The Cost of Incomplete Consumption Insurance against Health Shocks: Evidence from Mexico

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September 21, 2012

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Abstract

Using Mexican longitudinal data, I study the effect of breadwinners' health shocks on household consumption, measuring health shocks through changes in the capacity to perform Activities of Daily Living (ADLs). I find that health shocks to households' breadwinners are associated with significant long-lasting decreases in non-medical per capita consumption, but health shocks to other household members have no such effects. When consumption depends on labor income, the economic cost associated with a health shock may lie less with direct out-of-pocket medical expenditures than with the diminished capacity to work. Therefore, providing health insurance to the previously uninsured sector of the population could potentially increase social welfare because of its consumption smoothing properties, although it would not necessarily provide full consumption insurance against health shocks. To illustrate this, I estimate the marginal per peso welfare gains paid in the premium of a full insurance against health shocks. I complement these calculations by using a standardized expected utility model to compute the risk premia households would be willing to pay to reduce, either partially or entirely, households' risk exposure to any health shock.

1 Introduction and Motivation

The failure of private insurance markets to mitigate fluctuations in consumption among households that suffer an unanticipated health shock is often used as an economic justification for social health insurance.

*I thank, without implicating, Jeffrey Grogger, Robert LaLonde, Tomas Philipson, Stephen Durlauf, Matias Tapia and Dan Black's Labor Working Group at the Harris School of Public Policy for very helpful suggestions on earlier versions of this paper. The findings and conclusions expressed are solely those of the author.

Indeed, reducing the financial risk posed by unexpected health events is a key purpose of health insurance. Yet, health shocks include other sources of risk in addition to the out-of-pocket medical spending. In particular, when the individual that suffers a health shock is active in the labor market, not only must he cover out-of-pocket medical expenditures, but his capacity to generate consumption is likely affected as well. Therefore, for households whose consumption depends on labor income, the economic cost associated with a health shock may lie less with direct health care than with the diminished capacity to work. When private insurance markets fail to insure against health shocks, social health insurance raises welfare by smoothing consumption through the coverage of out-of-pocket medical expenditures. However, since health insurance does not typically cover productivity losses, it should not be expected to fully insure consumption. Under full insurance, consumption growth should be independent of idiosyncratic variables that are exogenous to consumers, such as health shocks, (Cochrane, 1991). Thus, only linking health insurance with disability insurance will fully insure individuals against health shocks, although at the risk of further moral hazard.

Given the scarcity of data suitable for assessing the effects of health shocks on the working-age population, the health insurance literature has focused more on evaluating exposure to out-of-pocket health expenditures and had rarely addressed the equally important question of exposure to earnings loss. In the present paper, by comparing the effects of health shocks on breadwinners and non-breadwinners using longitudinal data from Mexican households, I provide evidence of the relative importance of lost earnings among the mechanisms through which health shocks affect consumption. The results presented here allow me to contribute to our understanding of the potential welfare gains, as well as the limitations, of offering social health insurance., a topic that has a prominent role in the political agenda of both developed and developing countries.

The goal of this paper is to consider the potential welfare gains of different types of health insurance for the sector of the Mexican population that was uninsured in 2005. In order to do so, I first test empirically whether Mexican households were fully insured against a particular type of health shock during the period preceding the launch of Seguro Popular, a social health insurance targeting the uninsured. Following a strategy similar to that of Gertler and Gruber (2002), I estimate the impact of household heads' physical capacity shocks on consumption growth across households over a three-year period, measuring health shocks through changes in their capacity to perform Activities of Daily Living (ADLs). To test whether formal and informal insurance mechanisms effectively insure consumption against breadwinners' health shocks, I use the Mexican Life Survey (MxFLS), the only longitudinal survey available for Mexico.

Because this data allows me to simultaneously observe two waves of health and total expenditures and measures of physical-capacity for households where the head is still a breadwinner, I am able to address, to some measure, the impact of earnings loss on households' consumption paths. On one hand, I find that decreases in the physical functioning of household heads are associated with significant, long lasting decreases in consumption only if the household head is also the household's breadwinner. For uninsured households, when the breadwinner passes from being able to perform easily all the activities included in the ADLs index to being able to perform none, consumption level decrease is approximately 51 percent. Yet, for households whose head is not a breadwinner, consumption does not respond significantly to changes in the household heads' physical capacity. Presumably, shocks to breadwinners and non-breadwinners must involve equivalent out-of-pocket expenditures, thus I argue that illness-related losses in earnings and productivity are a substantial component of the total effect of health shocks on consumption. On the other hand, I find that, in Mexico, the consumption level of the institutionally insured population appears to be fully insured against household physical capacity shocks to the breadwinner. I interpret this consumption insurance as a result of the fact that, in Mexico, most formal health insurance is part of a wider social protection bundle that includes disability insurance.

Distinguishing the effects of health shocks between breadwinners and non-breadwinners gives robustness to my results with respect to the state dependence hypothesis, asking whether changes in non-medical consumption results only from the fact that the marginal utility of consumption declines as health deteriorates. State dependence would imply that the results presented here are simply the product of a correlation between the shock variable and a preference shift in the error term. Yet, if the negative effect on household consumption associated with the decrease in the health stock of household members was originated entirely by a decrease in the marginal utility of consumption due to complementarities between health and consumption, then, under certain assumptions, consumption levels would respond similarly to shocks among breadwinners and non-breadwinners alike. My results reject this hypothesis.

Moreover, the evidence of incomplete insurance against health shocks does not appear to result from a bias due to unobserved differences in attitudes towards risk common to the uninsured individuals, a concerned raised by Schulhofer-Wohl (2011). When I control for heterogeneity in risk aversion, by adding individual-level indicators for low and high risk aversion into the consumption OLS regression, the estimated coefficients do not change[1].

Since I find evidence of incomplete consumption insurance against the effects of shocks on breadwinners'

[1]The controls correspond to categories of breadwinners' individual-level risk aversion coefficient constructed using data from a new module on preferences included in the 2005 wave of the Mexican Family Life Survey.

physical capacity among Mexican households, providing social health insurance to the previously uninsured sector of the population could potentially improve social welfare. To illustrate this, I apply a theoretical framework, from Chetty (2006), using the estimated impact of breadwinners' health shocks on consumption among uninsured Mexican households to estimate the marginal per peso welfare gains paid in the premium of a full insurance against health shocks, including coverage for both health expenditures and loss earnings associated with the shock, given the specific realizations of health shocks suffered by their breadwinners.

I complement these calculations by using a standardized expected utility model to compute the risk premia households would be willing to pay to reduce, either partially or entirely, households' risk exposure to any health shock. I calculate these risk premia for different consumption terciles using the empirical distributions of breadwinners' health shocks and medical expenditures as proxies for households' risk exposure. I compare the risk premium of (partial) health insurance, covering medical expenditures for all members of the household, to the risk premium of a breadwinner-only (full) insurance, covering both medical spending and lost earnings due to a physical capacities health shock. The results show that, while complete insurance for the breadwinner has a larger average risk premium in absolute terms, the results reverse when the risk premium as a share of total expenditures is considered. Assuming a constant risk aversion coefficient of 3, uninsured households are willing to give up, on average, 4.6% of their total expenditures to insure against breadwinners' health shocks, and 5.5% of their total expenditures to insure against all out-of-pocket health expenditures from any member of the household. The difference between absolute and relative values can be explained by the fact that the risk exposure to the breadwinners' physical capacity shock is relatively similar across consumption terciles, while medical expenditures risk is relatively larger for the lowest tercile, resulting from their lower capacity to pay for out-of-pocket health expenditures. Households within the bottom tercile are willing to give-up an average of 5.8% of their total expenditures to insure against medical spending, whereas households within the top tercile are willing to give up only 3.5% at the most.

Finally, this paper provides evidence consistent with Gertler and Gruber's findings that mixed evidence on the existence of full insurance in developing countries can be explained by the instruments used to measure health shocks. In general, studies assessing health status through objective measures, such as the capacity to perform specific activities find significant effects on consumption while studies relying on self-reported data do not[2] . The results presented here are consistent with these findings, suggesting that these discrepancies are indeed related to the extent to which each instrument is either: (1) obscured by self-perception; or, (2) measuring different types of health shocks with varying degrees of correlation to labor productivity. After

[2]Either self-reported illness or self-reported amount of time suffering from illness.

using multiple measures of health status, including households' direct reports of having suffered an economic shock related to sickness, only the change in ADLs shows a statistically significant effect on non-medical consumption.

The remainder of the paper is as follows. The second section reviews previous literature relating health shocks to households' economies, including prior research on full insurance against economic shocks in developing countries and on the protective effects of health insurance against health spending. The third section presents a short overview of the health sector in Mexico, focusing on the characteristics of social security benefits and insurance. Section four describes our data and the instruments for measuring health shocks and consumption. Section five describes our empirical strategy and discusses results. Section six presents an extension of Chetty and Looney's (2006) theoretical framework aimed at disentangling the income effect from the substitution effect regarding medical spending while analyzing the effect of health shocks on households' optimal consumption. This theoretical section also considers the potential welfare gains of health insurance. In section seven I present estimates of the value of insurance under a two health-state scenario and, subsequently, the value of insurance under a multiple health-states scenario through the calculation of risk premia for different types of health insurances. Finally, my concluding remarks are presented in Section eight.

2 Literature Review on Insurance Against Health Shocks

2.1 Health Insurance Literature Introduction

Given its importance in terms of spending and potential welfare gains, health insurance programs have been the subject of an important body of empirical research. Yet, most of the research has focused either on the impact of these programs on health outcomes, (for an extensive review see Levy and Meltzer, 2008) or the behavioral distortions induced by them such as over-use of medical services or risky behavior (Cutler and Zeckhauser, 2000)and(Philipson and Goldman, 2007). Less research has focused on the insurance value of health insurance. On one hand, the financial protection provided by insurance against consumption volatility has been subject to a considerable amount of empirical scrutiny in the United States, but most of that research rather focuses on assessing the effectiveness of programs providing insurance against employment shocks (Gruber, 1997) and not health insurance. On the other hand, in many cases, the literature supporting the increase of health insurance coverage for its consumption smoothing properties is limited to attempts to provide evidence of incomplete consumption insurance against health shocks, and do not directly estimate the insurance value of health coverage. Finally, most of the literature is within the context of developing economies.

2.2 Testing consumption insurance against health shocks

The seminal paper by Cochrane (1991) refines the concept of full insurance and presents an empirical technique for testing consumption insurance. Cochrane regresses consumption growth on a series of idiosynchratic shocks of different nature in a effort to distinguish which are the shocks that individuals most fail to insure. He finds that the loss of more than 100 days of work due to illness and the involuntary loss of a job are the two right hand variable whose association with consumption growth are both economically andstatistically important for the U.S. consumers. Modified versions of Cochrane's empirical strategy have been generally adopted to provide evidence of incomplete insurance against health shocks–assuming a degree of separability between consumption and health–, in developing countries .

Using data from three poor Indian villages, and controlling for village consumption (i.e. for village level risk), Townsend (1994) tests consumption insurance against shocks associated to contemporaneous own income, sickness, unemployment, or other idiosyncratic factors, finding no significant effects on household consumption growth. However, his identification of health shocks relies on a self-reported recollection, at the household level, of the amount of time household members spent ill instead of physical assessments of the household members. In contrast, using data that is also from central India, Kochar (1995), models wage income and informal borrowing as a function of illness and finds that farm households may be more vulnerable to male illnesses than to crop income shocks. Koshar argues that this is due to the fact that idiosynchratic shocks are usually insured against through labor. Actually, health shocks have varying impacts depending on its timing with respect to the agricultural cycle: illness to the male lowers wage income and increases informal borrowing during peak periods in agricultural cycle, but there are no effects during slaking periods or if the health shock is suffered by a female member of the household.

The inability to use of labor to alleviate the effect of income shocks might explain Cochrane (1991)'s finding that health shocks and job loss were the only type of adverse shocks for which US consumers were not insured against. Indeed, for the case of Mexican breadinners over fifty years old, I find, on one hand, that physical health shocks affecting consumption growth are associated with changes in the intensive and extensive margins of their labor supply; on the other hand, limited and gender-specific labor substitution from the other members of the household, which would partially explain why these households fail to insure consumption. The limited labor substitution result has also been found by Coile (2004) for a similar population but in the U.S. economy. The author finds that shocks such as heart attacks lead the affected worker to reduce labor supply dramatically, particularly if the shock is accompanied by a loss of functioning and that the added worker effect is small for men and that there is no such effect for women.

