the review of income and wealth

Review of Income and Wealth
Series 62, Number 2, June 2016
DOI: 10.1111/roiw.12164

PRECAUTIONARY SAVINGS IN MEXICO: EVIDENCE FROM THE MEXICAN HEALTH AND AGING STUDY

by Durfari Velandia Naranjo*

Fundación Santa Fe de Bogotá, Centro de Estudios e Investigación en Salud, Bogota

and

Edwin van Gameren

El Colegio de México, Centro de Estudios Económicos, Mexico City

Precautionary saving is the additional saving done by individuals to protect them financially in situations of uncertainty and reduce their vulnerability for negative shocks that may affect their consumption levels. This paper investigates the existence and extent of savings motivated by precaution in Mexico for people aged between 50 and 75, using data from the Mexican Health and Ageing Study 2003. The empirical strategy is based on a test of the direct relationship between the accumulated wealth and the uncertainty generated by the social security status, in particular the availability of health insurance, accounting also for the expectation to receive a retirement pension. The endogeneity-corrected estimates do not yield results that unequivocally support the existence of private savings as a risk protection mechanism, implying that the public protection system has an important role in reducing the vulnerability of the population studied.

JEL Codes: C21, C26, D12, D31, D91, E21

Keywords: financial protection, precautionary saving, social security, uncertainty, vulnerability, wealth

1. Introduction

Precautionary saving is the private saving done by individuals in situations of uncertainty as a mechanism to ensure a certain level of consumption in the future. It could be thought that in Mexico precautionary saving would be frequent, since access to social security is inadequate for a wide section of the population. Traditionally, health insurance coverage in Mexico has been limited. As in other Latin American countries with an insurance structure covering only formal sector workers, in Mexico health insurance coverage rate is low and entitlement to a retirement pension is even lower, which results in a greater level of uncertainty about the future in comparison with countries with better social protection systems. Lack of public protection suggests that people have a reason to arrange their financial protection individually, for example with precautionary savings.

Note: We are grateful to two anonymous referees and the editor of this journal for their constructive comments, as well as to participants of the European Society of Population Economics (Berne, Switzerland), where an early version was presented. Both authors acknowledge financial support from El Colegio de México.

*Correspondence to: Durfari Velandia Naranjo, Fundación Santa Fe de Bogotá, Centro de Estudios e Investigación en Salud, Bogota, Colombia (durfari@gmail.com).

The main purpose of this paper is to find out whether precaution is a motive for saving in Mexico and, if so, to estimate its magnitude among Mexicans who were aged 50 to 75 in 2003. This age range was chosen because, in spite of the official retirement age limit in Mexico being below 75, approximately 18 percent of the working population in 2003 was between 65 and 75 years of age.

The strength and magnitude of the effects of uncertainty on savings is still a topic of debate (Carroll and Kimball, 2008; Mastrogiacomo and Alessie, 2013). The first theoretical model suggesting saving motivated by uncertainty was introduced by Leland (1968) as a problem of income distribution between saving and consumption in a two-period time horizon. Since then, conclusions have extended to the case of multiple periods (Carroll and Kimball, 2005, 2008). Empirical results range from precautionary saving not being done at all, to a value of 2, 10, and even 50 percent of accumulated wealth (Guiso *et al*., 1992; Lusardi, 1997, 1998; Hurst *et al*., 2010). Controversy over the relationship between uncertainty and savings has led to empirical implementations taking different routes to account for factors that could explain such widely varying results. In particular, empirical studies directly investigating the effect of uncertainty on individual savings have revealed the importance of exogeneity of the risk variables in use (Browning and Lusardi, 1996; Lusardi, 1997, 1998; Guiso *et al*., 2002; Kennickell and Lusardi, 2005), and the relevance of controlling for the difference between individuals with and without businesses, since the latter accumulate more and the volatility of their income is due to reasons other than precaution (Hurst *et al*., 2010). In general, it has been identified that endogeneity between income variance and occupation selection generates negatively biased estimates (Lusardi, 1997; Guiso *et al*., 2002), whereas positively biased estimates have been found when there is no adequate control over the business/no business condition (Hurst *et al*., 2010). Evidence for precaution as a motive for saving in Mexico has been provided from two perspectives: first, on the basis of aggregated-level series and using economic inflation levels as a source of uncertainty (Villagómez, 1998); and second, on the basis of microeconomic data from rural and semi-urban low-income populations (Villagómez and Fuentes, 2000).

This paper's contribution focuses on broadening the study of the relationship between uncertainty and saving in Mexico to a national level by using micro-data. Unlike the studies performed in the country, our conclusions are representative of the urban and rural population at all income levels, although they are limited to individuals aged 50 to 75. In addition, this study contributes to conclusions about empirical regularities by enabling international comparison. More generally, the paper sheds light on the role of precautionary saving in developing economies where many people would have more reasons to be concerned about future income while seeing their saving opportunities limited by their low income levels at the same time.

Where precautionary saving is the share of saving in a given period caused by the perception of future uncertainty, the accumulation of these savings over time gives the level of precautionary wealth caused by uncertainty. Keeping in mind such differentiation, we estimate a direct relationship between accumulated wealth and uncertainty in order to establish whether part of that wealth had precautionary motives; a methodological implementation that is innovative for Mexico. In

general, our methodology consists in an estimation of a financial and total net wealth measure similar to the one used by Hurst *et al.* (2010), Lusardi (1998), Guiso *et al.* (1992), and Starr-McCluer (1996). Our sources of uncertainty relate to the incomplete social security system. As the prime measure, we consider the individual's health insurance status (covered or not). Entitlement to medical care by means of health insurance can be acquired directly through one's labor market association or, indirectly, through a relative, but due to the large informal economy in Mexico a large share of the population has limited access to affordable health care services. Absence of health insurance coverage gives a direct reason for precautionary saving in order to be able to cover unforeseen expenses due to health eventualities. In addition, we control for the (positive/lack of) expectation of a retirement pension in the future. The expectation to have a steady income after retiring from the labor market is related to participation in a retirement pension fund. This differs from many other countries with more general and profound pension systems, in which the uncertainty regarding retirement pensions is related more to the individual's capacity to recollect the required amount to receive a sufficient pension, as well as to capital markets in general and to individual accounts' yield in particular (Mastrogiacomo and Alessie, 2013). In Mexico, the pension system in 2003 was based on a common savings plan in institutions such as the Mexican Institute for Social Security (IMSS) or the State Workers Institute for Social Services and Security (ISSSTE), where people with formal sector jobs acquired pension rights primarily based upon the duration of the payments of contributions to the system. Hence, a labor history consisting of alternating formal and informal jobs (which is quite common in Mexico) reduces pension expectations and may give a reason for additional saving to cover a partly foreseeable income reduction.

Our hypothesis is that there is a positive relationship between risk and accumulated wealth, so that the non-covered population is expected to have accumulated wealth as a way of protection against health eventualities and the expected absence of a retirement pension. We use data from the Mexican Health and Aging Study 2003 (MHAS) which is representative of the Mexican population aged 50 or older at a national level. We take advantage of the specificity of the demographic, health, and wealth information gathered by the study to construct the net financial wealth as a measure of accumulation in high liquidity assets and short-term savings, and the net total wealth that in addition to financial wealth includes less liquid assets such as real estate. In addition to the uncertainty measures, in the equation we include control variables that account for other motivations for wealth accumulation. Through the estimation of permanent income, we recognize that wealth must be understood as the result of accumulating part of the non-consumed income period after period. Obviously, the above-mentioned sources of uncertainty are not the only risks that people are faced with; for example, climate-related risks (rain, flooding, mis-harvests) and earthquakes are serious threats, but information about the (individualized) risks for these events is not available in our data. Acknowledging that uncertainty affects individuals differently depending on their level of wealth, and that an important percentage of the population in the sample presented financial wealth equal to or lower than zero (more debts than accumulated assets), the relation between wealth and uncertainty was estimated in

quartiles using quantile regressions. The main problem regarding the estimation method lies in the possible endogeneity of the uncertainty variables since, when having greater wealth, more resources can be dedicated to acquiring health insurance and/or contribute to a pension fund. We account for endogeneity by applying a control function strategy using gender and indicators of the size of the respondent's localities of residence as control (or instrumental) variables.

Our estimations do not provide evidence of a robust negative relationship between wealth and uncertainty; that is, there is no evidence that people in the sample are using their own resources as protection against uncertainty related to the incomplete social security coverage. There is some evidence that the absence of pension expectations is compensated by additional savings in liquid and less liquid wealth, but for the lack of health insurance we do not find increased savings out of precaution; in contrast, we find higher savings among those with insurance. The effects primarily occur in the median and the upper quartile of the distribution, while in the poorest quartile we do not find any effects. This suggests that public policies regarding financial protection may be important, considering that health expenses tend to increase at the latest stages of life while labor income tends to reduce or disappear.

The paper continues as follows. Section 2 contains a review of the international literature on precautionary saving as well as the existing evidence for Mexico, and it describes the relevant institutional context. Section 3 deals with the central theoretical points guiding our analysis on uncertainty, saving and wealth, and Section 4 presents a descriptive analysis of our data. Section 5 describes the implemented empirical strategy, and Section 6 contains our results. Section 7 presents a discussion and the main conclusions of this study.

2. Literature Review

Empirical approaches used to identify the strength and magnitude of precaution as a motive for saving can be classified into four groups according to the estimation methodology and the data sources they employ. While some studies estimate an Euler consumption equation, some others have implemented dynamic optimization life-cycle models using micro-data, and others have done estimations based on experimental data from survey modules inquiring about the interviewees' choices in a hypothetical risky situation (Browning and Lusardi, 1996; Carroll and Kimball, 2008).

Finally, and from a different perspective, there are the studies constituting this paper's methodological basis; that is, those who perform direct estimations of the relationship between wealth and some uncertainty proxy variables by means of a regression model. In principle, from these estimates it would be possible to calculate the level of wealth if uncertainty is equal to zero and, taking this value as a reference, the magnitude of precautionary wealth could be evaluated (Carroll and Kimball, 2008). For this paper, the studies by Guiso *et al.* (1992, 2002), Lusardi (1997, 1998), Starr-McCluer (1996), Hurst *et al.* (2010), and Kennickell and Lusardi (2005) have been taken as main references.

