426	4,426	
Robust Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1		
Breusch-Pagan LM	113.53	$\chi^2(1)$	P-value = 0.000

Bibliography

Aizenman, J., Cavallo, E., & Noy, I. (2015, mar). *Precautionary Strategies and Household Saving.* Cambridge, MA. Retrieved from `http://www.nber.org/papers/w21019.pdf` doi: 10.3386/w21019

Anagnostopoulos, A., & Li, Q. (2013, jun). Consumption taxes and precautionary savings. *Economics Letters*, *119*(3), 238–242. doi: 10.1016/j.econlet.2013.03.005

Angeletos, G.-m., Laibson, D., Repetto, A., Tobacman, J., & Weinberg, S. (2001). The Hyperbolic Consumption Model :. *Journal of Economic Perspectives*, *15*(3), 47–68. doi: 10.1257/jep.15.3.47

Arellano, M. (1993). On the testing of correlated effects with panel data. *Journal of Econometrics*, *59*(1), 87 - 97. Retrieved from `http://www.sciencedirect.com/science/article/pii/030440769390040C` doi: https://doi.org/10.1016/0304-4076(93)90040-C

Baiardi, D., Magnani, M., & Menegatti, M. (2014). Precautionary saving under many risks. *Journal of Economics*, *113*(3), 211–228. Retrieved from `http://www.jstor.org/stable/43575461`

Baiardi, D., Magnani, M., & Menegatti, M. (2019). The theory of precautionary saving: an overview of recent developments. *Review of Economics of the Household*. doi: 10.1007/s11150-019-09460-3

Baiardi, D., Manera, M., & Menegatti, M. (2013). Consumption and precautionary saving: An empirical analysis under both financial and environmental risks. *Economic Modelling*, *30*, 157 - 166. Retrieved from `http://www.sciencedirect.com/science/article/pii/S0264999312002817` doi: https://doi.org/10.1016/j.econmod.2012.09.006

Bande, R., & Riveiro, D. (2013). Private saving rates and macroeconomic uncertainty: Evidence from Spanish regional data. *Economic and Social Review*, *44*(3), 323–349.

Barro, R. (1999). Ramsey Meets Laibson in the Neoclassical Growth Model. *Quarterly Journal of Economics*, *November*.

Benito, A. (2006). Does job insecurity affect household consumption? *Oxford Economic Papers*, *58*(1), 157–181. Retrieved from `http://www.jstor.org/stable/3488818`

Blundell, R., Etheridge, B., & Stoker, T. (2014). *Precautionary saving for consecutive life-cycle risks* (Tech. Rep.). Mimeo.

Broadway, B., & Haisken-DeNew, J. P. (2019, jul). Keep calm and consume? Subjective uncertainty and precautionary savings. *Journal of Economics and Finance*, *43*(3), 481–505. doi: 10.1007/s12197-018-9451-0

Browning, M., & Lusardi, A. (1996). Household saving: Micro theories and micro facts. *Journal of Economic Literature*, *34*(4), 1797–1855. Retrieved from http://www.jstor.org/stable/2729595

Caballero, R. J. (1990). Consumption puzzles and precautionary savings. *Journal of Monetary Economics*, *25*(1), 113 - 136. Retrieved from http://www.sciencedirect.com/science/article/pii/0304393290900489 doi: https://doi.org/10.1016/0304-3932(90)90048-9

Campbell, J. Y. (1987). Does saving anticipate declining labor income? an alternative test of the permanent income hypothesis. *Econometrica*, *55*(6), 1249–1273. Retrieved from http://www.jstor.org/stable/1913556

Carroll, C. D. (1994). How does future income affect current consumption? *The Quarterly Journal of Economics*, *109*(1), 111–147. Retrieved from http://www.jstor.org/stable/2118430

Carroll, C. D. (1997). Buffer-Stock Saving and the Life Cycle/Premanent Income Hypothesis*. *Quarterly Journal of Economics*, *112*, 1–55. Retrieved from https://academic.oup.com/qje/article-abstract/112/1/1/1870884

Carroll, C. D., Dynan, K. E., & Krane, S. D. (2003, aug). Unemployment risk and precautionary wealth: Evidence from households' balance sheets. *Review of Economics and Statistics*, *85*(3), 586–604. doi: 10.1162/003465303322369740

Carroll, C. D., Hall, R. E., & Zeldes, S. P. (1992a). The buffer-stock theory of saving: Some macroeconomic evidence. *Brookings Papers on Economic Activity*, *1992*(2), 61–156. Retrieved from http://www.jstor.org/stable/2534582

Carroll, C. D., Hall, R. E., & Zeldes, S. P. (1992b). The Buffer-Stock Theory of Saving: Some Macroeconomic Evidence. *Brookings Papers on Economic Activity*, *1992*(2), 61. Retrieved from https://www.jstor.org/stable/2534582?origin=crossref doi: 10.2307/2534582