For the case of Indonesia, Gertler and Gruber (2002) also find that, in developing country economies, private informal coping mechanisms are insufficient to insure consumption against major illness. Their empirical strategy is similar to the one used in this paper, and the authors emphasize that measuring health status through the Activities of Daily Living indexes instead of self-reported health status perception allows to test insurance against large unexpected major illnesses instead of more frequent small illnesses that households seem to be able to fully insure. My results go along the line those of Gertler and Gruber since only health shocks measured though the ADLs index of breadwinners show a statistically significant effect on consumption growth while symptomatic illness measures similar to ones presented in their paper, in addition to and indicator of self-reported economic shock due to illness, show no effect on consumption. Complementing Gertler and Gruber's argument, I interpret the authors distinction between large and small illness as reflecting the degree to which a person's ability to work is affected.

On a slightly different vein, the dynamic effects of health shocks have been addressed by Conley and Thompson (2011)for the case of United States and by Gan et al. (2006) for the case of China. Conley and Thompson (2011)study the extent to which health shocks affect children net worth, contrasting the effect of acute illnesses and chronic illnesses. The authors find that the onset of an acute illness has a negative effect on family wealth levels and that the onset of chronic illnesses only makes an impact on children's net worth when it occurs for those uninsured. The authors conclude that under the current health regime of the United States, health dynamics play an important role in intergenerational stratification processes. Gan et al. (2006)also study the dynamic effects of major health shocks on household income but under a completely different context. Using a sample of households in 48 Chinese villages for the period 1987-2002, the authors find that on average, a shock-hit household falls short of its normal income trajectory by 11.8% in the first 15 years after a shock, and its recovery would take 19 years. Interestingly, authors find that village elections periods played an important role in mitigating these effects.

2.3 Beyond testing consumption insurance: estimates of welfare gains of health insurance.

Actually, inter-generational wealth costs was one of the examples used by Chetty and Looney (2006) to argue that perfect consumption smoothing does not rule out potential welfare gains of provinding a social insurance. The authors illustrate how under a setting of high risk aversion, which can be the case for some subpopulations in developing countries living close to survival consumption levels, consumption smoothing through informal mechanisms or family networks, is likely to be acheived at a realtively high costs with respect to what could be acheived through a formal social insurance. For example, families could pull children out of shcool to work to mitigate the consumption drop associated with a health shock to the household. Accounting for social insurance important efficiency gains imply that the inability to rule out full consumption insurance is not sufficient to rule out the existence of welfare gains of insurance.

Few papers have directly incorporated the insurance value of health insurance programs while assessing their overall impact. Finkelstein and McKnight (2008) study the impact of the the establishment of universal health insurance for the elderly in the U.S.A., including its insurance value, which they estimated through a stylized expected utility framework . The authors find that while the introduction of Medicare had no discernible impact on elderly mortality, elderly's exposure to out of pocket medical expenditure risk was reduced substantially. Actually, the welfare gains from such reductions in risk exposure alone may be sufficient to cover almost two-fifths of the costs of Medicare. Barofsky (2011) employed a similar approach than Finkelstein and McKnight (2008) to estimate the Seguro Popular's welfare gain from reduced health-expenditure uncertainty. Barofsky used experimental data from rural localities to compare the health expenditures risk premium of the treated localities–subject of an intense campaign of enrollment to Seguro Popular– with the risk premium of control localities. According to his results, 23% of the SPS out-of-pocket health expenditures benefits come from risk reduction[3]. In the present paper I construct a modified version of Finkelstein and McKnight (2008) methodology, adjusting it to fit the distributional particularities of developing countries, often characterized by a large heterogeneity in the capacity to pay for health spending.

Finally, Mcclellan and Skinner (2006) point out the importance of accounting for the insurance value of a health insurance program while estimating its redistributive consequences. Even though according to Mcclellan and Skinner (2006) calculations the Medicare program appears to be close to income-neutral in dollar terms, it still has redistributive properties. Indeed, the authors results show that Medicare's insurance value is relatively higher for those lower income elderly households whose consumption insurance

[3]Due to methodological issues explored in detail in section 8, Barovski results should be taken with caution.

was incomplete prior to the Medicare program, than for the richer elderly with better access to private insurance mechanisms. Given that the money-metric benefits to lower income groups exceed the value of their dollar flows, Medicare is redistributive.

3 Health Sector and Social Security in Mexico

3.1 Mexican Health Sector and the Uninsured

The structure of the Mexican health system mirrors that of the labor market. The occupational sector of a person determines to which healthcare subsystem she is subscribed to, and, therefore, it determines not only which institutions can be her healthcare providers, but also, the degree to which her health care will be financed through out-of-pocket spending. While formal employees of the private and public sector are affiliated to some social security institution defined by the nature of their employer, self-employed workers, unemployed workers, or informal employees are excluded from social security.

During the period assessed in this paper, the population excluded from social security financed their health care primarily through out of-pocket expenditures. Indeed, to receive healthcare, uninsured households had to choose between state governments or federally managed public health centers and private sector institutions, when they could afford their services. State and federally managed centers required payment for laboratory studies, medications and some health services. At the national level, in 2003, out-of-pocket spending accounted for more than half of total health spending and public funds were regressively distributed across income groups (Knaul and Frenk, 2010). As a result, each year between two and four million households either spent 30 percent or more of disposable income[4] on health or crossed the poverty line because of their health spending (Gonzalez-Pier Eduardo , Barraza Mariana, Gutierrez Cristina, 2005)

The financial vulnerability to health shocks endured by the uninsured population was one of the main drives of the 2003 reform of the Mexican health sector. This reform lead to the creation of a national system of social protection in health, that operates through a new social insurance called Seguro Popular de Salud (SPS). The main eligibility requirement for SPS is to be uninsured, defined as lacking employment-based health insurance. SPS guarantees access to a package of health services and interventions with SPS certified providers(Secretaria de Salud, 2010). In exchange, members of SPS are expected to pay a subsidized income-based health premium. In practice, however, most of the affiliates are exempt from payment (Lakin, 2010)

[4]Defined by the authors as total income minus spending on food)

The period covered by the present study precedes SPS coverage expansion. By 2005, the 11.4 million individuals affiliated with SPS accounted for only 23% of the targeted population eligible for the program(Presidencia de la Republica de Mexico, 2011). Further more, this affiliated population was concentrated within states that were excluded from the MxFLs sampling universe. For the particular case of the states included in our data sample, the share of eligible households covered by SPS was 2.6% in 2002 and 20% in 2005 while the national average was 4.2% in 2002 and 30.3% in 2005. Among the eligible adults that were surveyed in 2005 for the MxFLs, only 7% reported being affiliated with SPS while at the national level 23% of the eligible population had been affiliated. Still, since affiliation to SPS would affect our estimates of the effect of health shocks over household consumption, affiliation to SPS by any member of the household is included as a control variable.

3.2 Social security institutions

3.2.1 Affiliation Rules and Coverage

Among the different institutions that integrate social security, the largest institution is the Mexican Social Security Institute (IMSS). Since its creation in 1943, affiliation to IMSS has been mandatory for individuals working in the formal economy. However, political pressures lead to the creation of parallel social security institutions for the formal employees of Mexico's key political sectors. As a consequence, over the years these institutions have each developed their own healthcare and social benefits infrastructures, independently providing services to their affiliates by means of separate financing and delivery mechanisms. Federal government workers are affiliated to the Instituto de Seguridad Social para los Trabajadores del Estado (ISSTE), state-owned oil company (PEMEX) workers are affiliated to PEMEX benefits' subsystem, and military and navy staff and their families are protected by their own subsystems (SEDENA and SEMAR).

Even with the creation of these additional social security institutions, IMSS remains as the largest healthcare provider among the insured population. Since social security coverage is family based when a worker is affiliated with a social security institution, his spouse and children are also covered with health insurance. Moreover, beneficiaries have the option to expand the coverage to their parents by declaring them dependents. As shown in Table1, during the past decade near 50% of individuals seeking care at least once annually were social security beneficiaries; and, among this population, nearly 80% received care at an IMSS health center.

Despite the large presence of the IMSS by 2002, the employment based social security scheme left a large portion of the population uninsured from health expenditures. Estimates of the exact share of uninsured population vary across types of data sources. On one hand, as shown in table3, administrative data reported that from the almost 100 million Mexican population of 2002, approximately 55.6 million of individuals were affiliated to one of the two main social security institutions: 45.3 millions to IMSS and 10.3 millions to ISSTE (Presidencia de la Republica de Mexico, 2011). On the other hand, the 2000 Census, the 2000 National Health Survey (ENSA), and the Health Ministry's National Survey for Performance Evaluation (ENED) sampled between 2002 and 2003 estimated the share of the population affiliated to social security to be 39.8%, 39.6%, and 37.5%, respectively (Sesma-Vázquez et al., 2005). In sum, administrative records tend to over-estimate the insured population since all survey-based data estimated the uninsured population to account for near 60% of the Mexican population.

3.2.2 Social Security Subsisdies and Insurances

Unlike the uninsured sector of the population, social security institutions are financed through employers/employees payroll taxes and legally mandated government contributions. The differences in economic vulnerability to health shocks are further exacerbated by entitlements to a series of disability related benefits. Indeed, social security financial protection was conceived within broad welfare objectives that operate through three channels: health care, subsidies and pensions(IMSS, IMSS; Asegurados, 2005). In particular, IMSS and ISSTE have very similar rules of operation with regard to their affiliates benefits, (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, 2003; IMSS, IMSS) as presented below.

(i) Disability subsidies Temporary disability subsidies can be solicited if an insured worker, who has fulfilled institutionally regulated contribution requirements, suffers a defined physical or mental disability impeding work attendance. There are three types of disability subsidies: general sickness, risk at work, and maternity. General sickness is defined as a non-work related accident or sickness preventing an insured individual's ability to participate in the workforce. This corresponds to 60% of a current wage subsidy for a period that can last up to 78 weeks. The second type of benefit, risk at work, corresponds to a full wage subsidy for a period that can last up to 52 weeks. This can be claimed when an insured worker is injured either at the workplace or while traveling to the place of employment. Finally, females insured workers who have given birth are eligible for the third type of subsidy, maternity. Details on the amounts and requirements are shown in table2.

(ii) Disability related pensions Individuals with permanent disabilities qualify for disability pensions. There are two types of disabilities that are subject to a pension benefit for IMSS affiliates: relative and complete. Relative disability is granted when an insured worker is unable to reach a wage over 50% of the value of the wage received during his last year of work due to an illness or a non-labor related accident. Permanent disability is defined as the incapacity to perform work tasks due to the partial or total loss of physical or mental abilities resulting from an accident at work or a work-related illness. In order to receive these pensions, disabled individuals must have been contributing to social security prior to the injury or illness and must have contributed a minimum amount of aggregated quotas.

3.3 Implications for the analysis of the effect of health shocks on consumption.

The structure of the Mexican health system has two primary implications for the analysis on the effect of health shocks on consumption: (1) the Mexican employment-based health system is characterized by a significant heterogeneity in the financial burden of healthcare costs across the population and (2) social security beneficiaries' unobservable characteristics are likely to be correlated with their insured status since being insured is associated with having higher levels of earnings.

The first implication comes directly from the fact that public spending per capita varies by occupational sector with the uninsured population covering a proportionally larger fraction of the total costs of their healthcare. Further more, since each subsystem entitles its members to different social and economic benefits, the affiliation to a particular healthcare subsystem exacerbates the differences in the population's financial vulnerability to health shocks. This heterogeneity is reflected in variations across different subpopulations in the likelihood of incurring in catastrophic spending in health. Catastrophic spending is defined as any health expenditures representing over 30% of a household's capacity to pay for healthcare. For example, in 2002, according to the National Income and Expenditures Survey (ENIGH), while on average, 2.9% of the total Mexican households incurred catastrophic expenditures in health, that percentage increased to 5.8% for households living in rural areas (Grogger et al., 2011). This hypothesis is supported by results of this study since I find that social security beneficiaries are fully insured against the breadwinner's health shocks.

The second implication, that social security beneficiaries' unobservable characteristics are likely to be correlated with higher levels of consumption relative to the uninsured sector of the population, was considered while defining my estimation specification. By setting a model in terms of changes in consumption levels, our specification attempts to address the selection issue affecting the assessment of the protective effect of social security over the consumption paths of its beneficiaries. While it is clear that there would be selection bias if estimates of the effect of breadwinners' health shocks on household consumption levels among social security beneficiaries were computed, the nature of the correlation between social security affiliation and changes in per capita consumption over a short period of time is not clear.