Guiso *et al.* (1992) demonstrated the existence of precautionary savings among employed Italians aged less than 65 using accumulated wealth divided by

estimated permanent income as a dependent variable, introducing subjective income risk as a risk measure. The subjective income variation variable was constructed with information regarding the respondent's nominal salary increase for the year following the survey's, and the inflation expected by the interviewees. The main result was that precaution explained 2 percent of accumulated wealth. However, demonstrating precautionary saving by the relationship between accumulated wealth and income variance is not without problems, because to a certain extent the individuals' choice of an occupation can be linked to their attitudes to risk, so that the more risk-averse people will pick occupations with less income risk (Lusardi, 1997; Guiso *et al*., 2002). Lusardi (1997) reproduced Guiso *et al*.'s (1992) work, but accounted for endogeneity by instrumenting the subjective risk variable with the regional unemployment rate, dummies by region, and years of work experience. The magnitude of precautionary savings found was 20 percent (and 16 percent when only those with fully paid housing were included), which led to the conclusion that self-selecting occupations constitutes a kind of insurance against income risk.

Lusardi (1998) was the first to estimate precautionary savings using a subjective risk measure for the U.S., with information regarding working people aged between 51 and 61 recollected by the Health and Retirement Study (HRS). The subjective probability to lose the job during the year following the interview was introduced as the income risk variable. This risk measure is related to variations in income, but is not determined by the respondent's wealth, and therefore it can be considered as adequate exogenous variation. The precautionary savings estimations also included controls for risk aversion levels (low, high, and moderate), inheritance, probability to live more than 65 years, time horizon in which the individuals planned their personal finances (short-term, medium-term, and long-term) and health. Results indicated that 1–3.5 percent of total wealth (divided by permanent income) was accumulated due to precaution; this percentage was 2–4.5 percent when the regression was applied with accumulated financial wealth.

Hurst *et al*. (2010) separated individuals with or without a business of their own, arguing that business owners face a volatile risk in comparison with individuals with other types of labor relationship; they also have great amounts of wealth, but that this has more to do with their businesses' needs than with precaution. With estimates performed on separate samples from the Panel Study of Income Dynamics (PSID) in the U.S., precautionary saving explained up to 32 percent of wealth for those who owned a business and up to 10 percent for those who did not; meanwhile, when precautionary saving was calculated jointly for individuals, this percentage increased to 47.5 percent. Mastrogiacomo and Alessie (2013) quantified the relative importance of precautionary saving in the Netherlands by including subjective earnings uncertainty faced by the second income earner in addition to the household head's. They found that uncertainty could account for 30 percent of the accumulated savings.

We have so far referenced empirical literature that considered income risks, addressing problems associated to the risk indicator's endogeneity, while controlling for the differences among the individuals in the data samples used. However, the effect of other types of risks on saving is not a widely studied area. Starr-McCluer (1996) estimated the relationship of health risk with the logarithm

of accumulated wealth (liquid assets, financial and total wealth). Having health insurance or not was the risk measure employed, so that a negative relationship between health insurance and wealth would support the theory of precaution as the motive for saving; those who are not insured against health risks would accumulate greater wealth in order to face any eventuality, in comparison with those who are insured. Using information from the U.S. on respondents younger than 65, Starr-McCluer (1996) applied a selection model estimating jointly the wealth level and the health insurance coverage probability. A variable indicating the proportion of individuals hired in companies with over 100 workers was used as a determinant of health insurance but not wealth. Results were mixed, and the health risk indicator was significantly different from zero but positive; that is, having health insurance and thus being exposed to a lower risk was positively associated with wealth, a result contrary to what was expected.

2.1. *Empirical and Institutional Background in Mexico*

The study of precautionary savings in Mexico has been approached mainly from the macroeconomic perspective, which relates aggregate private saving to uncertainty caused by inflation. These studies confirmed the existence of precautionary saving in the country, but have also shown a negative relationship between financial saving and inflation that rules out precaution as a motive for saving (Villagómez, 2008).

From the microeconomic perspective, support for precautionary saving was established with the Survey on Saving, Popular Credit and Microfinance, analyzing financial systems among low-income households in rural and semi-urban areas. Results showed that 41 percent of the respondents saved, and 75 percent of them did so as a precautionary measure to face unexpected future expenses; hence, about 30 percent of the respondents stated they saved for precautionary reasons (Villagómez, 2008). A common characteristic of this type of savers was that they did not channel their savings toward the financial system but used other saving mechanisms, for example keeping their cash at home. From the same perspective, evidence from the National Household Income and Expenditure Survey found that among household heads aged between 15 and 50, saving in rural households was greater than in urban households. Moreover, rural households continued to save beyond retirement age (considered to be 75). Meanwhile, by comparing the poorest households with the least poor ones, it was found that, when the head of the household is around 60 years old, poorer households increased their saving, while the others did not modify it (Villagómez and Fuentes, 2000).

When looking at the Mexican economic background it is reasonable to consider that Mexican people face high levels of income-related uncertainty and are relevantly exposed to other types of risks. A major source of risks is constituted by the large proportion of the population working in the informal sector. By 2003, when the data used in this paper were gathered, about 50 percent of Mexican population was working in the informal labor market, which implied that they were not covered by the social security system (OECD, 2005), and therefore had very limited or no access to health insurance or to a pension fund to be used in the future during retirement.

Access to health care is fragmentary, dependent on employment, and with differences regarding offered services and quality and access to them. Workers in the formal sector and their relatives receive health care through insurance within the social security system; workers outside the formal sector access health care services provided by the Ministry of Health institutions; finally, the private sector offers health care services for those who can afford to pay for them (OECD, 2005; Homedes and Ugalde, 2009). One of the main problems of the Mexican health care system is inequality, a situation worsened by the system's vertical organizational structure and the out-of-pocket expense the population has to cover. Services provided by the social security system are exclusively for those subscribed to it and contributing to its financial support through payroll taxes. Meanwhile, the institutions of the Ministry of Health offer services within their own facilities for non-enrolled individuals who receive the services in a subsidized way, but have to face access restrictions due to services and medication being assigned with an availability criterion that varies among states and between urban and rural areas. People who do not receive public system services must use their own resources to obtain them from the private sector. A sign that health care services provision is insufficient in terms of offer and quality is that half of the country's health expense is concentrated in the private sector (OECD, 2005).[1]

Furthermore, the public pension system in Mexico has a fragmented structure, with plans being offered by social security institutions, state governments, and semi-public companies. Until 1997 the retirement pensions in the private sector were earnings-related and administered on a pay-as-you-go basis by the Mexican Institute for Social Security (IMSS), the most important pension program in the country. It granted retirement pensions to workers aged 65 or above, and to workers dismissed at the advanced age of 60 or above, where eligibility required at least 500 weeks of contributions and almost 25 years for a full pension (Villagómez, 2008). Due to the large informality in the Mexican labor market, many people do not fulfill the minimum requirements and hence do not receive a pension even after contributing for several years. Although nowadays the pension system is based on individual retirement savings accounts, the IMSS pension system is the most relevant for our analysis sample of people aged 50 and older, since it provides greater retirement benefits for this age category that constitutes the transition generation with rights to claim under the old system as long as they started contributing before 1997 (Aguila, 2007). For employees in the public sector, the State Workers Institute for Social Services and Security (ISSSTE) is responsible for their pensions, with regulations that differ in detail

[1]We have not included the introduction of the *Seguro Popular* (*SP*; "Popular Health Insurance") aimed at poor families not covered by the social security system, due to our data being previous to the implementation of this reform (pilots were implemented in 2002 while the official roll-out started in 2004 and was completed in 2012). We do not believe this exclusion affects the relevance of our study. The *SP* does not offer a pension plan for retirement or disability, and although it has been suggested that it reduces the probability of suffering catastrophic health-related expenses by approximately 23–50 percent (King *et al*., 2009; Galárraga *et al*., 2010), uncertainty caused by health risk is still important, since the *SP* covers a limited number of illnesses and the health care system's fragmented structure remains the same at a national level. Also, the quality gap persists among the social security institutions and those who take care of individuals subscribed to *SP* (the Ministry of Health institutions), a fact that is associated to the null increase in use of health services or improvement of health due to the *SP* (Barros, 2008).

from the IMSS pensions but essentially follow the same structure. The reform to individual savings accounts for the ISSSTE pensions has only been implemented since 2007.[2]

3. Theoretical Aspects of Precautionary Savings

The first theoretical model introducing uncertainty and risk as variables for consumption decisions was developed by Leland (1968); it constitutes the basis on which diverse generalizations and variations have been introduced on the problem of intertemporal consumption maximization which leads to precautionary saving. Specifically, the buffer stock saving model analyzes precautionary saving in a context in which consumers wish to keep the same target wealth level (buffer stock of wealth) in each period, and hence their consumption decisions and saving dynamics are linked to their initial wealth. We briefly describe this model in order to illustrate how uncertainty generates saving, and how the magnitude of such saving is related to level of wealth (Carroll and Kimball, 2005, 2008).

A representative consumer who is exposed to some future risk but is not subject to (present or future) liquidity constraints has a maximization problem to solve in each period that can be described as:

$$V_t(\omega_t) = \max_{\{c_t\}} \{u(c_t) + E_t[\beta V_{t+1}(\omega_{t+1})]\} \tag{1}$$

$$\text{subject to} \quad \omega_{t+1} = R_{t+1}(\omega_t - c_t) + y_{t+1}, \tag{2}$$

with u a utility function, and V a value function reflecting discounted utility from an infinite number of future periods, with $V'''(\cdot) > 0$, $u'''(\cdot) > 0$. The positive third derivative is a necessary condition to enable saving as a positive function of uncertainty; it allows for marginal utility to decrease more slowly as consumption increases (Leland, 1968).[3] Savings in each period are the result of the difference between wealth and consumption, $s_t = \omega_t - c_t$. The state variable, ω_{t+1}, denotes wealth available in period $t + 1$, and is the result of accumulated wealth at t and its yield—R = (1 + r) being the real interest factor and r the real interest rate—plus income in $t + 1$, y_{t+1}. Factor β represents the time preference factor. This problem does not have a definite solution but is solved numerically.