Carroll, C. D., & Kimball, M. S. (2001, October). *Liquidity Constraints and Precautionary Saving* (NBER Working Papers No. 8496). National Bureau of Economic Research, Inc. Retrieved from https://ideas.repec.org/p/nbr/nberwo/8496.html

Carroll, C. D., & Kimball, M. S. (2016). Precautionary saving and precautionary wealth. In *The new palgrave dictionary of economics* (pp. 1–9). London: Palgrave Macmillan UK. Retrieved from https://doi.org/10.1057/978-1-349-95121-5_2079-1 doi: 10.1057/978-1-349-95121-5_2079-1

Carroll, C. D., & Samwick, A. A. (1998). How important is precautionary saving? *The Review of Economics and Statistics*, *80*(3), 410–419. Retrieved from http://www.jstor.org/stable/2646749

Deaton. (2011, June). *The financial crisis and the well-being of americans* (Working Paper No. 17128). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w17128 doi: 10.3386/w17128

Deaton, A. (1987). Life-cycle models of consumption: Is the evidence consistent with the theory? In T. F. Bewley (Ed.), *Advances in econometrics: Fifth world congress* (Vol. 2, p. 121–148). Cambridge University Press. doi: 10.1017/CCOL0521345529.006

Deaton, A. (1991). Saving and Liquidity Constraints. *Econometrica*, *59*(5), 1221. Retrieved from https://about.jstor.org/terms doi: 10.2307/2938366

Deidda, M. (2013). Precautionary saving, financial risk, and portfolio choice. *Review of*

Income and Wealth, *59*(1), 133-156. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/roiw.12001 doi: 10.1111/roiw.12001

Dynan, K. E. (1993). How prudent are consumers? *Journal of Political Economy*, *101*(6), 1104–1113. Retrieved from http://www.jstor.org/stable/2138573

Friedman, M. (1957). A theory of the consumption function: A study by the National Bureau of Economic Research. *Princeton University Press*, 200 – 219. Retrieved from http://colmex-primo.hosted.exlibrisgroup.com/primo{_}library/libweb/action/display.do?tabs=detailsTab{&}ct=display{&}fn=search{&}doc=52COLMEX{_}ALMA2151958660002716{&}indx=1{&}recIds=52COLMEX{_}ALMA2151958660002716{&}recIdxs=0{&}elementId=0{&}renderMode=poppedOut{&}displayMode=f

Fuentes, R., & Villagomez, F. A. (2001). El Ahorro en los Hogares de Bajos Ingresos en Mexico: Un análisis por cohortes. *El Trimestre Económico*, *68*(269(1)), 109–133. Retrieved from http://www.jstor.org/stable/20857051

Gourinchas, P. O., & Parker, J. A. (2002). Consumption over the life cycle. *Econometrica*, *70*(1), 47–89. doi: 10.1111/1468-0262.00269

Guariglia, A., & Rossi, M. (2002). Consumption, habit formation, and precautionary saving: Evidence from the british household panel survey. *Oxford Economic Papers*, *54*(1), 1–19. Retrieved from http://www.jstor.org/stable/3488649

Guiso. (n.d.). Earnings uncertainty and precautionary saving. *hgfhgf*. Retrieved from https://econpapers.repec.org/article/eeemoneco/v{_}3a30{_}3ay{_}3a1992{_}3ai{_}3a2{_}3ap{_}3a307-337.htm

Hall, R. E. (1978, dec). Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence. *Journal of Political Economy*, *86*(6), 971–987. Retrieved from https://www.jstor.org/stable/pdf/1840393.pdf doi: 10.1086/260724

Hall, R. E., & Mishkin, F. S. (1982). The sensitivity of consumption to transitory income: Estimates from panel data on households. *Econometrica*, *50*(2), 461–481. Retrieved from http://www.jstor.org/stable/1912638

Kazarosian, M. (1997). Precautionary savings–a panel study. *The Review of Economics and Statistics*, *79*(2), 241–247. Retrieved from http://www.jstor.org/stable/2951457

Keynes, J. M. (2018). *The general theory of employment, interest, and money.* doi: 10.1007/978-3-319-70344-2

Khan, A., & Lidofsky, B. (2019). *Growth, Uncertainty and Business Cycles in an Overlapping Generations Economy* (Tech. Rep.).