Finally, since our results analyze the impact of health shocks for a population that remained uninsured by SPS at the time in which the data was collected, one could interpret the results as a reference of the potential benefits associated to this coverage. However, SPS does not provide coverage on all potential margins of health expenditures. Therefore, the value of insurance against health spending estimated in section eight should be seen as an upper bound for the potential gains of the program under its current design. Additionally, this interpretation presumes capacity to satisfy the demand for healthcare of the uninsured. Given the infrastructure constrains faced by the localities where the uninsured population is concentrated this capacities still needs to be created. As shown by Grogger et. al. (2012), in the localities that have access only to a very basic healthcare center, the effects of SPS on financial protection were null. Finally, it is worth noting that the value of full consumption insurance corresponds to the value of offering health spending and disability insurance; therefore, the value of full consumption insurance does not correspond to the potential gains that could be drawn from SPS.

4 Data Description

4.1 Mexican Life Survey

4.1.1 General Characteristics

For my analysis I use the Mexican Life Survey (MxFLS). The MxFLS is a longitudinal survey that follows households and individuals across time independently of their migration decisions. The MxFLS universe of reference corresponds to all the habitants of private households in Mexico in 2002. Households are represented at three levels of aggregation: national, urban/rural and regional [5]. After the 2002 baseline, two additional waves of the MxLS were taken in 2005 and 2009 using practically identical questionnaires. So far, only the first two waves have been made public. The MxFLS questionnaire includes seven different books, each one of them addressing a large range of topics including: (i) household level consumption, economy and infrastructure; (ii) individual level education, labor and migration decisions, cognitive skills, and health

[5] There are five identified regions in the MxFLS: (1) Central-Northeast, including the states of Coahuila Durango and Nuevo Leon; (2) West Central, including the states of Guanajuato Jalisco and Michoacan ; (3) Central, including Distrito Federal, Mexico, Morelos and Puebla; (4) Northwest: including the sates of Baja California Sur, Sinaloa and Sonora; and (5) South-Southeast including the states of Oaxaca, Veracruz, and Yucatan.

status including some anthropometric indicators. The variety of the MxFLS booklets allowed me to construct three different measures of health shocks; although, I will focus on the health shock based on changes in individual physical capacities.

For the purpose of the present study, attention is restricted to households whose heads were 50 years old or older in 2002 and for which I hold consumption and health information from both 2002 and 2005. For this particular subsample, the retention rate was 80%, slightly lower than the overall 2005 individual rate of retention of 90%[6]. I restrict the sample to persons over 50 years because it is within this age range that the interviews included ADLs questions. According to the literature, 50 years old is the threshold age at which the risk of suffering a decrease in physical capacities becomes significant. For example, it is at this age that chronic affections like hypertension start to manifest symptomatically (refs. here). Among this sample, I distinguish breadwinners and non-breadwinners. I define breadwinners as all male household heads active in the labor market, that are under 70 years old[7].

4.2 Health Shocks Measures

The MxFLS allows us to consider four different strategies to measure health shocks: changes in general ADLs, changes in the most basic ADLs, changes in the incidence of self-reported illness symptoms, and yearly families self-reported economic shocks related to some household member illness.

4.2.1 Variation on the Activities of Daily Living Index

The change in the physical capacities of household heads over 50 years old is performed assessing their degree of limitations in the ability to perform activities of daily living (ADLs). The term "activities of daily living" refers to a set of common tasks considered to be required for personal self-care and independent living (Wiener et al., 1990). The specific activities targeted in the Mexican Life survey are adapted from the RAND 32 Question Short Form (Ware, 1980). Each activity referred to is self-ranked as either: (1) "can do it easily"; (2) "can do it but with difficulty"; or (3) "is unable to do it". Adults were interviewed directly and proxy responses were not accepted.

Within the set of ADLs questions included in the MxFLS I differentiate between intermediate level ADLs

[6] The age structure of the MxFLS 2002 respondents corresponds to the population age structure obtained in the 2000 Mexican Census. For example, while half of the population was younger than 22 years old, according to the census, in the MxFLS that population group represents 49% of the total sample. My sample of panel individuals over 50 years old in 2002 represents 16.1% of the total population, while in the 2005 Census Population Count (Conteo) that same age group represented 15% of the total Mexican Population (INEGI.b)

[7] The exclusion condition was that the individuals must have worked full time at least one time during the past year so that temporary unemployed workers would be included.

and basic level ADLs. The ADLs considered to be intermediary assess the following abilities: carrying a heavy load for 20 meters; sweeping the floor or yard; walking for 5 kilometers; taking water from a well; bending; kneeling and stooping. The basic ADLs refer to the most basic activities required for independent living including the following abilities: bathing yourself; feeding yourself; clothing yourself; standing from sitting in a chair; going to the toilet by yourself; and, rising from sitting on the floor. Acquiring a limitation in any of these activities, particularly any of the basic ADLs, clearly represents a major change in physical health status.

The ADLs index used are a normalized version of the sum of all the responses reported in the set of ADLs questions. Following the literature specification (RAND, 1995) ADLs scores are constructed according to the following formula:

$$score_{physicalcapacity} = \sum_{i=1}^{8} adl_i$$

$$ADL_i = \frac{score_{physicalcapacity,i} - r(min)}{r(max) - r(min)}$$

Following RAND (1995), I constructed two different ADL indexes, one including all the ADL questions, the general ADL index; and one including only the questions referring to the most basic activities of every day, the basic ADL index. For robustness checks purposes, I also constructed an additional index allowing for differentiated weights between each of the ADLs components using a factor analysis methodology. I only show the results using the standard ADLs scores since the use of principal component index did not change any of our estimation results while the interpretation of the estimated coefficient was more difficult. This suggests that traditional ADLs scores present relatively low measurement error when measuring the latent physical capacity of respondents.

Figures 1 to 3 show the relationship between the head of the household's health, measured by his ADL index, and household's wealth. Figure 1 shows that, except for individuals at the very top of the age distribution (for which I have very few observations), household heads above 50 years old from the highest wealth quartile have higher indexes in 2002 than the household heads from the lowest quartile. Moreover, the socioeconomic gradient seems to be aggravated across time. This is because between 2002 and 2005 (Figure 3), a higher share of household heads on the lower end of the health distribution, suffered decreases in their ADLs index relative to what happens with the wealthiest households.

4.2.2 Other Symptomatic Measures of Health Shocks

For the second type of health shock measure included in my analysis, I use the report of newly acquired illness symptoms. Illness symptomes are asked directly to all adults living in the sampled household. Each illness symptom is matched with a dummy variable equal to one whenever the person reports the symptom and zero otherwise. The symptoms included in the interview are classified between acute infection/viral sindroms and chronic illnesses symptoms. Acute symptoms are characteristic of common infectious diseases either respiratory or gastro intestinal. They include, for example, throat pain, diarrhea and fever. The set of chronic diseases symptoms concentrate on symptoms associated with the most common chronic diseases in Mexico like hypertension and diabetes and heart failure. Some examples are shortness of breath, chest pain with physical activity, slow wound healing or waking up with headaches in the morning. Presumably, infectious diseases have a temporary only effect on individuals capacity to work whereas chronic diseases can have a more permanent effect on the productivity of individuals. Therefore I distinguish two types of symptomatic health shocks: the first, when individuals presents any infectious diseases symptoms in 2005; the second whenver and individual presents any new chronic disease symptoms with respect to 2002.

4.2.3 Reported Health-Related Economic Shocks

Additionally to the standard sections of household and individual characteristics, in the MxFLS each household completed an entire section of the survey devoted to reporting any economic shocks suffered in the last five years. Each household was able to report up to three shocks suffered during the five years that preceded the interview. Sickness of a household member that required hospitalization is included among the possible causes of household's economic shocks. For each sickness shock, it is possible to identify the household member that got sick (with respect to the household head) and the year in which the incident occurred.Over the 7,073 households that provided information on this section in both 2002 and 2005, more than 22% reported to have suffered at least one health-related shock. Indeed, in 2002 and 2005, the proportion of households that reported a health economic shock was 13.19% and 10.64% respectively. Considering only the intra waves shocks, approximately 9% of the panel households reported to have suffered a new health shock.

The benefits of targeting specific physical activities instead of general assessments of illness symptoms to assess physical functioning have been widely discussed in the literature (Strauss et. al. (2003), Wallace et al. (1995), Gertler et. al (2002) and Smith et. al. (2002)). I, therefore, focus my paper on the effect of shocks on the physical capacities of breadwinners, measured through variations in the intermediate and basic ADLs indexes.

4.3 Consumption Measures

4.3.1 Total Spending

The MxFLS collected detailed expenditures data only for food, and to a lesser extent, healthcare items. The other items were grouped into roughly 29 broad spending categories such as clothing, cleaning products, utilities, and so on.

The bundling of distinct spending categories adds measurement error on the estimate of total expenditures. For my analysis, I trim outliers in each of the broad spending categories by recoding to missing any observation that exceeds a cutoff value equal to five times the 99th percentile of spending in that category.

Additionally, items-specific non response vary greatly between categories -although most categories have low non-responses rates, very few households responded to every single detailed category of spending-. To have a measure of total spending the item-specific non-response problem needs to be addressed because failure to do so implicitly attributes a value of zero to the missing item, thus underestimating aggregate spending.

I address the non-response problem by imputing all missing values from the trimmed data, whether the data was missing due to trimming or item-specific non-response. Within each of the broad spending categories, missing values are replaced with the mean value for that category. I carry out imputations for all households for which I have non-missing data on either health or non-health expenditures.

4.3.2 Per Equivalent Adult Consumption

I ran the model over the log change in consumption per equivalent adult instead of log change in consumption per capita because I wanted to account for compositional differences that might undermine the observed level of individual consumption within households having a larger proportion of children. Indeed, I know that for the particular case of Mexico rural households tend to be larger; although, rural households also have a larger proportion of children than urban households. In 2000, the average household size at the national level was 4.2 persons, of which 1.26 were under 13 years old. In rural localities, however, household size was 4.45 versus the 4.03 that prevail in urban localities where the proportion of children is also lower than the national average (INEGI 2002).

My analysis incorporates the equivalence scales estimated by Teruel, Rubalcava and Santana (2005) using the Engel method (Engel, 1895). From the perspective of the Engel method, a large household and small household could be equivalent if both devoted the same proportion of their spending into food consumption

(Deaton, 1997). The estimated Engel equivalence scales considers the differences in nutritional needs of distinct sex and age groups as well as households spending patterns observed in the 2000 Mexican Income and Expenditures Survey (ENIGH). The group of reference for the equivalence estimations is persons between the ages of 19 to 65 years old. Relative to the group of reference the 0-5, 6-12, and 13-18 years old are found to represent 0.77, 0.81, and 0.76 units of additional costs for the household. Finally, in my analysis I decided not to consider the existence of economies of scale in consumption within households.

5 Testing Full Consumption Insurance Against Health Shocks

5.1 Statistical Methodology

I am interested in measuring the association of consumption growth with measures of breadwinners' health shocks that took place over the lapse of three years. Thus, I limit the sample to men with significant attachment to the labor force. For example, our base sample is limited to male workers, older than 50 years old and younger than 70 years old at the time of their first interview, with some full time labor experience during the year of the interview, declaring to be the head of their household. Any household head fulfilling these conditions is considered to be a breadwinner.[8]

I then relate breadwinners' health shocks to the log change of consumption per equivalent adult between 2005 and 2002. I estimate the effects of breadwinners health shocks on household consumption using a standard ordinary least squares regression framework. Specifically, I estimate a number of OLS regression models of the form:

$$\triangle ln(\frac{C_i}{n_i}) = \alpha_i + \beta_2 \triangle h_{ji} + \beta_3 \triangle ins_i + \delta_1 ins_i + \delta_2 ins_i * \triangle h_{ji} + \sum_k \gamma_k X_{ik} + \varepsilon_i \qquad (1)$$

where $\triangle ln(\frac{C_i}{n_i})$ is the change in C_{it} the log quarterly non-medical consumption[9] per n_{it} equivalent adults of household i in period$t$ between t = 2005 and t = 2002, α_i is a state of residence fixed effect, $\triangle h_{ji}$ is the difference between the 2005 and the 2002 ADLs score of household i's breadwinner, $ins_i$is an indicator variable for the social security insurance status of household i in 2005, $\triangle ins_i$ indicates a change in the social security status of household i between 2005 and 2002, and X_{ik} is a vector of baseline control characteristics

[8] The estimation results were tested using several definitions of breadwinners. Estimations using a breadwinner definition wihtout the household head condition finds similar results than those presented in this paper, yet the magnitudee of the health shock effect is stronger for breadwinners that are identified by the members of the household as the head of the household.