In each period, the consumer chooses a level of consumption, c_t, that maximizes the expected present value of the utility function, $V_t(\omega_t)$. By substituting equation (2) in (1) and with saving expressed in terms of wealth and consumption, $s_t = \omega_t - c_t$, we obtain the Bellman equation in terms of wealth with saving s_t as the control variable,

[2]In recent years a debate about universal pensions has evolved. In 2001 the Federal District (Mexico City) introduced a pension for persons over 70 years old not covered by other pension systems. Gradually the minimum age has been reduced while similar social programs have started in other states (Willmore, 2014).

[3]If the utility function was quadratic, marginal utility would be linear, which in turn would imply that the change in utility due to a change in consumption would be the same regardless of the level of consumption, since the second derivative would be constant (Leland, 1968).

$$V_t(\omega_t) = \max_{\{s_t\}} \{u(\omega_t - s_t) + E_t[\beta V_{t+1}(R_{t+1}s_t + y_{t+1})]\}. \tag{3}$$

Setting the first-order conditions of (3) with respect to the state variable ω_t equal to zero gives

$$u'(\omega_t - s_t) = E_t[\beta V'_{t+1}(R_{t+1}s_t + y_{t+1})], \tag{4}$$

which implicates that the choice of s that satisfies equation (4) equalizes the marginal utility of (current) consumption to the marginal discounted present value of wealth (available for future consumption), leaving no room for an increment in wealth by reassigning saving to consumption or vice versa.

Figure 1 illustrates the optimality condition (4) and shows how uncertainty generates precautionary saving when V and u are utility functions presenting constant relative risk aversion (CRRA), and income comprises uncertainty, $y_{t+1} = \bar{y} + \vartheta_{t+1}$, represented by a stochastic income component, ϑ. The level of saving without uncertainty, $\bar{s}$, is determined by the intersection of the marginal utility curve, $u'(\omega_t - s_t)$, and $\beta V'_{t+1}(R_{t+1}s_t + \bar{y})$, the marginal value the consumer would get at $t + 1$ from saving s_t in the previous period if she was certain to receive income $\bar{y}$ in $t + 1$. When income at $t + 1$ is uncertain, marginal utility of the first period must be equalized to the expectation of the marginal value function, the latter expectation being formed as a convex combination of the marginal values associated to each possible result. If, for example, with probability p income $\bar{y} + \eta$ is expected at $t + 1$, and with probability $(1 - p)$, $\bar{y} - \eta$ is received, then the marginal value expected by the consumer will be on the segment formed by the points $\beta V'_{t+1}(R_{t+1}s_t + \bar{y} + \eta)$ and $\beta V'_{t+1}(R_{t+1}s_t + \bar{y} - \eta)$. As Figure 1 illustrates, if for example the chosen saving level at t is $s_t = \bar{s}$, the marginal value expected at $t + 1$ is given by $p\beta V'_{t+1}(R_{t+1}s_t + \bar{y} + \eta) + (1 - p)\beta V'_{t+1}(R_{t+1}s_t + \bar{y} - \eta)$. The new expected marginal value function, $\beta E_t[V'_{t+1}(R_{t+1}s_t + \bar{y} + \vartheta_{t+1})]$, for each saving level is constructed from the convex combinations of good and bad results. The optimal saving level under uncertainty is obtained in s^*, where the new marginal value

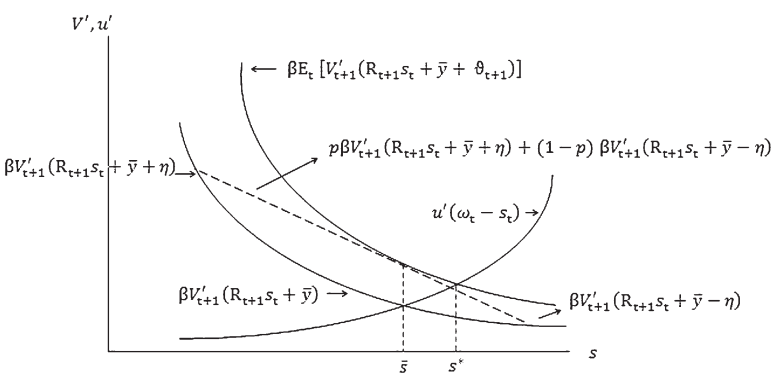

Figure 1. Marginal Utility of Wealth and Consumption

Source: Based on Carroll and Kimball (2005).

curve including uncertainty intersects with the marginal utility of consumption. Precautionary saving is then given by the distance between s^* and $\bar{s}$, the distance between optimal saving under uncertainty and the optimum when future income is certain.

In the case of liquidity constrained consumers the problem becomes more complicated, but under fairly general conditions it can be shown that liquidity constraints also generate a motive for precautionary savings, mainly because those consumers have less flexibility in their responses when confronted with a financial shock (Carroll and Kimball, 2005). Furthermore, currently unconstrained consumers who fear that in the future the liquidity constraints may become binding, have an incentive to raise savings beyond the level that would be optimal without liquidity constraints, while the amount of precautionary savings also increases by adding more risks. However, for those initially facing liquidity constraints, adding risks may not induce enough precautionary motives to increase savings.

The analysis above starts from a given initial wealth level. Solving the optimization problem for all possible wealth levels gives rise the consumption function pictured in Figure 2. It compares the relationship between precautionary savings and wealth and hence, the relationship between consumption and wealth in total certainty and under uncertain conditions. The "Permanent Income" curve represents income at $t + 1$ plus the interest on savings; this line represents the level of expenses at which the consumer maintains a constant expected wealth level. An impatient consumer who does not face uncertainty (or liquidity constraints) would choose to spend above this permanent income in each period (Carroll and Kimball, 2008), an (unsustainable) situation represented by curve $\bar{c}(\omega)$. If this impatient consumer faces an uncertain risk at $t + 1$, his consumption path will be concave (Carroll and Kimball, 2005) and lie below the consumption under

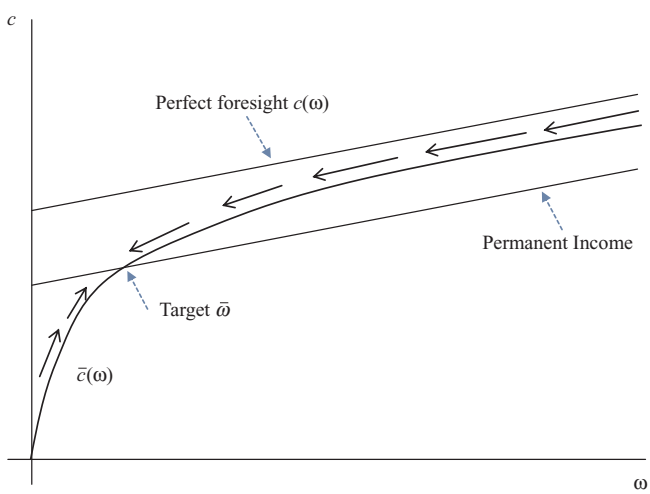

Figure 2. Consumption Function

Source: Based on Carroll and Kimball (2008).

certainty, as illustrated by the consumption function $c(\omega)$. The distance $\bar{c}(\omega) - c(\omega)$ between the two curves is the difference in consumption due to uncertainty and thus measures precautionary savings at every wealth level ω. The target wealth $\bar{\omega}$ is defined by the intersection between the expenses that would maintain a constant expected wealth ("Permanent Income") and the consumption curve. For impatient uncertain consumers with accumulated wealth above $\bar{\omega}$, consumption is above the permanent income and accumulated wealth decreases until the target is reached. When wealth is below the target, consumption is lower than the permanent income and as a consequence the consumer accumulates more wealth. However, due to the concavity of the consumption function, the propensity to consume $c'(\omega)$ is high; a small increase in wealth (moving toward the target level) is expected to result in a reduction of saving out of precaution in favor of consumption.

Hence, those with the lowest wealth levels have the highest incentives for precautionary saving, but at the same time have the highest propensity to adjust their behavior in favor of consumption when the financial situation becomes more relaxed if additional income is received or more wealth has been accumulated. This theoretical framework highlights that the importance of saving with a precautionary motive depends in a complex way on uncertainty, risk aversion, liquidity constraints, time preference, permanent income, initial wealth, and other factors. It is expected that a higher level of uncertainty increases the reasons to save out of precaution, while more impatient consumers are less likely to save. In Section 5 we discuss the empirical set-up used to identify the importance of precaution, following lines set out by other researchers who in essence link the observed wealth levels to the potential explanatory factors. Our analysis is done by quartiles taking into account differences in the population's wealth level.

4. The Data

The data used for our analysis come from the Mexican Health and Aging Study (MHAS), a survey representative at the national level for the Mexican population born before 1951; 13 million people approximately. The survey was designed to study socioeconomic effects of aging in Mexico. In order to allow for international comparison, information was gathered in a format similar to the one used by the Health and Retirement Study (HRS) in the U.S. and the Survey of Health, Aging and Retirement in Europe (SHARE) (Puig *et al.*, 2006). The MHAS was applied in 2001 and 2003 in a panel data format; it inquired about income, accumulated assets, and consumption, and also gathered historical and current information about health, use of health care services, and employment among the interviewed individuals.[4] In those households where the selected individual was married (or in a relationship) and living with the partner, the survey was also applied to the partner regardless of their age, so that the total number of respondents was 15,230, 5424 of which were partners of the selected respondents (Wong and Espinoza, 2003).

[4]Recently the third wave, held in 2012, has become available. All data and documentation can be found at http://www.mhasweb.org/.