Kimball, M. S. (1990). Precautionary Saving in the Small and in the Large. *Econometrica*, *58*(1), 53. doi: 10.2307/2938334

Kouri, P. J. K. (1986). Franco modigliani's contributions to economics. *The Scandinavian Journal of Economics*, *88*(2), 311–334. Retrieved from http://www.jstor.org/stable/3439985

Laibson, D. (1997). Golden Eggs and Hyperbolic Discounting. *Quarterly Journal of Economics*, *112*(2), 443–477. doi: 10.1162/003355397555253

Leland, H. E. (1968). Saving and Uncertainty: The Precautionary Demand for Saving. *The Quarterly Journal of Economics*, *82*(3), 465. doi: 10.2307/1879518

Li, J. (2012, 07). Precautionary saving in the presence of labor income and interest rate risks. *Journal of Economics*, *106*, 1-16. doi: 10.1007/s00712-011-0244-6

Limosani, M., & Millemaci, E. (2014, jul). Precautionary savings of agents with heterogeneous risk aversion. *Applied Economics*, *46*(20), 2342–2361. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/00036846.2014.896983 doi: 10.1080/00036846.2014.896983

Liu, D., & Menegatti, M. (2017, 04). Precautionary investment in wealth and health. *Journal of Risk and Insurance*. doi: 10.1111/jori.12212

Loewenstein, G., & Thaler, R. H. (1989, nov). Anomalies: Intertemporal Choice. *Journal of Economic Perspectives*, *3*(4), 181–193. doi: 10.1257/jep.3.4.181

Lugilde, A., Bande, R., & Riveiro, D. (2018, dec). Precautionary saving in Spain during the great recession: evidence from a panel of uncertainty indicators. *Review of Economics of the Household*, *16*(4), 1151–1179. doi: 10.1007/s11150-018-9412-6

Lugilde, A., Bande, R., & Riveiro, D. (2019, apr). Precautionay Savings: A Review of the Empirical Literature. *Journal of Economic Surveys*, *33*(2), 481–515. doi: 10.1111/joes.12284

Lundberg, E. (1971). Simon kuznets' contribution to economics. *The Swedish Journal of Economics*, *73*(4), 444–461. Retrieved from http://www.jstor.org/stable/3439225

Lusardi, A. (1993). Euler Equations in Micro Data: Merging Data from Two Samples. *Discussion Paper Tilburg University, Center for Economic Research*, *1993-4*.

Mabille, P., Gertler, M., Kozlowski, J., Midrigan, V., Philippon, T., Nieuwerburgh, S. V., . . . Zin, S. (2019). *Aggregate Precautionary Savings Motives ** (Tech. Rep.).

Michler, J. D., & Balagtas, J. V. (2017, mar). The importance of the savings device in precautionary savings: Empirical evidence from rural Bangladesh. *Agricultural Economics (United Kingdom)*, *48*(2), 129–141. doi: 10.1111/agec.12320

Modigliani, F. (2019, jan). Utility Analysis and the Consumption Function. In *The collected papers of franco modigliani.* The MIT Press. doi: 10.7551/mitpress/1923.003.0004

Pericoli, F., & Ventura, L. (2012). Family dissolution and precautionary savings: An empirical analysis. *Review of Economics of the Household*, *10*(4), 573–595. doi: 10.1007/s11150-011-9127-4

Rossi, M., & Sansone, D. (2018, jun). Precautionary savings and the self-employed. *Small Business Economics*, *51*(1), 105–127. doi: 10.1007/s11187-017-9919-x

Rothschild, M., & Stiglitz, J. E. (1971). Increasing risk ii: Its economic consequences. *Journal of Economic Theory*, *3*(1), 66 - 84. Retrieved from http://www.sciencedirect.com/science/article/pii/0022053171900342 doi: https://doi.org/10.1016/0022-0531(71)90034-2

Sandmo, A. (1970). The effect of uncertainty on saving decisions. *The Review of Economic Studies*, *37*(3), 353–360. Retrieved from http://www.jstor.org/stable/2296725

Shefrin, H. M., & Thaler, R. H. (1988). The Behavioural Life-Cycle Hypothesis. *Economic Inquiry*, *26*(4), 609–643. doi: 10.1111/j.1465-7295.1988.tb01520.x

Tversky, A., Kahneman, D., & Slovic, P. (1974). Judgement under Uncertainty: Heuristics and Biases Summary. *Science*, *185*(4157), 1124–1131.

Velandia Naranjo, D., & van Gameren, E. (2016, jun). Precautionary Savings in Mexico: Evidence From the Mexican Health and Aging Study. *Review of Income and Wealth*, *62*(2), 334–361. doi: 10.1111/roiw.12164

Villagomez, F. A. (1998). Ahorro Privado y Restricciones de Liquidez en Mexico. *Investigacion Economica*, *58*(225), 82–98. Retrieved from http://www.jstor.org/stable/42777514

Weil, P. (1993). Precautionary savings and the permanent income hypothesis. *The Review of Economic Studies*, *60*(2), 367–383. Retrieved from http://www.jstor.org/stable/2298062

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data* (Vol. 1) (No. 0262232588). The MIT Press. Retrieved from https://ideas.repec.org/b/mtp/titles/0262232588.html

Zeldes, S. P. (1989). *Consumption and Liquidity Constraints: An Empirical Investigation* (Vol. 97; Tech. Rep. No. 2).