[9] values are in deflated into real 2008 pesos

such as the household-head's age and education level, wealth proxies, and, wether there was more than one household member participating in the labor force in 2002, among others. A full description of all the control variables is presented in appendix A. Finally, all results were estimated using robust standard errors.

5.2 The effect of health shocks on consumption

5.2.1 Moderate physical capacity health shocks

Table 4 presents the effect of breadwinners and non-breadwinners household heads' physical capacity health shocks on non-medical consumption growth for the case of moderate health shocks, measured through changes in the general ADLs index. For breadwinners, passing from being able to perform easily all the activities included in the ADLs index to being able to perform none implies a 51% decrease in household consumption levels. Yet, for non-breadwinners the corresponding decrease in consumption is 11% and the health shock effect is not statistically significant.

It is worth notice that ADL index like many health measures has a distribution concentrated around the 0 with more than 40% of the breadwinners experiencing no change at all in their ADL index. Therefore it is perhaps more relevant to assess what the costs of health shocks are for the households that suffered any type of shock than for the average household. For example, although, the average three years change in the general ADL index for uninsured breadwinners is only -0.051 and thus their average drop in consumption due to physical capacity shocks is 2.6%, for the 33% of the uninsured households whose breadwinner experienced any decrease in his physical capacity non-medical consumption fell on average 11% due to breadwinners' physical capacity shocks.

Table 4 also shows that my results suggest that social security beneficiaries seem to be fully protected against breadwinners' health shocks. The interaction coefficient between social security insurance and the change in the ADLs index completely offsets the coefficient associated with the change in the general ADLs index. On the other hand, while the coefficient of the social security insurance main effect has the expected positive sign, it is not significant. This probably reflects the fact that although being a social security beneficiary is related to unobservables that presumably affect household consumption levels, most of the relevant unobservables characteristics are constant over time and they seem uncorrelated with changes in consumption.

5.2.2 Severe physical capacity health shocks

Table 5 repeats the exercise in Table 4, controlling now for changes in the basic ADLs index. Results are roughly similar to the previous table, as there is a significant effect of health shocks on consumption. Indeed for breadwinners, passing from being able to perform easily all the activities included in the basic ADLs index to being able to perform none implies a 69% decrease in household consumption levels and this result is significant at a 1% confidence level. Given that the average change in the basic ADL index for uninsured breadwinners was -0.057, the associated average drop in consumption for uninsured households due to severe physical capacities shocks is 3.5%.

Again, the insurance status variable has the expected sign, but is not statistically significant while the interaction between social security insurance and the change in basic ADLs offsets the entire effect of the health shock. This allows me to confirm that while for households that are not insured through the social security health shocks to breadwinners severely undermines consumption levels, beneficiaries of social security seem to be fully insured against health shocks of their breadwinners.

5.2.3 Self reported illness symptoms

Table7 show how, when relying on self-reported, dichotomic measures of presence of illness symptoms, there are no significant effects of the appearance of illness symptoms on household non-medical consumption growth whether the symptoms are related to suffering an episode of an infectious disease or suggest that a chronic disease is starting to manifest it-self. There are two possible interpretations confounded in this result. First, relatively more subjective self-reported health measures are subject to recall bias and personal interpretation, which makes them extremely noisy. Therefore, not being able to reject the null hypothesis that the estimates of the self-reported symptomatic health measures' effect over consumption growth are significantly different than zero is due to measurement error bias. In the light of our previous results, the second interpretation is that given that households seem not to be insured against breadwinners' earnings losses associated with their decreased physical capacity, the new illness symptoms might be accurately reported yet not significantly affecting breadwinners' productivity or capacity to work.

5.2.4 Insurance status robustness check

Table 6 provides a direct comparison of different measures of insurance using different questions asked at different parts of the questionnaire to the respondents regarding their insurance status. As earlier found, lagged measures of insurance appear to play no protective role against health shocks whereas contemporary health insurance in its many possible specifications does. Although the exact estimate of the attenuation role of current insurance depends on the specific measure of insurance under consideration, their respective interaction with the health shock variable is in all cases statistically significant and of similar magnitude than the estimate of the main effect of the health shock.

5.2.5 Risk Aversion Heterogeneity Robustness Test

The evidence of incomplete insurance against health shocks does not appear to result from a bias due to unobserved differences in attitudes towards risk common to the uninsured individuals, a concerned raised by Schulhofer-Wohl (2011). According to an argument made by Schulhofer, if uninsured breadwinners were relatively less risk averse than the insured population, given that they self-selected into uninsured occupations, then they would be less willing to sacrifice present resources to either avoid or be prepared for the eventuality of a health shock, making their households more vulnerable to health shocks. Yet, the data shows no correlation between breadwinners' insurance status and their level of risk aversion. As shown in column4 of Table8, when we control for heterogeneity in risk aversion, by adding individual-level indicators of low risk aversion and high risk aversion into the consumption OLS regression, the estimated coefficients do not change.

5.3 Implications of Consumption results

In sum, the correct evaluation of the effects of health shocks on household's consumption levels needs a precise definition of the economic role that the person who suffers the shock plays. For instance, a share of household heads in our sample are women. However, only 30% of female household heads are breadwiners, compared to 85% of men. Thus, an aggregate look at household heads hides considerable heterogeneity regarding the potential impact of the shock and insurance on income.

Indeed, as mentioned before, the impact of a health shock on non-medical consumption comes through two channels. First, health shocks reduce the resources available for non-medical consumption. Second, if the person affected by the shock is a breadwinner, by affecting her ability to work, the shock can lower household's budget constraint. An insurance that covers not only out-of-pocket expenditures in health but also labor income from an incapacity associated to health shocks is more likely to insure consumption against illnesses. My results appear to be consistent with this hypothesis. The direct effect of the shock is much larger for heads below 70 years old, which are much more likely to be still in the labor market, and results are also larger than the ones in the sample with both men and women. Social security insurance provides a large and significant buffer, which makes the net effect on the consumption of a health shock for households with insurance basically zero. Therefore, the stronger effect found for health shocks from breadwinners on household consumption suggests that effectively, uninsured health shocks reduce non-medical consumption both directly and indirectly, depending on whether they affect households' earnings capacity.

6 General theoretical framework for social insurance against health shocks.

In this section we will present a general framework for analyzing the welfare effects of health shocks, following the normative framework presented in Chetty and Looney (2006).

6.1 Consumer maximization problem.

Consider a parametric model where a representative agent faces health risks represented by unforeseeable changes in his health stock. Suppose that to each level of health stock correspond different costs of producing one unit of non-medical consumption[10]. This is due to the fact that health stocks affect his labor income as well as his medical consumption . Assuming that only non-medical consumption provides utility to the agents, the agent utility function in each state is:

$$u(c) = \frac{c^{1-\gamma}}{1-\gamma} \tag{2}$$

Where γ is the agent's risk-aversion coefficient. In this setting, the worker chooses consumption in each state by solving:

$$\max_{c} \frac{c^{1-\gamma}}{1-\gamma} - \psi(c, h, m, x) \tag{3}$$

where $\psi(c, h, m)$ represents the disutility of obtaining c units of non-medical consumption. $\psi(c, h, m)$ is a function of the agent's health stock h, his out-of-pocket medical expenditures m, and other observable and

[10] Health shocks can affect the household capacity to produce non-medical consumption in other ways—for example, by requiring other members of the household to become caregivers— but in this section we will focus exclusively on the effects directly related to the breadwinners.

unobservable variables represented by vector x. For simplicity, let $\psi(c,h,m)$ be defined by the linear form:

$$\psi(c,h,m,x) = \theta(h,m,x)c \tag{4}$$

where θ summarizes the effects of health, medical expenditures, and any other factors that affect the utility cost of raising an additional unit of non-medical consumption. We assume that $\theta_h \leq 0$, $\theta_m \geq 0$, $\theta_{hh} \geq 0$ and $\theta_{mm} \geq 0$. Optimal consumption conditional on θ—i.e. conditional on health, medical consumption, and all other factors that can affect the utility cost of raising an additional unit of non-medical consumption— can be written as:

$$c^*(\theta) = \theta^{-1/\gamma} \tag{5}$$

6.2 The effect of health shocks on optimal consumption.

Under this setting, the effect of a negative health shock ϕ on the marginal cost of producing a unit of non-health consumption will be represented by $\frac{\partial\theta}{\partial\phi} = \theta_\phi$, and, this effect will vary depending on the type of insurance the agent has. The θ_ϕ in itself does not measure shocks directly; rather, it provides a reduced form for their effects, after taking into account the role of insurance, labor market behavior, liquidity constraints, etc[11]. Thus, for any given shock ϕ that changes θ_t to θ_{t+1} the associated change in non-medical consumption is:

$$\frac{\triangle c}{c} = \frac{c_{t+1} - c_t}{c_t} = \left(\frac{\theta_t}{\theta_{t+1}}\right)^{1/\gamma} - 1 \tag{6}$$

In general for any given shock ϕ, non-medical consumption will fall more for those agents that lack insurance (as θ_{t+1} will increase more in their case), and for those agents that are relatively less risk averse, and thus have less willingness to substitute consumptions across states (smaller γ).

Given my previous specification of agents' utility function, the effect of ϕ on optimal consumption c^* — or $\triangle c$ — can be expressed as:

$$\frac{\partial c^*(\theta)}{\partial\phi} = \frac{-1}{\gamma}\theta^{-(1+\gamma)/\gamma}\frac{\partial\theta}{\partial\phi} \tag{7}$$

[11]Notice that, if we redefine $u(c) = \frac{c^{1-\gamma}}{1-\gamma} - \theta c$, which does not change the optimization problem at all, then u_c is decreasing in θ. In that sense, this setup allows us for non-separability between consumption and health

6.2.1 Full insurance case

When agents are fully insured against health shocks the utility cost of raising an additional unit of non-medical consumption is less sensitive to health shocks, and therefore, optimal non-medical consumption level does not respond strongly to the shock. In the extreme scenario of assuming complete separability between health and consumption —i.e. the marginal utility of consumption does not depend on health—, full insurance would imply that $\frac{\partial \theta}{\partial \phi} = 0$, and thus, by (6) optimal consumption would not change.

6.2.2 Incomplete insurance case

However, when agents are not fully insured against health shocks, their optimal consumption level will respond to the rise in utility cost of raising an additional unit of non-medical consumption provoked by ϕ. In the light of the empirical results presented earlier, for the uninsured agents that suffer a negative health shock the utility cost of raising an additional unit of non-medical consumption increases through at least two mechanisms: higher out-of-pocket medical expenditures, and earning losses associated with a lower capacity to work due to the fall in the health stock of the agent. Therefore, the effect of a negative health shock ϕ over the marginal cost of producing one unit of non-medical consumption optimum can be decomposed it the following way:

$$\frac{\partial c^*(\theta)}{\partial \phi} = \frac{-1}{\gamma} \theta^{-(1+\gamma)/\gamma} \left[\underbrace{\frac{\partial \theta}{\partial h} \frac{\partial h}{\partial \phi}}_{(IE)} + \underbrace{\frac{\partial \theta}{\partial m} \frac{\partial m}{\partial h} \frac{\partial h}{\partial \phi}}_{(SE)} \right] \tag{8}$$

Where the first component of θ_ϕ, [IE], corresponds to a negative income effect due to the loss earnings provoked by the lower capacity to work given the lower level of h; and the second component [SE] corresponds to a consumption substitution effect linked to the fact that agents are forced to allocate more budget into medical expenditures, and, therefore, a smaller share of each peso earned is available for non-medical consumption. In other words, given $\theta_h < 0$ and $\theta_m > 0$, for any given negative shock ϕ that lowers the agent health stock and increases its medical spending, we expect $\frac{\partial c^*}{\partial \phi} < 0$.

6.2.3 More on health shocks effects under incomplete insurance

Let the amount of out-of-pocket health expenditures be defined by:

$$m = p.m(h) * (1 - i)$$

where i is the proportion of medical expenditures covered by the household insurance and p is the relative price of medical goods with respect to non-medical goods.

And let each agent's labor income be defined by:

$$y = w * g(h, z)$$

where w is agents market wage, and $g(h, z)$ is the amount of time allocated into work by the agent, which is a function of his health stock and vector of other variables z.