Our empirical analysis was done at household level, where the data sample was limited to the 3321 households in which at least one partner aged over 50 was employed. The selected individuals were those who, at the time of the survey in 2003 were working, not working but with a job, looking for a job, or not declared as retired from the labor market; and who in addition were younger than 75 in 2001.[5] In households with two working partners we used the information on the household head for the analysis (we defined the household head as the one who brings in the larger share of the income, or in case of a tie, the one with better health or pension coverage). Age selection was done in order to analyze saving with precaution as a motive while people are active in the labor market; despite the official retirement age in Mexico being 65, the amount of people aged between 65 and 75 in the MHAS 2003 represented 17.53 percent of the total amount of working people, which we considered an important percentage of the population that should be covered by the analysis.[6] With the aim to reduce the sources of variability of the information on income and wealth, individuals who experienced changes in partner or marital status between 2001 and 2003 were not taken into account. One of the advantages of the MHAS when compared to other household income information sources (such as the National Household Income and Expenditure Survey, ENIGH) is that information on income, wealth, and assets is gathered with the same instrument. Additionally, the survey asked rescue questions for income, wealth, and assets when there was no answer from the respondents; so instead of a missing result, a range value for those variables was recorded. It allowed us to reduce non-responses and gather more accurate information (Wong and Espinoza, 2003; Wong *et al.*, 2007).[7]

4.1. *Variables*

In order to estimate precautionary saving, two wealth measures were constructed as dependent variables following Lusardi (1998), Hurst *et al.* (2010), and Starr-McCluer (1996): a measure of more liquid wealth that could be used to cover (short-term) eventualities caused by some unexpected situation, as well as a more general and less liquid wealth measure that accounts for the possibilities to acquire resources and use them as collateral or sell them in order to face unforeseen expenses in the longer run. The more liquid measure, *net financial wealth*, adds the value of stocks, bonds, savings account, investments, and their yield, a valuation of other liquid assets net of short-term debts, and pensions and institutional and

[5]We used information from those who answered the survey directly. Interviews answered by a substitute informant were disregarded; we considered the direct informant would provide more accurate information in the case of questions about past events such as labor history and perceived health, since these entail personal opinions.

[6]Labor force participation among elderly men in Mexico is generally larger than in other OECD countries, with a striking difference among those aged over 65. More than 50 percent of them report to be working (OECD, 2007). Participation among elderly women is smaller, but the rate of 15 percent for women over 65 is still higher than in other OECD countries. There are indications that those with better pensions are more likely to retire (van Gameren, 2008).

[7]The MHAS uses the same technique as the HRS to collect income data. For the HRS, the household wealth and income variables report values that are substantially higher than those from surveys specifically aimed at collecting information on household income and expense. We presume that the MHAS, as has been suggested for the HRS, captures income and wealth with more accuracy and that underreporting is better controlled for (Browning and Lusardi, 1996).

personal transfers.[8] The *net total wealth*, our less liquid measure, includes the net financial wealth together with the value of real estate (either for living or renting), business assets, and private means of transportation, all net of debts.

The main challenge in estimating the relationship between uncertainty and wealth lies in including, among the independent variables, observable, exogenous risk variables with few measurement errors which vary enough between individuals to make it possible to use them as explanatory variables and evaluate their significance (Browning and Lusardi, 1996). The uncertainty indicators in our estimations are both associated with the incomplete social security system in Mexico in general; and in particular, on the one hand, with the health-related financial risk caused by the lack of health insurance coverage,[9] and on the other hand, with the absence of expectations to receive a pension indicating a perceived uncertainty which would directly affect future income. The former could be considered a short run risk of unexpected health care expenditures in case of falling ill, generating a clear incentive to save out of precaution; while the latter has a vision more in the long run that can also be interpreted as a control, allowing us to differentiate savings for retirement motives, that is, savings to finance consumption during the period after retirement from the labor market. We will not assume that these variables are exogenous; instead, we will analyze their endogeneity by applying a control function approach (see Section 5).

4.2. *Descriptive Statistics*

Table 1 presents the main socio-demographic characteristics of the 3,321 household heads in households with at least one working member aged between 50 and 75 forming our sample. In the first column it can be seen that men represent 74.35 percent and women 25.65 percent of the household heads used in the analysis. When descending the age ranks of the population, the groups decrease in size; overall, about 81.4 percent of the observations are for those aged between 50 and 65. Among the contract categories, 56.25 percent of the sample worked as employees with a fixed salary during 2003, while 30.68 percent worked independently. The second and third columns show the distribution of the observations in each category according to health insurance, which is a key approximation of the uncertainty the individuals are exposed to. In general, 61.52 percent of the sample has the right to receive medical care from a health institution, acquired either through their own employment or through a member of the household; the proportion of female household heads who are insured is larger than the men's; 66.90 percent and 59.46 percent, respectively. Insurance level reduces as age increases and rises with

[8]The checking account is commonly included as a component of the financial wealth. However, a checking account at a bank, used to receive income and do the daily expenses, is less common in Mexico, which can still be considered a "cash society" (in our data only about 12 percent report having a "checking or saving account"). To compensate the absence of short-term checking accounts we mimic the (equally short-term) cash holdings by inclusion of the sources most susceptible for saving in the analysis; for our sample of respondents still active in the labor market the income from assets, pensions, and transfers is less likely to be needed for direct consumption. In a variant that mimics short-term cash-holdings even closer, adding up income from all sources and subtracting the household consumption, the results are similar to the results we present in the next section.

[9]The variable for health insurance coverage captures whether the person is entitled; it does not distinguish the way in which insurance was acquired.

TABLE 1

MEDIAN INCOME AND WEALTH OF WORKING HOUSEHOLD HEAD AGED 50 AND OVER WITH AND WITHOUT HEALTH INSURANCE

	% of total (1)	Insured (%) (2)	Not Insured (%) (3)	Median (MX$) Income 2003[a] Insured (4)	Income 2003[a] Not Insured (5)	Net Financial Wealth Insured (6)	Net Financial Wealth Not Insured (7)	Net Total Wealth Insured (8)	Net Total Wealth Not Insured (9)
n	3,321	2,043	1,278						
All observations	100	61.52	38.48	4,800	2,733	26,500	12,000	312,961	218,690
Gender									
Male	74.35	59.46	40.34	5,000	3,000	26,231	12,648	326,490	239,200
Female	25.65	66.90	33.10	4,183	1,733	28,416	10,021	288,856	164,392
Age groups									
50–54	36.62	63.49	36.51	5,566	3,189	25,675	10,000	309,073	254,075
55–59	26.26	61.58	38.42	4,668	3,000	25,050	11,000	321,086	202,000
60–64	18.52	58.70	41.30	4,700	2,408	27,010	14,620	314,315	192,756
65–69	11.83	61.83	38.17	3,400	2,333	30,350	14,365	294,350	241,461
70–75	6.78	57.78	42.22	3,589	1,544	27,675	12,000	341,714	204,547
Education									
None	19.01	41.52	58.48	3,083	2,200	15,200	10,000	217,892	170,444
Primary	53.48	59.10	40.90	3,890	2,581	24,400	11,000	281,000	209,725
Secondary	8.13	72.96	27.04	6,000	4,600	24,000	15,000	316,900	330,000
Technical	5.54	85.87	14.13	6,830	4,240	33,500	33,000	405,918	343,772
High school or more	13.83	81.92	18.08	11,583	7,000	50,000	64,193	665,000	753,541
Contract type in principal job throughout life									
Salaried	56.25	73.55	26.45	5,107	2,497	26,471	13,111	303,738	167,900
Boss	4.43	50.34	49.66	6,000	5,500	48,324	49,800	601,000	683,791
Self-employed	30.68	42.20	57.80	3,800	2,600	27,850	10,000	307,004	236,932
Commission	6.50	60.65	39.35	3,650	2,833	21,100	11,000	307,036	209,655
Without payment	1.57	51.92	48.08	3,450	3,433	28,200	12,000	507,766	309,330
	0.57	36.84	63.16	6,000	4,450	20,000	16,300	330,000	233,808
Future pension									
Yes	46.52	91.13	8.87	5,500	4,000	29,450	20,000	326,747	308,000
No	53.48	35.75	64.25	3,211	2,517	22,616	10,900	286,200	209,450

[a]Income 2003 is the sum of monthly labor income, pensions, transfers, and profits at individual level.

TABLE 2
DESCRIPTIVE STATISTICS OF WEALTH (MX$)

Percentile/ Statistic	Net Financial Wealth	Net Total Wealth	Net Financial Wealth/Current Income 2003[a]	Net Total Wealth/Current Income 2003[a]
No. obs.	3,321	3,321	3,321	3,321
p1	–27,000	–150	–4.3	–0.1
p5	0	5,940	0.0	2.0
p10	0	26,676	0.0	8.5
p25	3,000	106,848	0.9	26.0
median (p50)	20,166	285,000	4.9	62.5
p75	67,060	608,202	16.3	137.1
p95	400,000	1,742,265	76.0	537.3
p99	1,126,256	4,415,199	241.6	1,598.6
Mean	92,260.9	528,947.1	21.0	152.8
S.D.	4,977.5	16,251.2	2.0	7.3
Skewness	10.7	7.7	28.3	9.5
Kurtosis	179.5	105.0	1,081.3	192.8

[a]Current income 2003 is the sum of monthly labor income, pensions, transfers, and profits at individual level.

higher educational level. Employees with a fixed salary show a higher level of health insurance coverage (73.55 percent) than self-employed workers (42.20 percent), mainly because salaried work is more likely to be in the formal sector than self-employment or any of the other contract categories. The final rows show that 46.52 percent of the sample expects to receive a pension in the future, and 91.13 percent of them are covered by some form of health insurance. Meanwhile, 53.48 percent of household heads in the sample believe they will not have a pension, and 64.25 percent of them are not covered by health insurance.

The medians for current (monthly) income and for accumulated net financial and total wealth by insurance status are reported in columns (4)–(8) in Table 1.[10] Current income corresponds to the household's total monthly income, which includes income from salary and its complements, as well as income from transfers and other incomes from business or capital. The columns corresponding to the no-insurance situation compared with insurance, present in general a lower level for each variable, which at first glance does not indicate that people save more in the face of risks due to lack of health insurance, if only because other relevant characteristics are not considered.

The main statistical properties of the constructed wealth variables, direct and as a proportion of current income, are presented in Table 2. A wide distribution for wealth variables stands out, with the mean well above the median, while the positive skewness and high kurtosis indicate that many individuals have little wealth upon approaching retirement age. By comparing the value of wealth measures, we find wealth accumulates in non-financial, not very liquid terms above all, and, while about 2 percent of the population have negative or zero total wealth, around 13 percent of the distribution has net financial wealth equal to or below

[10]All income and wealth variables are reported in Mexican pesos (MX$) of 2003, when 1 USD was equivalent to about 10 MX$.

zero. Wealth variables divided by current income give us an idea of the different accumulated magnitudes in the various percentiles of the sample, suggesting that the relevance of risk exposure may differ between population quartiles.

Table 3 relates the median of the wealth measures by permanent income quartile to the insurance status (Panel A) and pension expectations (Panel B). It can be seen that the dominant tendency is that those with health insurance or pension expectations present greater financial wealth than those without insurance or pension. The same tendency can be observed for the total wealth variable, except for the last permanent income quartile, where the median of those without health insurance is higher. This last quartile is the only one showing the expected systematic relationship, that the uncertainty regarding health eventualities due to not having insurance coverage is an incentive for saving. Additionally, the median financial wealth in the lower three quartiles is similar, while the median for financial wealth in the last income quartile ($37,906) is equal to approximately 1.5 times the median in the lower quartiles for those with insurance and 2.5 times higher for the uninsured ($26,099 vs. $10,000–12,250). For total wealth the median in the higher quartile ($481,641) is about 1.8 times larger than in the lower quartiles among those with insurance, and between 2.2 and 2.8 times for those without insurance. Mainly among the uninsured we observe an increase of the net total wealth through the permanent income quartiles (and not only in the highest quartile), suggesting savings to prepare for unforeseen health expenses may be at hand. When we look at the wealth levels relative to the current income (as in Table 2), we see that the difference in wealth levels between insured and uninsured households is even smaller, and especially the (relative) total wealth is higher among the uninsured than the insured, suggesting that precautionary savings are done. The same patterns arise when we separate according to pension expectations, although we see that in the lower three quartiles the medians for those without pension expectations are slightly higher than the medians for those without health insurance (but not in the highest permanent income quartile). For those with insurance or pension expectations that happens only in the lowest quartile. Again, the relative wealth magnitudes give more indications that additional saving may be done in the expected absence of a pension; median wealth relative to current income is often higher among those without pension expectations than among those who expect a pension. The empirical implementation will take into account these differences, and hence quartile regressions are estimated in order to identify if additional saving is different among people in different wealth ranges.

5. Empirical Strategy

Our basic analysis strategy follows the empirical approach used by Starr-McCluer (1996), Hurst *et al.* (2010), Lusardi (1997, 1998), and Guiso *et al.* (1992), which consists in directly estimating the effect of an uncertainty measure on a wealth measure to test its significance. The regression to be estimated is as follows:

$$(5) \qquad {Wealth_i}/{PI_i} = \varphi + \sigma_0 AccessSS_i + \sigma_1 Pensionf_i + \beta' X_i + \varepsilon_i.$$

The dependent variable $Wealth_i/PI_i$, stands for one of the constructed measures of accumulated wealth: net financial wealth or net total wealth, as a proportion

TABLE 3

Median Net Financial and Total Wealth by Permanent Income Quartile and Insurance Resp. Pension Status (MX$)

PI Quartiles[a]	Less than $1,969		$1,969–2,667		$2,667–3,783		$3,783 and more	
Panel A. Health Insurance Status	Insured	Not Insured	Insured	Not Insured	Insured	Not Insured	Insured	Not Insured
Absolute wealth								
Financial W.	26,208	10,000	26,220	12,250	20,000	10,000	37,906	26,099
Total W.	267,328	173,600	254,894	206,000	280,000	220,000	481,641	488,000
Wealth relative to current income								
Fin. W./Inc	8.9	5.6	6.7	5.0	4.0	3.3	3.7	4.0
Tot. W./Inc	77.2	81.4	58.7	64.7	55.9	54.8	56.7	74.0
No. obs.	306	463	480	371	571	279	686	165
Panel B. Pension Expectations	Pension	No Pension	Pension	No Pension	Pension	No Pension	Pension	No Pension
Absolute wealth								
Financial W.	29,528	13,600	24,250	17,600	20,000	11,400	40,000	20,400
Total W.	307,560	202,902	254,602	215,761	276,871	253,768	485,652	482,000
Wealth relative to current income								
Fin. W./Inc	6.4	7.1	6.2	5.9	4.1	3.3	4.3	3.6
Tot. W./Inc	61.4	83.7	58.0	63.3	54.5	59.8	56.6	71.4
No. obs.	100	669	308	543	492	358	645	206

[a]The estimation of Permanent Income (PI) is based upon the (monthly) current income, see Appendix Table A1.

of the permanent income (its estimation is explained later). Coefficients σ_0 and σ_1 are the ones that interest us most, as they indicate the effect of uncertainty caused by access or entitlement to health insurance, $AccessSS_i$, and by the expectation to receive a retirement pension in the future, $Pensionf_i$, on the accumulated wealth.

In the vector X_i we have, on the one hand, a set of socio-demographic variables such as age, marital status, education, and speaking an indigenous language. On the other hand, also contained in X_i are variables that account for other motives and opportunities to save, such as a variable that controls for the possibility that the motive for wealth accumulation by individuals aged 50 and over is the interest in leaving a legacy. Also included is a variable to account for individual preferences: a binary variable was included to mark those people currently smoking, to control for the degree of impatience (Kennickell and Lusardi, 2005) and risk tolerance level (Barsky *et al.*, 1997). Because smoking increases the health risk for the interviewees, those currently smoking are more impatient and tolerant of risk than those who do not smoke. Regarding objective health status, a binary variable was introduced that gathered information on individuals having been diagnosed by a physician as suffering or not from a high-risk, high-cost illness such as hypertension, diabetes, cancer, lung disease, heart disease, stroke, or arthritis. At the same time, this variable represents an expected—more accurately, not uncertain—cost, and a perception of health risks given the current state of health. Furthermore, we include two subjective categorical variables to control for health risk perceptions: first, one that accounts for the actual health status in 2003 in comparison with 2001; and second, one that considers the level of health concerns in comparison with two years before.

The respondent's perceived economic situation is taken as a proxy variable of the place where each individual was located regarding their target wealth, considering the acquired wealth level as a reflection of the household's economic situation. If the respondent's opinion of his economic situation is "excellent" or "very good," it is assumed he is also very satisfied with the acquired wealth level, which is interpreted as the individual being located above his target level. If he answers "good," this is interpreted as being just in his target level; and if he perceives his economic situation is "regular" or "bad," then that individual is considered to be below his target level. However, the perceived economic situation may also be an indicator of the perception of the opportunities to acquire a sufficiently large income, in which case the expected effects would be the opposite; although those in a bad economic situation may want to save, they may perceive that as impossible.

The idea of including the (estimated) permanent income, $\widehat{PI_i}$, as a divisor in the dependent variable fulfils the objective of adjusting accumulated wealth levels according to individual income determined by each individual's particular attributes and the activities they perform, which gives them a condition of permanence and attempts to take out temporal fluctuations (Starr-McCluer, 1996; Lusardi, 1997, 1998; Hurst *et al.*, 2010). The permanent income variable is also included as an explanatory variable, thus allowing for non-homothetic preferences (Starr-McCluer, 1996; Lusardi, 1997, 1998; Hurst *et al.*, 2010); in other words, it

allows us to account for people with different income levels and facing the same risk accumulating wealth (through saving) in a non-proportional way. Permanent income $\widehat{PI_t}$ is obtained by estimating current income as a function of demographic characteristics (vector $Demog_i$), labor characteristics such as type of contract and industry (vector $Labour_i$), and an error term (υ_i):[11]

$$CurrentIncome2003_i = \alpha + \gamma' Demog_i + \delta' Labour_i + \upsilon_i, \tag{6}$$

after which the permanent income is calculated as the expected value (the results of the estimation are presented in the Appendix, Table A1):

$$\widehat{PI_t} = E[CurrentIncome2003_i] = \hat{\alpha} + \hat{\gamma}' Demog_i + \hat{\delta}' Labour_i. \tag{7}$$

The main problem in using insurance status and future pension expectation as explanatory variables indicating uncertainty (and risk of a negative income shock in the future) lies in the possible endogeneity of these variables with wealth. Individuals with a higher level of savings (wealth) can dedicate more resources, time, effort and money, to obtaining health insurance coverage and contributing to a retirement fund (Starr-McCluer, 1996). In order to account for this endogeneity, a two-stage estimate with instrumental variables has been introduced. In the case of the quartile regressions we implement this by applying a control function approach. The control function requires the same identification conditions as the instrumental variable method calculated by 2SLS (Imbens and Wooldridge, 2007). As instrumental variables in the control function, we use the respondent's gender, and a set of four indicators of the size of the locality of residence.

Given that the endogenous variables are binary, the two-stage estimation procedure of equation (5) consists in estimating first the probit models of health insurance entitlement and future pension expectation given the regression variables X_i of equation (5) and the exogenous variables Z_i that instrument the control function:

$$Prob(AccessSS_i = 1) = \Phi(\theta_h' X_i + \varphi_h' Z_i) \tag{8a}$$

[11]As in the referred studies, we follow Friedman's (1957) definition by which an observed income is the sum of a permanent and a transitory component. The first is analogous to the expected value of a probability distribution of the individual's human capital value as determined by personal attributes, training, and education, and attributes of the economic activity performed. The second is the reflection of all factors that can be considered as accidental or fortuitous. Lusardi (1997, 1998), Hurst *et al.* (2010), Starr-McCluer (1996), and Guiso *et al.* (1992) estimate permanent income by using only non-capital current income; that is, income coming from the salary and its components. The current income we use corresponds to the total income received by individuals, including income from transfers, pensions, and capital investment yield, since 87.5 percent of self-employed people with a business-originated income report their salary income to be null, possibly due to the difficulty of conceptually and numerically separating their business earnings and the payment for their work. We estimate permanent income at the individual level before adding it up to the household level used for the main equation (equation 5).

(8b) $$Prob(Pensionf_i = 1) = \Phi\left(\theta_p' X_i + \varphi_p' Z_i\right)$$

and use the estimates to calculate the generalized residuals as:

(9a) $$\widehat{gr_{ssi}} = AccessSS_i \lambda\left(\hat{\theta}_h' X_i + \hat{\varphi}_h' Z_i\right) - (1 - AccessSS_i)\lambda\left(-\left(\hat{\theta}_h' X_i + \hat{\varphi}_h' Z_i\right)\right)$$

(9b) $$\widehat{gr_{pfi}} = Pensionf_i \lambda\left(\hat{\theta}_p' X_i + \hat{\varphi}_p' Z_i\right) - (1 - Pensionf_i)\lambda\left(-\left(\hat{\theta}_p' X_i + \hat{\varphi}_p' Z_i\right)\right)$$

where $\lambda(\cdot) = \phi(\cdot)/\Phi(\cdot)$ is the inverse Mills ratio. For the second stage, the generalized residuals $\widehat{gr_{ssi}}$ and $\widehat{gr_{pfi}}$ are added to the main equation (5), hence, finally, the equation to be estimated is:

(10) $$Wealth_i \Big/ \widehat{PI}_i = \varphi + \sigma_0 AccessSS_i + \rho_0 \widehat{gr_{ssi}} + \sigma_1 Pensionf_i + \rho_1 \widehat{gr_{pfi}} + \beta' X_i + \mu_i.$$

In the following section we present the results of equation (5) estimated by OLS, 2SLS, and by quartile regressions with specification (10), in order to compare results.