Incorporating (8) and (9) into expression (7), the effect of a negative health shock over the marginal cost of raising an additional unit of consumption θ, can be re-defined as:

$$\frac{\partial \theta}{\partial \phi} = \underbrace{w \frac{\partial g(h, z)}{\partial h} \frac{\partial h}{\partial \phi}}_{(IE)} + \underbrace{p \frac{\partial m(m)}{\partial h} \frac{\partial h}{\partial \phi}(1 - i)}_{(SE)}$$

6.2.4 Accounting for risk aversion

Finally, as noted before, equation (6) implies that observed consumption adjustments to health shocks will vary depending not only on agents' capacity to smooth consumption across states through formal and informal insurance mechanisms, but also on their level of risk aversion. Indeed, Chetty and Looney (2006) show that when γ and θ are not fully identifiable, observing smooth consumption paths across states does not rule out potential welfare gains when introducing social insurance, because highly risk-averse agents could be smoothing consumption across states at a relatively higher cost than what could be achieved through social insurance.

6.3 Welfare gains of insurance against health shocks

For simplicity of presentation, assume that a healthy agent faces only one type of potential health shock, which occurs with probability p. Optimal consumption in the healthy state and in the sickness state are noted c_h and c_s, respectively. Once again, c_s depends not only on the shock, but also on the types of asset - including insurance - the agent holds. Unless the agent is fully insured, consumption in both states will not be the same, and the greater the difference in consumption levels between states, the greater the potential welfare gains of insurance.

As illustrated by Chetty (2006) and Chetty and Looney (2006), under a two-states scenario an actuarially fair insurance program that raises consumption under a health shock state c_s by 1 unit must lower consumption under the shock-free state c_h by the relative probability of suffering that health shock- that is, by $\frac{p}{1-p}$ units. Thus, the marginal welfare gain from insuring against a health shock can be expressed as: :

$$\widetilde{W} = pu'(c_s) - (1-p)\frac{p}{1-p}u'(c_h) = p(u'(c_s) - u'(c_h)) \tag{9}$$

The marginal welfare gain from each peso spent in the health-shock insurance premium in expression (5) can be converted into a money metric by normalizing this welfare gain by the welfare change from a $1 peso increase in consumption in the "good" shock-free state. Therefore, relative to an increase in consumption in the healthy state, the welfare gain from insurance is proportional to:

$$W \propto \frac{u'(c_s) - u'(c_h)}{u'(c_h)} \tag{10}$$

Assuming that the third component of the Taylor expansion of u(c) is negligible, expression (6) can be approximated by:[12]:

$$W \simeq \frac{u''(c_h)}{u'(c_h)}(c_h - c_s) \tag{11}$$

$$= \gamma\frac{\triangle c}{c}$$

In the following section I will use this approximation to estimate the potential welfare gains of insuring against breadwinners health shocks for a subsample of the uninsured Mexican population.

7 Empirical estimates of potential welfare gains of social insurance against health shocks in Mexico

I now present estimates of potential welfare gains of providing health and disability insurance for the breadwinners of our sample that lacked insurance in 2005. First, I present the welfare gains consumers would

[12]Results in Chetty (2006) show that very similar expressions can be derived from a dynamic set up with a distribution of shocks across the different periods of the agent's life.

have had, had they been insured, given the specific realizations of health shocks they suffered between 2002 and 2005. Second, I complement this estimate by considering the value of reducing, partially or entirely, households' risk exposure to any possible health shock, given the empirical distributions of breadwinners health risks and medical expenditures faced by the agents in my sample.

7.1 Two health states case

I start by estimating the potential welfare gains of providing full insurance against breadwinners health shocks to the uninsured population given its expected changes in consumption associated with realization of health shocks suffered by their breadwinners between 2002 and 2005. As in the previous section, I focus on health shocks quantified as changes in the breadwinner's level of ADLs general index between 2002 and 2005 for households with a breadwinner between 50 and 70 years old.

As previously described, under a two states scenario an actuarially fair insurance program that raises consumption under a health shock state by 1 peso must lower consumption under the shock-free state by the relative probability of suffering that health-shock (that is, by p/(1-p) pesos). The marginal welfare gain from each peso spent in the health-shock insurance premium —shown in expression (4)— can be converted into a money metric by normalizing this welfare gain by the welfare change from a $1 peso increase in consumption in the "good" shock-free state (Chetty and Looney (2006)). As shown in equations (5) and (6), this welfare gain from insurance against health shocks relative to an increase in consumption in the shock-free state can be approximated by $\gamma\frac{\triangle c}{c}$.

Using the previous section's OLS estimates of the effect of a change in breadwinners' ADLs index on the logarithmic change in household non-medical consumption, I compute uninsured households' expected change in non-medical consumption given their observed breadwinner's health shocks by multiplying the average change in uninsured breadwinners' ADLs index by the value of the ADLs change estimated coefficient. Then, following the normative framework of Chetty (2006) and Chetty and Looney (2006), I compute estimates of the marginal welfare gains per peso paid in the premium of an insurance against health shocks. For the sake of robustness, I obtain estimates for an array of risk-aversion coefficients, from γ=1.5 to γ=5.

As shown in Table1, among uninsured households the expected change in breadwinners general ADLs index is -0.0507. This reduction in the breadwinners' physical capacities corresponds to a decrease of 2.6 percent in households' non-health consumption. Therefore, the marginal increase in expected utility from an extra peso spent in insurance $\gamma\frac{\triangle c}{c}$ is 0.039 when $\gamma = 1.5$, and rises up to 0.129 when $\gamma = 5$, the highest level of risk aversion considered. For the case of $\gamma = 3$[13], the marginal increase in expected utility from an extra peso spent in insurance is 0.078.

Yet, like many health measures, the change in ADLs index has a very skewed distribution: while the average change in breadwinners' ADLs index is very low, very few households actually experience this average change. In fact, the median breadwinner ADLs change is zero, and there is a fraction of the breadwinners that suffers severe negative changes. For near 16% of the households in the sample, healths shocks suffered by breadwinners during a period of only three years represented an expected 12.7% decrease in household's non-medical consumption; furthermore, 4% of the sample is expected to have endured a correspondingly decrease of over 25% of their non-medical consumption.

Under the strong assumption that the Taylor approximation to the utility function is valid along the array of different consumption values supported by the distribution of ADLs changes, Table 2 illustrates how the segments of the population that endured more severe shocks —and therefore faced a higher risk initially— would have greatly benefited from social insurance. For example, with $\gamma = 3$, an extra peso spent on an insurance premium would represent to the persons situated in the top 5^{th} percentile of the distribution of the ADLs change, a net welfare gain of at least 0.76.

The expected consumption change for each magnitudee of shock is estimated by multiplying the coefficient estimate of the effect of a change in ADLs over the change in non-medical consumption from section 1, with each of the possible changes in ADLs index considered. The share of the uninsured breadwinners that suffered each particular level of shock is shown in column 8 of Table 2.

7.2 Multiple health states case

The previous section assumed, for sake of illustration, that agents were only potentially exposed to the health shock they actually experienced. If we relax this assumption, and allow for more than two health states, estimations of the value of social insurance can take into account the entire spectrum of potential health shocks faced by the agents. In order to do so, I use the empirical distribution in my sample of both health shocks and health expenditures in a stylized expected utility framework to calculate the insurance value of reducing agents risk exposure in two different dimensions.

[13] $\gamma = 3$ is the standard parameter used by Finkelstein (2008) among others.

7.2.1 Sources of health risk from he perspective of consumption

My analysis goes along the lines of McClellan and Skinner (1997) and Finkelstein and McKnight (2008). Finkelstein and McKnight estimated the overall magnitudee of welfare benefits associated with Medicare's reduction in risk exposure, while McClellan and Skinner focused on Medicare's redistributive effect by estimating the relative insurance value of Medicare for individuals at different parts of the income distribution. Both of these analysis focus exclusively on insurance against medical expenditures. However, neither of them is able to address the endogeneity of the income generation process with respect to health because of the nature of their population under study (.e., retired agents).

In contrast, my data offers the advantage of simultaneously observing two waves of realizations of health and total expenditures, as well as physical-capacity data for households where the head is still a breadwinner, in the sense that he remains in the labor force. Indeed, in my empirical section, I find that *only* breadwinners' health shocks had a resilient effect on household non-medical consumption levels. My empirical results thus emphasize the importance of recognizing two distinct sources of health-related risk exposure: medical spending and loss earnings[14].

Both sources of risk, the breadwinner's loss earnings effect and the higher medical consumption effect due to a breadwinner health shock, are included in the OLS coefficient of the effect of a change in breadwinners' ADLs' index on non-medical consumption. Therefore, by combining the OLS coefficient of the change in breadwinners ADLs' index with the empirical distributions of health expenditures and breadwinner's health shocks, I am able to incorporate both sources of risk within my standard expected utility framework.

Let full insurance be defined as insurance against medical spending and loss earnings due to disabilities provoked by physical capacity shocks, while partial health insurance be defined as insurance against medical spending only, excluding the effects of health shocks on earnings. Consequently, in my analysis, I am able to provide an approximation to the difference between the values of *full* health insurance for the breadwinner and *partial* health insurance for all the members of the household, the latter allowing for shocks on other members of the household and health shocks on the breadwinner unreflected in his physical capacity. In that sense, one type of insurance is not strictly a subset of the other. I am able to provide a measure of the absolute and relative value of these two types of insurance, providing an approximation to the differences between specific and more comprehensive types of insurance[15].

[14] It is worth to notice that the two health states calculations corresponded to the welfare gains of providing both medical expenditures and loss earnings insurance to the breadwinner only.

[15] I cannot estimate the value of partial health insurance exclusively for the breadwinner because in the MxFL survey consumption by item is reported at the household level only.

7.2.2 Risk exposure valuation

Our expected utility model is an extension of my previous framework in which agents' utility $u(c)$, defined by expression (1), is a function of non-medical consumption c. Unlike Finkelstein and McKnight (2008), we do not need to make any assumptions regarding individuals' budgetary constraints, since we directly observe out-of-pocket medical expenditures as well as total household consumption. Empirically, household non-medical consumption is thus given by:

$$c = TC - m \tag{12}$$

where TC is the agents' per-period total consumption, and m is his out-of-pocket medical expenditures. For the sake of simplicity, consider that health shock ϕ is a random variable with probability density function $f(\phi)$ and support [-1;1], given that agents' health stock h itself has a support of [0;1]. In the present exercise both TC and m are endogenous to agents' health stock and thus can be affected by the potential health shocks that the agent faces at each period, so that expression (8) can be re-written as:

$$c(\phi) = TC(\phi) - m(\phi) \tag{13}$$

In a generalized expression the agent's expected utility is given by[16]:

$$\int_{\underline{\phi}}^{\bar{\phi}} u(c(\phi))f(\phi)d\phi \tag{14}$$

The maximum amount of money agents would be willing to pay for an insurance against health shocks is that which leaves them indifferent between a risk-free state, net of the risk premium payment, and their current risk exposure to different health shock states. In the social insurance literature, the welfare gains of insurance have been conceived as reductions in risk exposure whose value can be approximated by the fall in risk premium before and after insurance coverage is modified (Finkelstein and McKnight, 2008; Brown and Finkelstein, 2004; and Feldstein and Gruber, 1995).

It is worth notice that in all US-based studies, the insurance beneficiaries remain exposed to a certain degree of risk once coverage expansions take place. In contrast, as shown in section1, for the case of Mexico, I find that the social security beneficiaries are fully insured against health shocks—that is, their consumption paths seem not to respond to breadwinners' health-shocks. This might be explained by several factors: (1)

[16] The upper and lower limits of the integral are such that the agent's health stock does not become negative or surpasses the value of 1.

Social security offers health expenditures and disability insurance; (2) No co-payment is required to access to social security healthcare on top of the contributions deducted from its beneficiaries wages ; (3) For some reason, social-security beneficiaries' unobservable characteristics allow them to be better at smoothing consumption across health states. In the present paper, I cannot address point 3, but I can use points 1 and 2 to interpret my results. In particular, I assume that the insurance considered in my welfare calculations will not require co-payments for its services to its beneficiaries, so that *any difference between the risk premium and the value of the premium charged to the insured beneficiaries would be a private welfare gain.*

Furthermore, if no payment is required from the beneficiaries of the health social insurance, the entire value of the risk premium would represent a private welfare gain for the previously uninsured consumers, with the cost of the fair premium being implicitly transferred by the public sector to the private sector. Finally, if one wanted to obtain the net social-welfare gains of completing the market of health insurance, one would need to consider the total costs of operation of the new health insurance. We will do this only for the case of the partial-health-insurance exercise in section 5, using as a reference the Seguro Popular costs of operation.

7.3 Risk premium estimates for the Mexican uninsured

In order to estimate the welfare gains associated with the implementation of different types of insurance against health shocks among the Mexican uninsured population, I compute two different risk premia for each of the 2,017 uninsured households within my sample, corresponding to their full-health-insurance against health shocks on the physical capacity of the breadwinner premium and their partial-health-insurance premium, both insuring non-medical consumption against breadwinners' health shocks ϕ.

7.3.1 Breadwinner full insurance premium

The first risk premium π_1, the breadwinner full insurance premium, corresponds to the maximum amount of money risk-averse individuals would be willing to give up to be completely insured against the random variable ϕ. In other words, π_1 is how much they would be willing to pay to insure their non-health consumption against both the loss earnings and the medical expenditures provoked by a physical capacity health shock to the household breadwinner. Individuals would be indifferent between (1) remaining in a permanent shock-free state by paying π_1 and (2) having to face the risk of suffering a health shock at every period of their life:

$$u(c-\pi_1)=\int_{\underline{\phi}}^{\bar{\phi}} u(c(\phi))f(\phi)d\phi \tag{15}$$

I calculate π_1 by taking breadwinners' health shocks distribution in my sample as the risk distribution faced by each household breadwinner. Since all households included in the sample have a male breadwinner that was between 50 and 70 years old in 2002, I assume that all breadwinners are exposed to the same risk distribution . As in the two states estimations, I use the change in ADLs OLS coefficient to compute households' expected change in non-medical consumption due to breadwinner health shocks; but this time, I do this for each of the potential health shocks in the risk distribution faced by the households. I then estimate each household risk premium assuming a constant relative risk aversion utility function defined in (1) for a range of risk aversion coefficients γ going from 1 to 5. [17].

7.3.2 Household partial insurance premium

The second risk premium π_2, the partial-insurance premium, corresponds to the maximum amount of money risk-averse individuals would be willing to give up to insure against any unforeseen variations in their medical expenditures. That is, how much agents would be willing to pay to insure against the effect of the random variable ϕ on medical expenditures but not on earnings. π_2 is thus implicitly defined by the following equality:

$$u(c-\pi_2)=\int_{\underline{\phi}}^{\bar{\phi}} u(TC-m(\phi))f(\phi)d\phi \tag{16}$$

In this case, I start by sorting out households by their per-equivalent-adult consumption tercile, acknowledging the correlation between income and out-of-pocket health expenditures. Notice that health expenditures are not necessarily associated to the household's breadwinner, but to any member of the household. Then, for each tercile, I estimate the risk premium of the out-of-pocket health expenditures insurance using the within-tercile health expenditures distribution as households' potential out-of-pocket health-expenditures. Finally, for each household, potential out-of-pocket spending values exceeding a tercile-specific upper-threshold fraction of households' total expenditures are capped out to avoid unrealistically excessive health-spending imputations.

[17] I repeated the risk premium calculations using a tercile-specific health-shocks risk distribution, and the resulting values are almost identical, with variations under 0.1%.

Indeed, it is necessary to take into consideration spending patterns and total expenditures distribution of the population under study to avoid a situation where an unrealistic burden of a few potential out-of-pocket health expenditures leads to an overestimation of the risk premium. Particularly in the context of developing countries, the capacity to pay for out-of-pocket health expenditures can be significantly lower than in developed countries, since the high percentage of income assigned to food consumption gives households a small margin of decision. In Mexico, for example, in 2002, food represented 48% of household total expenditures for the first three deciles of the income distribution[18]. This implies that, by the literature standards, households in the bottom tercile that incur in health expenditures accounting for 21% of their total expenditures would have been considered to have suffered catastrophic health expenditures.[19] Therefore, the 80% cap used by Finkelstein and McKnight (2008) using U.S. Medicare beneficiaries' data, and by Barofski (2011) in this case using data from rural Mexican households, seems to exceed households total capacity to pay for most of the uninsured population in Mexico. [20]

In the MxFLS subsample of uninsured households with a male breadwinner between 50 and 70 years old, the 99th percentile of the distribution of out-of-pocket spending as a fraction of total consumption for the bottom, mid, and top terciles of the per-equivalent-adult consumption is 36%, 63% and 79%, respectively. Given the enormous differences in capacity to pay for out-of-pocket health spending -which are a reflection of Mexico's severe income inequality-, in order to avoid either over-estimating or under-estimating the risk premium of the out-of-pocket health expenditures I estimate the premium using tercile-specific caps corresponding the 99th percentile of the respective distributions of the fraction of health expenditures over total expenditures. The risk premium is calculated for a range of risk aversion coefficients from 1 to 5.

Before discussing the results, notice that full protection against physical capacity shocks on the breadwinner does not imply complete insurance against any health expenditures on the household. First, breadwinners can personally experience health shocks and illness that provoke out-of-pocket expenditures, but that do not affect their physical capacity. Second, the health shock may not hit the breadwinner, but another member of the household. As a result, it is not necessarily true that all households will be willing to pay more for full insurance against shocks on the breadwinners physical capacity than for insurance that only targets health

[18]Encuesta Nacional de Ingresos y Gastos de los Hogares, 2002

[19]A household incurs catastrophic expenditures on health if the ratio of its health spending to its total capacity to pay exceeds a threshold of at least 30%. Capacity to pay is defined as household spending minus the household's own food expenditures (Knaul, Arreola- Ornelas, and Mendez, 2005; Knaul et al 2006; Galarraga et al 2010). Alternatively capacity to pay can also be defined as total expenditures minus a food-related poverty line. The food-related poverty line is mean food spending among households between the 45th and 55th percentiles of the food share distribution, where the food share is simply the ratio of food expenditures to total expenditures (Gakidou et al 2006; King et al 2009; Perez-Rico, et al 2005; Xu et al 2003).

[20]The 80% of total income cap was defined by Finkelstein and McKnight (2008) using the 95th percentile of the distribution of out-of-pocket spending as a fraction of income for the Medicare beneficiaries that were at the bottom income tercile. Using this cap without taking into consideration the population under study spending distribution characteristics is arbitrary.

expenditure shocks at the household level.

7.3.3 Risk Premium Results

Results are presented in Tables 3 and 4 and in figures 1 to 4. Each risk premium was calculated for an array of risk aversion coefficients including the values of 1, 1.2, 1.5, 2, 3 and 4. I present the results for each aversion coefficient as well as the average across estimates.

As shown in figure-1 I find that the sample average risk premium to fully insure against breadwinner health shocks (BWS-RP) is higher than the risk premium for health expenditures insurance (HXP-RP) for any level of risk aversion assumed. Across all risk aversion coefficients, the monetary value of the HXP-RP represents around 72% of the BWS-RP value.

However, the results reverse when we calculate premia as a share of total consumption. Figure-2 shows how, the average fraction of households' total consumption that households would be willing to give up to insure against medical spending is higher than the average fraction of total consumption they would be willing to give up to insure against breadwinner health shocks for any given level of risk aversion. Indeed, results from Table 4 show that, assuming a risk aversion of 3, uninsured households are willing to give-up up to 4.6% and 5.5% of their total consumption to be insured against breadwinners' health shocks and medical expenditures, respectively. For all risk coefficients, the estimates for HXP-RP as a fraction of total expenditures are on average between 14 and 30% higher than those for BWS-RP. Averaging across the different estimates, HXP-RP and BWS-RP represent on average 4.8% and 4% of households total expenditures, respectively.

What might seem as a surprising result can be explained by a combination of two factors. On one hand, the risk exposure to breadwinners' health shocks faced by agents in the sample is relatively similar across consumption terciles, which is reflected by the relatively low variation in the burden of the BWS-RP as a fraction of total consumption, as shown in Table 4. Moreover, when the risk distribution faced by each household is restricted to potential shocks observed within its own per-equivalent-adult consumption tercile, the resulting BWS-RP is extremely close to the BWS-RP that takes into consideration the risk distribution of the complete sample across consumption terciles from Table 3. In sum, for the uninsured breadwinners in my sample, the risk distributions within terciles are similar to the risk distribution across all three terciles.

On the other hand, the distribution of health expenditure risk premia is not homogeneous across consumption terciles. In particular, as a fraction of households' total consumption, the HXP-RP varies significantly across terciles. As shown in figure-3, for $\gamma = 3$, while households within the bottom tercile are willing to give-up on average up to 5.8% of their total expenditures to insure against medical spending, households within the top tercile are willing to give up at the most 3.5% of their total consumption to insure against medical spending. Averaging across the estimates corresponding to each of the risk coefficient taken into consideration, the HXP-RP accounted for 5.3% and 3% of total consumption for the households in the bottom and top terciles, respectively. Thus, poorer households face relatively larger risks due to health expenditures.

It is worth to notice that HXP-RP estimates appear to be very sensitive to the health expenditures upper threshold assumed to be possible for households to be spent as fractions of their total expenditures. As mentioned, the burden of the risk of health expenditures is larger for the first tercile than for the third one. This result holds even though I use tercile-specific caps to estimate the risk premia, corresponding to the 99th percentile of actual health expenditure shares within consumption tercile. The procedure implies that potential health expenditures were capped-out at 36% for the bottom tercile, and at 79% for the top tercile. If we relax the cap on health expenditures for the lower tercile (Figure-4) to values used in previous literature, or to the cap applied to the richer tercile, thus allowing very poor agents to devote up to 80% on their income on health, I get extremely large premia, that easily exceed 20% of income, which appear to be unrealistic.

Since the bottom consumption tercile is where the health expenditures risk is relatively greater, one could argue that, if a bottom tercile-household faces a health shock, the household will be unable to spend as much as they would like, due to the financial constraints they face or, potentially, due to limitations on the infrastructure and supply of medical services they have access to. Thus it might be the case that my HXP-RP estimate is being limited by households' own capacity to pay. Still, assuming that households could be exposed to health expenditures reaching levels up to 60% of total households consumption across all terciles—although empirically this is not the case—, the BWS-RP would still be the equivalent of 70% of the value of the HXP-RP in terms of total expenditure fractions. In this case, for $\gamma = 3$, the HXP-RP would account on average for 5.6% of households' total consumption while BWS-RP accounts on average for 4% of households' total consumption.

Finally, as previously noted, it is not obvious ex ante which type of insurance should be more valued by the household. While full protection against health shocks on the breadwinner is more comprehensive, as it does not only cover medical spending but also loss earnings associated with any effects over the agent's working capacity, it is only associated to a particular member of the household, and only captures shocks affecting his physical capacity—those shocks captured by changes in ADLs index—. Conversely, coverage on the risk of health expenditures covers any unexpected medical spending due to any type of health shock across all members of the household, but leaves aside the potential impact of the health shock on labor market outcomes. The fact that on average, the BWS-RP and the HXP-RP are so close in values—as fractions of households' total expenditures—, points out the importance of the role played by breadwinners in securing consumption paths.

8 Conclusion

This paper has presented evidence on the impact of health shocks on the consumption of health shocks among Mexican households. While formally insured households seem to be mostly isolated from adverse consumption effects of shocks, uninsured households can suffer statistically and economically significant consumption fluctuations.

Crucially, the effect of the health shock depends on whether it affects the household´s breadwinner. Among uninsured households, a shock on the physical capacity of the breadwinner, measured through an ADL index, can have large effects on household consumption. In particular, I find that when male breadwinners over fifty years old move from being able to perform all the ADLs included in the general index to being able to perform none, their household non-medical consumption decreases by about 50 percent. Moreover, moving from being able to perform the six most basic ADLs to being able to perform none of the ADLs lowers consumption by almost 70 percent. On the other hand, identical shocks affecting other household members do not have a statistically significant impact on consumption.

This is an important result for various reasons, and has implications that go beyond the particularities of the Mexican case. First, it allows us to interpret the decrease in household consumption as direct evidence of incomplete insurance and not simply as reflecting the lack of separability in utility between consumption and health. If health shocks affected the marginal utility of household consumption directly, health shocks on any member, and not just the breadwinner, should have a significant effect on consumption. Second, it highlights that the impact of health shocks is not only associated with unexpected out-of-pocket expenditures, but also with health shocks' effects on labor market outcomes through their impact on the agent´s working capacity. Thirdly, it has a clear policy implication. Welfare programs seeking to provide financial protection in health but that only cover health expenditures are probably providing incomplete insurance against health shocks. The analysis of more comprehensive programs, that include disability insurance to account for productivity losses associated to a specific health shocks, should be part of the policy agenda.