6. Results

Estimation results for the full sample are presented in Tables 4 and 5, corresponding to the two measures employed: net financial wealth and net total wealth, respectively. The first column contains the ordinary least squares estimations, where health insurance entitlement and the expectation to receive a pension in the future are treated as exogenous. Column (2) shows the results obtained with 2SLS, the variables having been endogeneity-corrected by using the previously mentioned instrumental variables, while columns (3) to (5) present those corresponding to endogeneity-corrected quartile regressions using the control function approach.

Results differ somewhat, depending on which wealth accumulation measure is taken into consideration. Regarding the more liquid financial wealth (Table 4), the mean-centered regressions, considering either exogenous risk variables or endogeneity-correction—columns (1) and (2)—do not provide evidence that individuals save to protect themselves against a future health-related income risk or a lack of financial protection from a pension fund, since these variables' coefficients are not significant. The tests of the instrumental variables (Appendix, Table A2), show that the instruments are valid (the instruments identify the insurance and pension variables, and the overidentification test shows that they can be excluded from the main equation), while the endogeneity test suggests that the uncertainty indicators can be considered as exogenous. Hence, the results obtained from OLS estimates are preferred.

Nevertheless, given the skewed distribution (see Tables 2 and 3), the mean is not the best summary measure for these variables; it is worth exploring the saving behavior for individuals in different sections of the distribution. The estimations of equation (10) were performed by quartiles (q25, q50, and q75), with

TABLE 4

PRECAUTIONARY SAVING; DEPENDENT VARIABLE: NET FINANCIAL WEALTH/PERMANENT INCOME

	Specification				
	(1) OLS	(2) IV[a]	(3) q25[c]	(4) q50[b]	(5) q75[b]
Uncertainty indicators					
Has health insurance	7.810*	10.204	0.430***	8.583***	31.352***
	(4.485)	(21.582)	(0.162)	(2.616)	(9.406)
Expects/has retirement pension	−6.528	−1.642	0.020	−12.147***	−35.158***
	(4.659)	(25.126)	(0.177)	(2.777)	(8.112)
Demographic characteristics					
Age	−2.166	−2.105	0.148	−0.322	−2.735
	(4.793)	(4.676)	(0.208)	(0.784)	(2.505)
Age squared (·100)	2.253	2.205	−0.083	0.360	2.435
	(3.843)	(3.791)	(0.166)	(0.635)	(2.075)
Marital status: married/cohab.	8.722**	8.808**	0.329*	0.858	1.304
	(3.927)	(4.051)	(0.174)	(0.528)	(1.406)
No. residents (excl. resp./partn.)	−0.492	−0.498	−0.010	−0.099	0.176
	(0.501)	(0.502)	(0.026)	(0.078)	(0.286)
Speaks native language	−0.557	−0.098	−0.286	−1.434*	2.054
	(5.933)	(6.856)	(0.221)	(0.782)	(3.579)
Suffers a high-cost illness[d]	−0.945	−1.476	0.002	0.172	−0.636
	(3.018)	(3.176)	(0.169)	(0.499)	(1.835)
Health status 2003 vs. 2001 (ref.cat.: better)					
The same	5.689	5.839	0.181	0.077	2.867
	(3.626)	(3.651)	(0.288)	(0.861)	(1.954)
Worse	7.258	7.686	0.055	−1.112	0.778
	(4.701)	(4.908)	(0.301)	(0.885)	(2.002)
Worried about health, 2003 vs. 2001 (ref.cat. the same)					
More	−3.079	−3.062	−0.177	−0.200	2.111
	(2.803)	(2.927)	(0.150)	(0.470)	(1.562)
Less	−4.495	−4.061	0.248	0.659	−1.328
	(4.373)	(4.346)	(0.584)	(1.639)	(4.347)
Perceived economic situation (ref.cat.: excellent/very good)					
Good	29.427*	28.986*	1.792	5.722	6.573
	(17.513)	(17.512)	(2.179)	(5.863)	(29.627)
Fair	−14.430***	−14.263***	−0.610***	−3.756***	−16.079***
	(3.760)	(3.896)	(0.216)	(0.777)	(3.499)
Poor	−16.980***	−15.789***	−0.681**	−4.541***	−17.273***
	(4.956)	(5.250)	(0.267)	(0.982)	(3.704)
One or more parents alive	−1.921	−1.885	0.037	0.386	1.640
	(4.569)	(4.715)	(0.146)	(0.479)	(1.419)
Level of education (ref.cat.: none)					
Primary	1.996	0.985	0.151	0.961	1.093
	(3.865)	(4.524)	(0.188)	(0.606)	(2.117)
Secondary	2.250	0.223	0.356	2.244**	5.527
	(4.505)	(6.110)	(0.276)	(1.037)	(3.694)
Professional	19.017***	16.539**	0.646*	2.629*	5.494
	(6.985)	(7.971)	(0.352)	(1.577)	(4.863)
High school or more	33.505***	31.712***	0.741**	4.920***	13.650***
	(9.956)	(9.332)	(0.330)	(1.261)	(4.747)
Permanent income/1000	−6.127***	−6.530***	−0.305***	−0.848***	−2.341***
	(1.092)	(1.706)	(0.049)	(0.167)	(0.539)
Smokes cigarettes now	2.413	2.417	0.039	0.454	0.582
	(3.613)	(3.612)	(0.158)	(0.460)	(1.658)
Keeps a reserve for emergencies	15.748***	15.591***	3.304***	9.110***	20.782***
	(4.320)	(4.644)	(0.205)	(0.460)	(1.340)
Legacy motive	14.056***	13.718***	1.081**	3.702**	10.046
	(5.028)	(5.038)	(0.528)	(1.490)	(6.561)
Gen. residual (pension)[b]				6.513***	20.019***
				(1.668)	(4.910)
Gen. residual (health insur.)[b]				−3.743**	−16.574***
				(1.597)	(5.558)
Constant	79.724	76.348	−5.226	12.596	96.387
	(148.918)	(144.892)	(6.534)	(23.926)	(74.610)
Number of observations	3314	3314	3314	3314	3314
(Pseudo) R-squared	0.039	0.038	0.025	0.045	0.060

***p < 0.01, **p < 0.05, *p < 0.10. Standard errors in parentheses. Robust standard errors in col. (1)–(2); bootstrapped standard errors (200 repetitions) in col. (3)–(5).

[a]Tests of the instruments in Appendix Table A2.

[b]Results of the probit estimations for the control function in Appendix Table A3.

[c]The coefficients of the generalized residuals in the estimations of the quartiles q25 were not significant: Gen. resid. (pension) = 0.929 (0.594); Gen. resid. (health insur.) = −0.471 (0.602). Therefore, the results presented in column (3) correspond to the quartile estimations without endogeneity correction by control functions.

[d]Suffers a high-cost illness takes value "1" if ever diagnosed with: hypertension, diabetes, cancer, respiratory disease, heart disease, stroke, and/or arthritis.

endogeneity-correction using the control function described in the previous section. The generalized residuals (the endogeneity-control variables), were not significant for the lowest quartile of the distribution, thus discarding endogeneity.[12] Consequently, the coefficients presented in column (3) of Table 4 correspond to the quantile estimates without the control function. For the lowest level of the distribution, q25, there are very small positive effects of the risk measures on the accumulated financial wealth, while for the two higher quartiles both variables were larger and significant. In the case of pension risk, the found sign supports the hypothesis that not expecting a pension motivates additional saving. The estimated coefficient (endogeneity-corrected) has a significance level of 99 percent, and indicates that those in the upper two quartiles of the distribution accumulate more net financial wealth (12.15 resp. 35.16 more wealth relative to PI) in order to face absence of pension expectations than those who do expect to receive a pension.

The fact that the relationship between uncertainty and wealth is statistically negative and significant in the upper wealth quartiles regression but not in the lowest quartile is not in line with what is suggested by target-wealth-accumulation theory, where protective reactions (increased saving) are stronger for those individuals who are more economically vulnerable in the face of uncertainty. Also the negative and significant coefficients when the economic situation is perceived as fair or poor suggest that recuperating a target wealth level is not at hand in our data for Mexico. Expected costs due to an illness do not influence the level of financial wealth, and neither does the perceived state of health. Legacy as a motive for saving is positive and significant for quantiles q25 and q50. The proxy for risk-tolerance, smoking, was not significant in any case; and the greater the permanent income, the smaller the saving in financial wealth. Education is significant in all quartiles; a higher education is associated with a greater accumulation of net financial wealth relative to PI.

When considering accumulated net total wealth relative to PI as a dependent variable (Table 5), results are slightly different though comparable regarding its main implications. For total wealth, just as in the case of the financial wealth variable in Table 4, we corrected for endogeneity by 2SLS (column 2), which in this case are the preferred estimates. The IV tests (Appendix, Table A2) indicate that the instruments are valid and can be excluded from the main equation, but in contrast with the results for financial wealth we now find that the uncertainty indicators should be considered as endogenous. Hence, we focus on column 2. The coefficient of health insurance coverage is not significant, while the estimated coefficient of expecting or having a pension is significantly negative. The negative sign indicates that those who need to procure their own resources in order to maintain their consumption during the retirement stage and face risks related to income fluctuations save more in comparison with those who have the financial protection of a pension fund.

Due to the great dispersion of data regarding total net accumulated wealth, in this case we also performed quartile estimations (columns 3–5 of Table 5). The significance of the effects of the risk variables is similar to the results for financial

[12]The results of the probit estimates corresponding to equation (8) are presented in Appendix Table A3.