The paper, consistent with previous research by Gertler and Gruber (2002), shows that contradictory results in the empirical results can be potentially reconciled by looking at the specific definition of health shock used in each study. The significant effects on consumption for health shocks measured by changes in ADLs disappear if the same empirical exercise is repeated with health shocks defined by self-reported indicators. This suggests that the precise definition of health shock used in an empirical study is crucial for policy analysis. First, because measurement errors due to self-perception subjectivity, for example, can lead to radically different conclusions. Second, different types of health shocks, associated with different kinds of diseases, can affect different margins with varying intensity, both in terms of expenditure and labor market outcomes.

The final section of the paper uses the estimated effects on health shocks to analyze the welfare costs associated with the Mexican households´ current exposure to health risks - and, conversely, potential welfare gains from providing insurance. I analyze the two potential insurance schemes that can be defined with the available data. First, actual health expenditure shocks at the household level. Second, health shocks on breadwinners that affect household consumption through the coefficient estimated in the empirical section. Using various measures of the relevant risk distribution for households and different values for risk aversion, I find that the potential welfare gains of providing insurance are large. That is, households would be wiling to pay economically significant share of income to be fully insured against these shocks. Interestingly, the results show that lower income households (as a share of total consumption) place more value on protection against health expenditure, while higher income households are more affected by shocks on the breadwinners. This result once again highlights that the design of a comprehensive public health insurance program is a complex task that has to take into account multiples heterogeneities.

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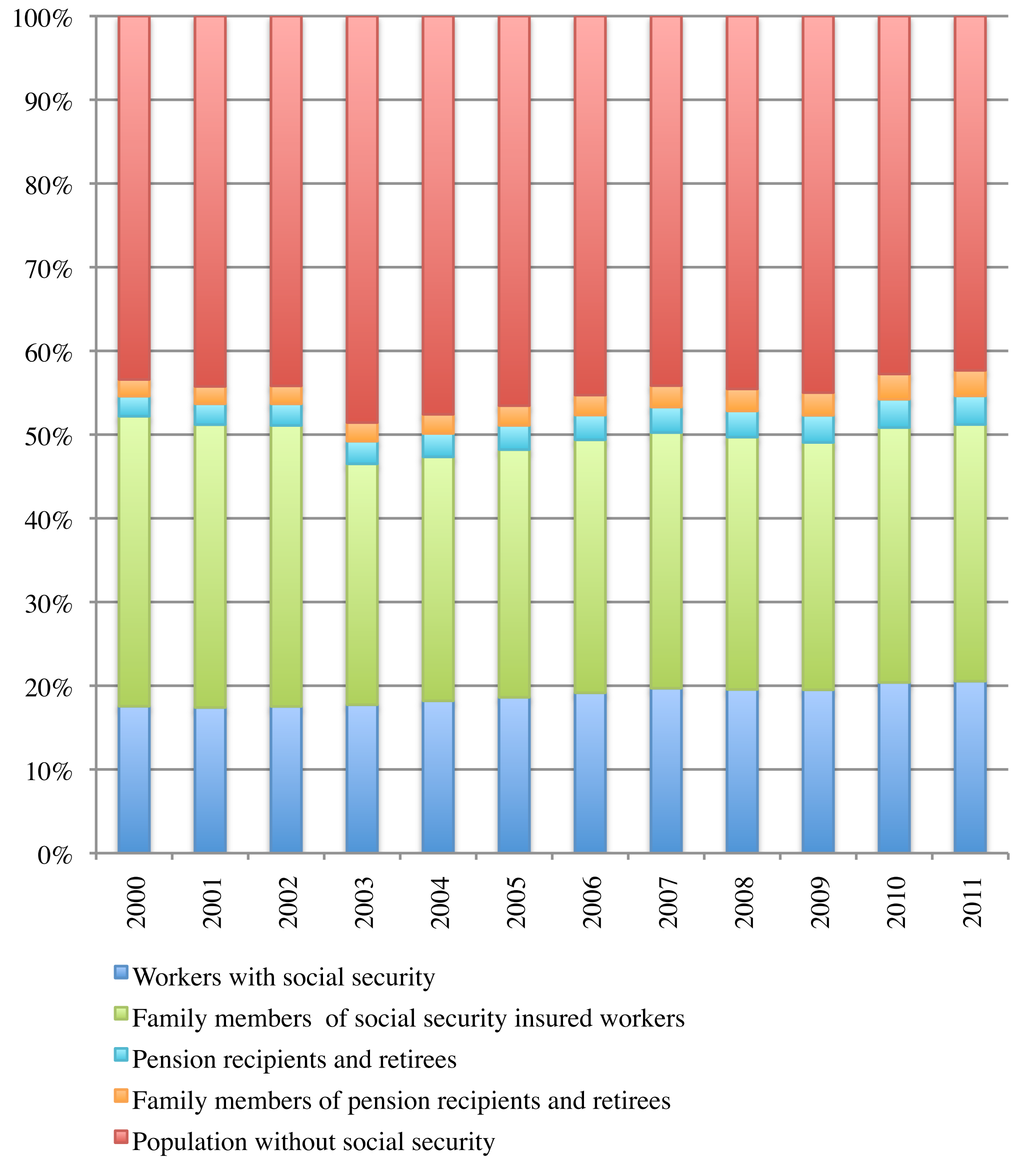
Table 1: Users of health services by health provider and insurance status/1

	2000	2001	2004	2005	2006	2007	2008	2009	2010
Total	77,066	78,248	84,593	88,093	90,964	85,437	85,082	91,617	89,762
Uninsured Population	37,403	37,720	41,385	43,709	43,386	41,267	40,552	42,944	42,976
	49%	48%	49%	50%	48%	48%	48%	47%	48%
Ministry of Health	26,478	27,016	31,186	33,323	32,634	30,490	30,268	32,492	32,220
	71%	72%	75%	76%	75%	74%	75%	76%	75%
IMSS-Oportunidades	10,925	10,704	10,199	10,049	10,683	10,571	10,284	10,311	10,499
	29%	28%	25%	23%	25%	26%	25%	24%	24%
University Hospitals	n.a.	n.a.	n.a.	337	69	207	n.a.	141	257
	n.a.	n.a.	n.a.	1%	0%	1%	n.a.	0%	1%
Insured Population	39,663	40,529	43,208	44,384	47,578	44,169	44,530	48,673	46,786
	51%	52%	51%	50%	52%	52%	52%	53%	52%
IMSS	29,979	30,965	33,083	35,021	36,140	35,331	35,333	38,005	36,131
	76%	76%	77%	79%	76%	80%	79%	78%	77%
ISSTE	7,203	6,957	7,111	7,209	7,339	7,463	7,736	8,143	8,211
	18%	17%	16%	16%	15%	17%	17%	17%	18%
PEMEX	647	665	690	708	712	712	728	739	743
	2%	2%	2%	2%	1%	2%	2%	2%	2%
SEDENA	489	511	677	n.a.	n.a.	n.a.	n.a.	866	1,048
	1%	1%	2%	n.a.	n.a.	n.a.	n.a.	2%	2%
SEMAR	155	184	179	172	169	202	218	228	240
	0%	0%	0%	0%	0%	0%	0%	0%	1%
State Hospitals	1189	1247	1469	1275	3217	462	516	691	414
	3%	3%	3%	3%	7%	1%	1%	1%	1%

1/ Population that demanded at least once during the year any type of health service. The sum of partial rows might differ from the total row due to rounding.

Source: Mexican Ministry of Health, quoted in the 5th Executive Branch Report, Mexican Office of the Presidency.

Figure 1: Social Security Coverage in Mexico



Source: Anexo Estadistico, Quinto Informe de Gobierno, Presidencia de la Republica (2011)

Table 2: Disability subsidies available for the beneficiaries of the Mexican Institute of Social Security (IMSS)

Type of subsidy	Required weeks of contribution to be elegible	Benefit as share of wage, at the begining of the discapacity	Limit of payments
Risks at work	Does not require a minimun of weeks of contribution	100% of the wage registred at IMSS	From 1 day to 52 weeks when approved by IMSS medical authorities.
General Sickness	4 weeks inmediatly before the beginning of the sickness period. If temporary worker, 6 weeks during the 4 months preceeding the beginning of the sickness period	60% of the wage registred at IMSS	Starting the 4th day until the 52nd week of the leave, with the approval of IMSS medical authorities, it can be extended for 26 additional weeks.
Maternity	* 30 weeks during the 12 months preceeding the beginning of the disability period. * If the insured woman does not furfill this requisite, it is her employer obligation to pay to her full wage	100% of the wage registred at IMSS	42 days before the delivery and 42 days after the delivery

Source: IMSS, Art. 103 Ley del Seguro Social, http://www.imss.gob.mx/Pensionesysubsidios/Pages/subsidios_3.aspx, retrieved on may20th 2012.

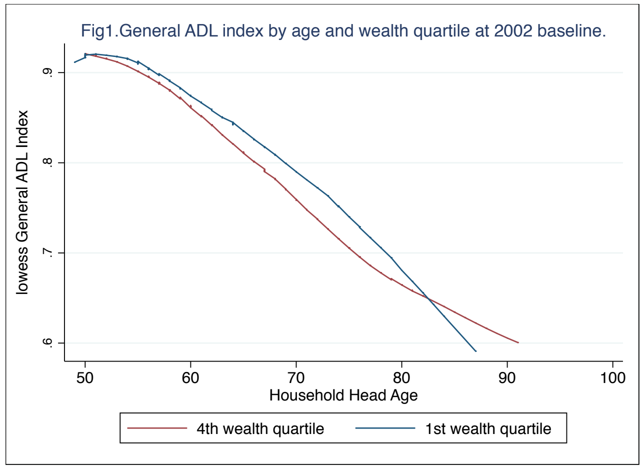


Figure 2: ADLs index of household heads, by age and household wealth quartile

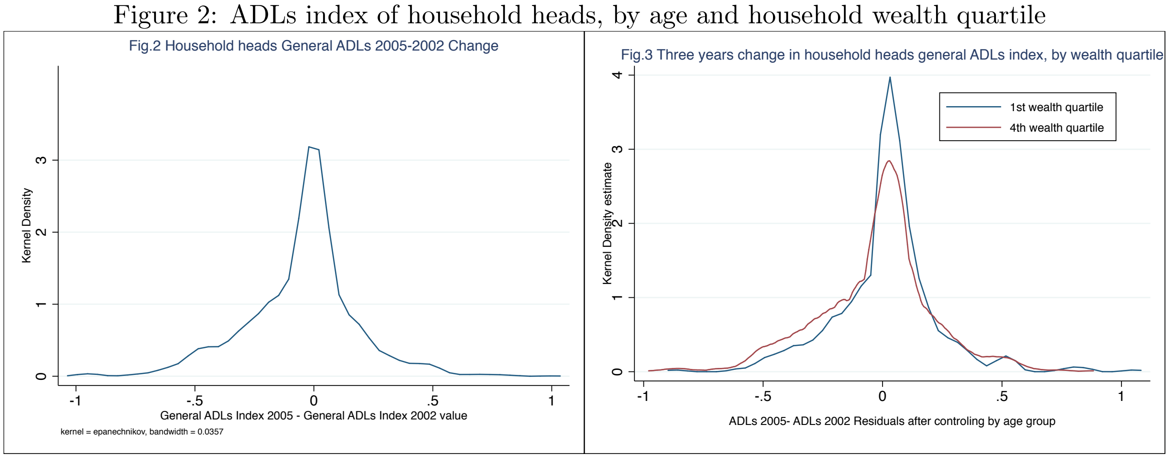


Figure 3: General ADLs index variation over a 3 years period, 50 years old, overall and by wealth quartiles, controlling by age

Table 3: Characterization of the selected panel sample across waves: households with heads 50 years old or older in 2002.

		panel N	2002 mean value	2005 mean value
Household head		2,240		
	Males		0.73	0.73
	Age		62	66
	Without education		0.29	0.31
	Elementary education		0.57	0.56
	Secondary education		0.06	0.07
	Married		0.59	0.58
	Working status		0.64	0.58
Household wealth	Multi-earners household	2,213	0.43	0.43
	Own a vehicle		0.31	0.28
	Own electronic devices		0.89	0.86
	Own a washing-machine		0.85	0.82
	Own electro-domestics		0.83	0.79
	Estimated value of all assets^		34,000	30,000
	Access to phone		0.35	0.44
	Access to water		0.83	0.81
	Access to sewage		0.50	0.57
	Access to trash		0.60	0.72
	Access to cooking gas		0.82	0.81
	Household has dirt-floor		0.15	0.14
	Wealth F.A. First Component		-0.18	-0.18
Household composition	Total number of members	2,232	3.8	4.1
	% of members 14 to 17 years old		0.06	0.05
	% of members 18 to 23 years old		0.09	0.09
	% of members 24 to 60 years old		0.42	0.39
	% of members over 60 years old		0.31	0.35
Consumption measurement quality	Same respondent in both waves	2,207	0.72	0.72
	Respondent was male		0.16	0.22
	Excellent accuracy of responses		0.23	0.28
	Good accuracy of responses		0.71	0.70

^ excluding house value and financial assets

Table 4: Incidence of Activities of Daily Life Changes, by magnitudee and type, uninsured household heads.