TABLE 5

PRECAUTIONARY SAVING; DEPENDENT VARIABLE: NET TOTAL WEALTH/PERMANENT INCOME

	Specification				
	(1) OLS	(2) IV[a]	(3) q25[c]	(4) q50[b]	(5) q75[b]
Uncertainty indicators					
Has health insurance	−11.913	97.269	5.703*	111.288***	187.090***
	(12.860)	(62.061)	(3.004)	(23.491)	(61.029)
Expects/has retirement pension	−35.681***	−220.272***	−4.515	−104.558***	−271.113***
	(11.441)	(69.442)	(3.432)	(24.929)	(54.134)
Demographic characteristics					
Age	−30.951*	−33.003*	−4.259	−7.808	−25.553*
	(18.339)	(18.672)	(4.785)	(7.195)	(15.503)
Age squared (·100)	28.739*	29.722*	4.130	6.905	23.055*
	(15.228)	(15.513)	(3.924)	(5.856)	(12.681)
Marital status: married/cohab.	70.353***	68.180***	28.894***	44.540***	59.838***
	(12.011)	(12.442)	(3.191)	(5.420)	(9.860)
No. residents (excl. resp./partn.)	−2.745	−2.977	0.676	−0.177	−0.809
	(1.784)	(1.883)	(0.577)	(0.966)	(1.764)
Speaks native language	−9.035	−0.188	−10.866**	−0.294	15.815
	(22.321)	(23.037)	(4.874)	(9.084)	(25.709)
Suffers a high-cost illness[d]	10.354	11.077	−2.287	−7.065	−8.963
	(9.984)	(11.459)	(2.827)	(5.137)	(10.295)
Health status 2003 vs. 2001 (ref.cat.: better)					
The same	12.557	12.443	−2.609	−1.629	6.898
	(13.948)	(14.651)	(4.546)	(8.449)	(13.638)
Worse	14.393	9.059	−6.709	−2.143	17.018
	(14.585)	(16.217)	(4.902)	(8.758)	(14.269)
Worried about health, 2003 vs. 2001 (ref.cat. the same)					
More	−1.179	1.465	−1.670	7.279	21.451**
	(11.176)	(11.786)	(2.909)	(5.621)	(9.212)
Less	−0.528	−4.891	−5.981	14.428	15.283
	(23.458)	(24.702)	(6.376)	(16.978)	(26.876)
Perceived economic situation (ref.cat.: excellent/very good)					
Good	238.052**	229.653**	33.082**	80.410	209.689***
	(106.774)	(105.826)	(15.703)	(53.352)	(60.461)
Fair	−67.826***	−74.068***	−18.216***	−30.454***	−68.650***
	(16.149)	(16.716)	(5.549)	(6.829)	(13.896)
Poor	−94.560***	−108.644***	−28.345***	−49.899***	−102.956***
	(19.032)	(22.479)	(6.355)	(9.970)	(21.124)
One or more parents alive	−2.776	−1.414	−0.894	−4.801	−1.460
	(11.089)	(11.421)	(3.072)	(5.291)	(9.429)
Level of education (ref.cat.: none)					
Primary	33.675***	42.393***	8.926**	12.985*	36.443**
	(12.763)	(15.401)	(3.692)	(6.963)	(16.497)
Secondary	79.860***	107.852***	5.896	29.198***	79.781***
	(23.100)	(26.079)	(5.716)	(10.934)	(24.504)
Professional	100.015***	126.155***	15.969*	45.188***	97.301***
	(25.329)	(29.454)	(8.613)	(12.129)	(26.349)
High school or more	190.272***	215.378***	25.709***	64.809***	160.881***
	(38.184)	(36.756)	(6.169)	(12.431)	(24.523)
Permanent income/1000	−34.343***	−26.985***	−5.946***	−12.476***	−18.476***
	(3.753)	(5.364)	(0.971)	(1.774)	(3.601)
Smokes cigarettes now	−10.689	−10.307	−3.809	−11.920***	−20.021**
	(11.584)	(11.875)	(3.196)	(4.029)	(9.654)
Keeps a reserve for emergencies	42.346***	46.229***	21.526***	32.158***	29.149***
	(10.135)	(10.660)	(2.621)	(4.899)	(9.023)
Legacy motive	94.831***	96.839***	17.494***	40.291***	91.829***
	(20.705)	(21.360)	(6.562)	(9.517)	(22.226)
Gen. residual (pension)[b]				54.694***	146.402***
				(15.411)	(32.091)
Gen. residual (health insur.)[b]				−64.459***	−122.214***
				(15.088)	(37.547)
Constant	1024.488*	1098.434**	143.675	298.307	903.170*
	(547.791)	(558.164)	(144.744)	(220.084)	(471.285)
Number of observations	3314	3314	3314	3314	3314
(Pseudo) R-squared	0.111	0.053	0.038	0.053	0.082

***p < 0.01, **p < 0.05, *p < 0.10. Standard errors in parentheses. Robust standard errors in col. (1)–(2); bootstrapped standard errors (200 repetitions) in col. (3)–(5).

[a]Tests of the instruments in Appendix Table A2.

[b]Results of the probit estimations for the control function in Appendix Table A3.

[c]The coefficients of the generalized residuals in the estimations of the quartiles q25 were not significant: Gen. resid. (pension) = 8.258 (11.226); Gen. resid. (health insur.) = −9.972 (9.828) in the equation for q25. Therefore, the results presented in column (3) correspond to the quartile estimations without endogeneity correction by control functions.

[d]Suffers a high-cost illness takes value "1" if ever diagnosed with: hypertension, diabetes, cancer, respiratory disease, heart disease, stroke, and/or arthritis.

wealth, though the absolute values are larger for total wealth. Columns (4) and (5) show positive and significant coefficients for the health insurance indicator; the relationship between net total wealth (as a proportion of permanent income) and health risk is positive, which does not support the hypothesis that saving is done with a precautionary motive. On the other hand, the pension indicator is negative and significant in quantiles q50 (–104.56) and q75 (–271.11); individuals without financial protection for the future save more in comparison with those who are protected.

The coefficients of the other variables have the expected sign. The variable "keep a reserve for emergencies" maintains the positive sign and the statistical significance. It indicates that people do accumulate wealth for protecting themselves against fortuitous events. But even though this is the case, the results regarding the risks due to the absence of protection by the social security system do not show solid evidence of accumulation due to precaution. Those who plan to leave a legacy save more than those who do not; those who are concerned about their health in the top quartile save more (coefficient 21.45) and, as we found for financial wealth, an economic situation perceived as fair or poor limits saving. The significance of the permanent income indicates that preferences are not homothetic; the larger the permanent income, the smaller the income proportion destined to saving. The variable "smoking" links impatient and more risk tolerant individuals to less accumulation of net total wealth.

Taken together, the results in Tables 4 and 5 suggest that, in the higher wealth quantiles, the absence of future pension expectations is translated into increased savings, either in the more liquid, short-term, financial wealth or—even more strongly—in less liquid wealth such as real estate. Following Wong and Espinoza (2003), net wealth could be seen as a type of individual fund substituting a pension. However, with respect to the generally more short-term risk caused by a lack of health insurance, which would give a clearer indication for precaution as the motive, we find a counterintuitive positive impact, suggesting more savings for those who are covered by health insurance. The positive sign associates better risk protection (access to health insurance) with higher savings, which does not settle evidence about precaution as the motive for saving. Starr-McCluer (1996) set up similar findings for the U.S.; she interpreted it as mixed evidence, significant coefficients but counterintuitive positive signs. In the lowest quartile, on the other hand, we hardly see any indications for additional savings related with the (absence of) social security coverage. Although the most vulnerable and therefore more susceptible to require precautionary savings to overcome eventualities, in the Mexican situation with a large share of the population living in poverty or even extreme poverty, we may presume that for many households saving is hardly a viable option given the basic financial needs just for subsistence.

Taking into account that business owners face high income volatility and can have greater wealth accumulation for reasons having more to do with the economic support for the business than with income uncertainty (Hurst *et al.*, 2010), we estimated the same regressions separately for households regarding their business-ownership and self-employment status, since we do not have variables associated to business risk that allow us to identify the magnitude of wealth

TABLE 6

PRECAUTIONARY SAVING FOR HOUSEHOLDS WITH AND WITHOUT BUSINESSES[a]

	Net Financial Wealth/ Permanent Income			Net Total Wealth/ Permanent Income		
	(1) q25	(2) q50	(3) q75	(4) q25	(5) q50	(6) q75
Panel A. Non-Business Sample						
Uncertainty indicators						
Has health insurance	3.180*	8.154	30.701**	6.956*	104.510**	190.472**
	(1.903)	(6.225)	(14.169)	(4.030)	(43.306)	(94.572)
Expects/has retirement pension	−3.187*	−10.628*	−37.068***	−0.138	−24.881	−109.420
	(1.852)	(5.470)	(9.998)	(4.276)	(32.654)	(67.999)
Generalized residuals	Yes	Yes	Yes	No	Yes	Yes
No. of observations	1475	1475	1475	1475	1475	1475
Panel B. Small-Business Sample						
Uncertainty indicators						
Has health insurance	0.559**	7.192*	21.304*	44.285**	108.019***	105.442**
	(0.272)	(3.930)	(11.253)	(18.961)	(29.134)	(52.542)
Expects/has retirement pension	−0.215	−11.620*	−34.827**	15.902	13.550	32.007
	(0.318)	(6.645)	(14.174)	(28.219)	(42.445)	(78.845)
Generalized residuals	No	Yes	Yes	Yes	Yes	Yes
Observations	1118	1118	1118	1118	1118	1118
Panel C. Large-Business Sample						
Uncertainty indicators						
Has health insurance	0.602	4.543*	68.911*	288.156***	255.579*	201.146
	(0.803)	(2.518)	(37.514)	(81.257)	(132.029)	(263.072)
Expects/has retirement pension	0.761	−2.037	−15.974	−170.171	−326.017*	−618.898**
	(0.930)	(2.582)	(48.135)	(107.552)	(167.268)	(263.103)
Generalized residuals	No	No	Yes	Yes	Yes	Yes
Observations	721	721	721	721	721	721

Bootstrapped standard errors (200 repetitions) in parentheses. ***p < 0.01, **p < 0.05, *p < 0.10.

[a]Only the parameter estimates of the uncertainty indicators are shown; in the regressions all other variables are included too.

accumulation that could be linked to capital risk rather than absence of health or pension coverage.

Panel A of Table 6 presents the coefficients for the quartile estimations (our preferred estimates), for both net financial and total wealth for those who do not report business ownership or self-employment, Panel B presents the estimates for the households with a small business—mainly consisting of self-employed working on their own account—while Panel C presents the same for the households who report a business ownership with a larger business capital. Evidence for additional savings due to the absence of pension expectations is mainly found for the more liquid net financial wealth in the 50th and 75th quantiles of the non-business and small-business samples; results for the non-business and small-business owners are similar to the results in the full sample. Furthermore, the positive coefficients for health insurance that we found in Tables 4 and 5 are found again in those samples, giving no indication for precautionary savings. The largest amounts of additional savings are however found for net total wealth among the owners of larger businesses (Table 6, Panel C, columns 5 and 6). Results in Table 6 suggest that the behavior of those with small businesses (mainly, the self-employed) is similar to the behavior of those without business-ownership in the household. Households with

larger businesses, on the other hand, show a different behavior; they appear to build up a capital stock especially with regard to the total wealth.

7. Conclusions and Discussion

We have found some indications that the population under consideration, Mexicans aged between 50 and 75 years, make additional savings in the face of the incomplete social security system. In particular, for the future financial risks caused by the absence of the expectation to receive a retirement pension, we find evidence that the absence is compensated by additional savings in both liquid and less liquid wealth. This is primarily found in the upper half of the distribution, while in the poorest quartile we do not find confirmation of private savings. Financial risks that households run due to the absence of health insurance coverage, which would be clearer evidence for a precautionary motive, on the other hand, are not compensated by extra savings. Health eventualities form a risk that may occur with short term notice but do not lead to extra private savings, while the absence of pensions, which require planning in the longer run, generate some extra saving. On the contrary, we find evidence that households with access to health insurance and thereby to health care services, and thus have lower risks, save more. This effect is stronger in the upper part of the distribution, while no effect is found in the poorest quartile. Hence, altogether, we find some weak evidence for additional savings by elder Mexicans, but not out of precaution for short-term unexpected health eventualities.

Use of the same econometric technique for the cases of the U.S. and Italy, allows us to make some comparisons with what was found in Mexico. Taking into account that there can be a cohort effect for which we could not control, it is important to mention that our results refer specifically to the working population in 2003 born before 1951. Our findings are consistent with those of Lusardi (1997 and 1998) and Guiso *et al*. (1992), who found that the amount of saving motivated by uncertainty is modest rather than important. Particularly interesting are the counterintuitive findings with respect to risks due to a lack of health insurance. These findings are similar to Starr-McCluer's (1996) in the U.S.: she also found evidence positively relating entitlement to health security to a higher level of saving when considering total net wealth (as a proportion of permanent income), which is a result contrary to the expected one when defining no entitlement to social security as a source of uncertainty. Separating the sample in those who own a business and those who do not, as suggested by Hurst *et al*. (2010), weakens even more the evidence of a relationship between saving and uncertainty; in particular it does not favor the hypothesis that those who own small businesses save more to build a capital back-up.

Alternative individual protection mechanisms are limited, although we cannot rule out, because it is not explicitly asked for in the survey, that participation in informal saving for example through *tandas* (or *roscas*, rotating savings and credit associations) is underreported. However, the saved amounts are likely to be small, and participation also implies obligations. There are some public programs, particularly the Temporary Employment Program, that provide support in case of natural disasters, but there are no generally available programs that apply in case

of individual eventualities. The *Oportunidades* program, focused as improving access to schooling and health services for children, may indirectly reduce the incentives for savings, because investments in children may pay off in terms of them earning higher incomes in the future and supporting their parents when they grow older. Similar hopeful expectations for the future come from the results of Villagómez (1998, 2008), who linked the reduction of domestic savings in the 1980s and 1990s to the liberalization of the Mexican economy.

Given the low protection of social security in Mexico in comparison with a country like the U.S. or with European countries, we expected to find a strong relationship between individual wealth accumulation and uncertainty, but the results we have found seem to indicate otherwise, possibly because resources are needed on a more daily basis without opportunities for large-scale saving. The absence of precautionary savings as a way of individual protection demonstrates the vulnerability of the population and gives protection provided by the public security system a predominant role, mainly among those with fewer resources. In this sense, the introduction of the *Seguro Popular*—a public health insurance aiming to eliminate catastrophic health care expenditures (for medication and other out-of-pocket expenses) for the population without social security coverage—can be seen as a first step to protect those who are more vulnerable. However, this health insurance plan will have to corroborate its quality and capacity in the long term. Regarding financial protection at retirement age, there are public initiatives such as monetary transfers to adults aged over 60 or 70 that recently have been implemented in some states; evaluations on their sufficiency is not yet available, but in general the amounts that the elderly receive are rather low. Nevertheless, proposals for a universal non-contributive pension are currently under discussion. We conclude that carefully designed public policies could have an important role in the reduction of vulnerability for future (financial) risks.

References

Aguila, E., "Retirement Behavior: Evidence of the Mexican Case," RAND Corporation, 2007.

Barros, R., "Wealthier but not Much Healthier: Effects of a Health Insurance Program for the Poor in Mexico," SIEPR Discussion Paper 09-002, Stanford Institute for Economic Policy Research, 2008.

Barsky, R., T. Juster, M. Kimball, and M. Shapiro, "Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study," *Quarterly Journal of Economics*, 112, 537–79, 1997.

Browning, M. and A. Lusardi, "Household Saving: Micro Theories and Micro Facts," *Journal of Economic Literature*, 34, 1797–855, 1996.

Carroll, C. and M. Kimball, "Liquidity Constraints and Precautionary Saving," Johns Hopkins University (http://www.econ2.jhu.edu/people/ccarroll/papers/liquidRevised.pdf), 2005.

———, "Precautionary Saving and Precautionary Wealth," in S. N. Durlauf and L. E. Blume (eds), *The New Palgrave Dictionary of Economics, 2nd Edition*, Palgrave Macmillan, New York, 579–85, 2008.

Friedman, M., *A Theory of the Consumption Function*, Princeton University Press, Princeton, NJ, 1957.

Galárraga, O., S. Sosa-Rubí, A. Salinas-Rodríguez, and S. Sesma-Vázquez, "Health Insurance for the Poor: Impact on Catastrophic and Out-of-Pocket Health Expenditures in Mexico," *European Journal of Health Economics*, 11, 437–47, 2010.

Guiso, L., T. Jappelli, and D. Terlizzese, "Earnings Uncertainty and Precautionary Saving," *Journal of Monetary Economics*, 30, 307–37, 1992.

Guiso, L., T. Jappelli, and L. Pistaferri, "An Empirical Analysis of Earnings and Employment Risk," *Journal of Business & Economic Statistics*, 20, 241–53, 2002.

Homedes, N. and A. Ugalde, "Twenty-Five Years of Convoluted Health Reforms in Mexico," *PLoS Medicine*, 6(8), 1–8, 2009.
Hurst, E., A. Lusardi, A. Kennickell, and F. Torralba, "The Importance of Business Owners in Assessing the Size of Precautionary Savings," *Review of Economics and Statistics*, 92, 61–9, 2010.
Imbens, G. and J. Wooldridge, "Control Function and Related Methods," Lecture 6 in "What is New in Econometrics?" Lecture Notes, NBER Summer Institute 2007 (http://www.nber.org/WNE/lect_6_controlfuncs.pdf), 2007.
Kennickell, A. and A. Lusardi, "Disentangling the Importance of the Precautionary Saving Motive," Dartmouth College (http://www.dartmouth.edu/~alusardi/Papers/Kennickell_Lusardi_dec05.pdf), 2005.
King, G., E. Gakidou, K. Imai, *et al*., "Public Policy for the Poor? A Randomised Assessment of the Mexican Universal Health Insurance Programme," *The Lancet*, 373, 1447–54, 2009.
Leland, H. E., "Saving and Uncertainty: The Precautionary Demand for Saving," *Quarterly Journal of Economics*, 82, 465–73, 1968.
Lusardi, A., "Precautionary Saving and Subjective Earnings Variance," *Economics Letters*, 57, 319–26, 1997.
———, "On the Importance of the Precautionary Saving Motive," *American Economic Review*, 88, 449–53, 1998.
Mastrogiacomo, M. and R. Alessie, "The Precautionary Savings Motive and Household Savings," *Oxford Economic Papers*, doi: 10.1093/oep/gpt028, 2013.
OECD, *OECD Reviews of Health Care Systems: Mexico*, Organisation for Economic Co-Operation and Development, Paris, 2005.
———, *Labour Force Statistics 1986–2006*, Organisation for Economic Co-Operation and Development, Paris, 2007.
Puig, A., J. A. Pagán, and B. J. Soldo, "Envejecimiento, salud y economía: La Encuesta Nacional sobre Salud y Envejecimiento en México," *El Trimestre Económico*, 73, 407–18, 2006.
Starr-McCluer, M., "Health Insurance and Precautionary Savings," *American Economic Review*, 86, 285–95, 1996.
van Gameren, E., "Labor Force Participation of Mexican Elderly: The Importance of Health," *Estudios Económicos*, 23, 89–127, 2008.
Villagómez, A., "Ahorro privado y restricciones de liquidez en México," *Investigación Económica*, 53(225), 83–98, 1998.
———, *El ahorro en México desde 1960: estructura, evolución y determinación*. Centro de Investigación y Docencia Económicas, México D.F., 2008.
Villagómez, A. and R. Fuentes, "El ahorro en los hogares de bajos ingresos en México: un análisis de cohortes," Documento de trabajo No. 188, Centro de Investigación y Docencia Económicas, México D.F., 2000.
Willmore, L., "Old Age Pensions in Mexico: Toward Universal Coverage," International Institute for Applied Systems Analysis (IIASA) (http://ssrn.com/abstract=2383768), 2014.
Wong, R. and M. Espinoza, "Ingreso y bienes de la población de edad media y avanzada en México," *Papeles de Población*, 9(37), 129–66, 2003.
Wong, R., M. Espinoza, and A. Palloni, "Adultos mayores mexicanos en contexto socioeconómico amplio: salud y envejecimiento," *Salud Pública de México*, 49(suppl. 4), 436–47, 2007.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table A1: Estimation of the Permanent Income
Table A2: Tests of the validity of the instrumental variables
Table A3: Probit estimations for the control function