		All household-heads *over50 years old* mean value	Breadwinners *over50 years old* mean value
Level of ADLs general index at baseline		0.826	0.897
		(0.213)	(0.164)
Change in the ADLs general index			
	Average change	-0.055	-.0507
		(0.229)	(0.204)
	If reported any change	-0.073	0.0756
		(0.262)	(0.245)
	If reported a negative change	-0.231	-.210
		(0.169)	(0.165)
% of negative changes < -1 std deviation		44.0%	34.6%
	If reported a positive change	0.195	0.183
		(0.148)	(0.147)
% of positive changes > 1 std deviation		30.3%	25.5%
Level of ADLs basic index at baseline		0.915	0.961
		(0.162)	(0.116)
Change in the ADLs basic index			
	Average change	-0.061	-0.051
		(0.214)	(0.187)
	If reported any change	-0.126	-0.158
		(0.296)	(0.284)
	If reported a negative change	0.288	0.285
		(0.175)	(0.174)
% of negative changes < -1 std deviation		57.0%	49.5%
	If reported a positive change	0.234	0.232
		(0.163)	(0.187)
% of positive changes > 1 std deviation		47.0%	49.9%
N		2240	1275

Notes: Estimated means using frequency sample weights.

Table 5: OLS estimates of the effect of change in breadwinners general ADLs index over consumption growth

	(1)	(2)	(3)
Sample	All household-heads *over 50years old*	Breadwinners	Breadwinners
△General ADL	0.1136	0.5097***	0.5082***
	(0.1299)	(0.1945)	(0.1947)
Current Social Security Insurance	0.0051	0.0180	0.0152
	(0.0479)	(0.0618)	(0.0620)
Current Social Security Insurance*△General ADL	-0.0927	-0.6089***	-0.6086***
	(0.1598)	(0.2278)	(0.2272)
△ Social Security Insurance Status	0.0669	0.0598	0.0615
	(0.0477)	(0.0581)	(0.0580)
Low level of risk aversion^			0.0033
			(0.0478)
High level of risk aversion^			-0.0862
			(0.0849)
Head SES characteristics controls	yes	yes	yes
Wealth/assets controls	yes	yes	yes
Consumption data quality controls	yes	yes	yes
State Fixed Effects	yes	yes	yes
N	2128	1216	1216
Adjusted R^2	0.0346	0.0399	0.0392

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

^Refers to the breadwinner risk aversion coefficient.

Table 6: OLS estimates of the effect of change in household heads basic ADLs index over consumption growth

	(1) All household-heads *over 50years old*	(2) Breadwinners	(3) Breadwinners
△Basic ADL	0.2382	0.6906***	0.6927***
	(0.1478)	(0.2154)	(0.2159)
Current Social Security Insurance	0.0033	0.0151	0.0121
	(0.0479)	(0.0615)	(0.0617)
Current Social Security Insurance*△Basic ADL	-0.1567	-0.7120***	-0.7123***
	(0.1717)	(0.2444)	(0.2444)
△ Social Security Insurance Status	0.0676	0.0614	0.0633
	(0.0476)	(0.0581)	(0.0580)
Low level of risk aversion^			0.0010
			(0.0479)
High level of risk aversion^			-0.0929
			(0.0841)
Head SES characteristics controls	yes	yes	yes
Wealth/assets controls	yes	yes	yes
Consumption data quality controls	yes	yes	yes
State Fixed Effects	yes	yes	yes
N	2128	1216	1216
Adjusted R^2	0.0359	0.0428	0.0422

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

^Refers to the breadwinner risk aversion coefficient.

Table 7: Models comparing different insurance status specifications estimating effect of severe healthshocks on change in consumption per equivalent adult; breadwinners sample

insurance covariate(s):	none	social security insurance 2002	any insurance 2005	social security insurance 2005	job-benefit insurance 2005
	(1)	(2)	(3)	(4)	(5)
$\triangle$basicADLs	0.3310***	0.5925***	0.6250***	0.6906***	0.4306***
	(0.1274)	(0.2134)	(0.2256)	(0.2154)	(0.1414)
social security 2002		-0.0199			
		(0.0541)			
interact. soc.security2002		-0.4268			
		(0.2586)			
any insurance 2005			0.0386		
			(0.0523)		
interact. any ins.2005			-0.5292**		
			(0.2617)		
social security 2005				0.0151	
				(0.0615)	
interact. soc.security2005				-0.7120***	
				(0.2444)	
job insurance 2005					-0.0121
					(0.0557)
interact. job ins. 2005					-0.5687**
					(0.2680)
N	1220	1219	1217	1216	1219
Adjusted R^2	0.0385	0.0393	0.0410	0.0428	0.0380

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Effect of different symptomatic dicotomic health measures on household consumption growth

	(1) all male heads	(2) breadwinners	(3) all male heads	(4) breadwinners	(5) all male heads	(6) breadwinners
Current Social Security Insurance	0.0607	0.0604	0.0676	0.0637	0.0650	0.0677
	(0.0474)	(0.0537)	(0.0475)	(0.0540)	(0.0475)	(0.0539)
△symptoms of infectious diseases	0.0247	0.0013				
	(0.0565)	(0.0672)				
Current Social Security Insurance*△infectious symptoms	0.0270	0.1416				
	(0.0750)	(0.0901)				
△symptoms of chronic diseases			-0.0557	-0.0725		
			(0.0726)	(0.0879)		
Current Social Security Insurance*△chronic symptoms			0.1194	0.1673		
			(0.1017)	(0.1261)		
△ any illness symptom					0.0274	-0.0007
					(0.0550)	(0.0649)
Current Social Security Insurance*△any illness symptom					-0.0026	0.0890
					(0.0729)	(0.0877)
N	1514	1117	1525	1125	1525	1125
Adjusted R^2	0.0268	0.0295	0.0259	0.0280	0.0282	0.0316

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Potential marginal welfare gains of insurance against breadwinners health shocks per peso invested in insurance, 2005 Mexican uninsured households.

Expected breadwinner health shock $E[\triangle ADL]$	Expected Consumption change $^{\triangle c}/_{c}$ $= \beta^{adl*} \triangle ADLs$	Potential welfare gains $-\gamma^{\triangle c}/_{c}$				
		$\gamma = 1.5$	$\gamma = 2$	$\gamma = 3$	$\gamma = 4$	$\gamma = 5$
-.0507	-0.026	-0.039	-0.052	-0.078	-0.103	-0.129

Note: Estimations valid for Mexican uninsured households with breadwinners between 50 and 70 years old.

Table 10: Potential marginal welfare gains of insurance against breadwinners health shocks per peso invested in insurance, by type of shock suffered by breadwinners, 2005 Mexican uninsured households.

Breadwinner health shock $\triangle ADLs$	Expected Consumption change $^{\triangle c}/_{c}$ $= \beta^{adl*} \triangle ADLs$	Potential welfare gains $-\gamma^{\triangle c}/_{c}$					Frequency	Cumulative Frequency
		$\gamma = 1.5$	$\gamma = 2$	$\gamma = 3$	$\gamma = 4$	$\gamma = 5$		
-0.500	-0.255	-0.38	-0.51	-0.76	-1.02	-1.27	2.9	4.4
-0.250	-0.127	-0.19	-0.25	-0.38	-0.51	-0.64	3.3	15.6
-0.063	-0.032	-0.05	-0.06	-0.10	-0.13	-0.16	13.6	43.6

Note: Estimations valid for Mexican uninsured households with breadwinners between 50 and 70 years old.

Table 11: Average risk premia, by type of insurance and expenditures tercile

	Risk aversion coefficient γ						
	1^	1.2	1.5	2	3	4	5
Breadwinner full insurance,tercile-specific risk distribution[1]							
First tercile	\$205	\$214	\$227	\$249	\$298	\$353	\$416
Second tercile	\$342	\$356	\$377	\$415	\$497	\$593	\$706
Third tercile	\$702	\$727	\$763	\$826	\$956	\$1,093	\$1,237
Sample average	\$416	\$431	\$455	\$496	\$583	\$679	\$786
Breadwinner full insurance,common risk distribution[2]							
First tercile	\$200	\$207	\$219	\$240	\$284	\$334	\$390
Second tercile	\$356	\$370	\$391	\$428	\$507	\$595	\$695
Third tercile	\$694	\$721	\$762	\$834	\$988	\$1,159	\$1,355
Sample average	\$416	\$432	\$457	\$500	\$592	\$695	\$812
Household medical expenditures insurance[3]							
First tercile	\$226	\$231	\$239	\$253	\$285	\$324	\$370
Second tercile	\$360	\$374	\$397	\$441	\$562	\$736	\$970
Third tercile	\$323	\$330	\$342	\$365	\$432	\$537	\$679
Sample average	\$303	\$312	\$326	\$353	\$426	\$532	\$673

Notes: All values given are in 2005 constant pesos.

^Risk premiums corresponding to $\gamma = 1$ were computed using the log function as consumers' utility function $u(x) = ln(x)$

All other risk premiums are computed using the potencial funcion: $u(x) = x^{1-\gamma}/(1-\gamma)$ for different values ofγ

1/Premium that corresponds to a full insurance of consumption against breadwinner health shocks including medical expenditures and disability earning losses, assuming tercile specific health risk distribution.

2/Premium that corresponds to a full insurance of consumption against breadwinner health shocks including medical expenditures and disability earning losses, assuming a commun health risk distribution across the uninsured population.

3/Values of potencial 2005 medical expenditures within the empirical distribution of risk faced by households were caped at their tercile-specific 99th percentile which corresponded to 36%, 46% and 79% of of the value of their total expenditures in 2002 for the first, second and third tercile respectively.

Table 12: Average risk premia, as share of households' total expenditures, by type of insurance and expenditures tercile

	Risk aversion coefficient γ						
	1^	1.2	1.5	2	3	4	5
Breadwinner full insurance,tercile-specific risk distribution[1]							
First tercile	0.034	0.035	0.037	0.041	0.049	0.058	0.069
Second tercile	0.031	0.032	0.034	0.038	0.045	0.054	0.064
Third tercile	0.032	0.033	0.035	0.038	0.044	0.050	0.057
Sample average	0.032	0.034	0.036	0.039	0.046	0.054	0.063
Breadwinner full insurance,common risk distribution[2]							
First tercile	0.033	0.034	0.036	0.040	0.047	0.055	0.064
Second tercile	0.032	0.034	0.036	0.039	0.046	0.054	0.063
Third tercile	0.032	0.033	0.035	0.038	0.045	0.053	0.062
Sample average	0.032	0.034	0.036	0.039	0.046	0.054	0.063
Household medical expenditures insurance[3]							
First tercile	0.046	0.047	0.049	0.052	0.058	0.066	0.075
Second tercile	0.043	0.045	0.048	0.055	0.072	0.097	0.129
Third tercile	0.022	0.023	0.024	0.027	0.035	0.048	0.065
Sample average	0.037	0.038	0.041	0.045	0.055	0.070	0.090

Notes: All values given are in 2005 constant pesos.

^Risk premiums corresponding to $\gamma = 1$ were computed using the log function as consumers' utility function $u(x) = ln(x)$

All other risk premiums are computed using the potencial funcion: $u(x) = x^{1-\gamma}/(1-\gamma)$ for different values ofγ

1/Premium that corresponds to a full insurance of consumption against breadwinner health shocks including medical expenditures and disability earning losses, assuming tercile specific health risk distribution.

2/Premium that corresponds to a full insurance of consumption against breadwinner health shocks including medical expenditures and disability earning losses, assuming a commun health risk distribution across the uninsured population.

3/Values of potencial 2005 medical expenditures within the empirical distribution of risk faced by households were caped at their tercile-specific 99th percentile which corresponded to 36%, 46% and 79% of of the value of their total expenditures in 2002 for the first, second and third tercile respectively.

Figure 4: Health risk premia, by type of insurance, uninsured Mexican households with male breadwinner between 50 and 70 years old

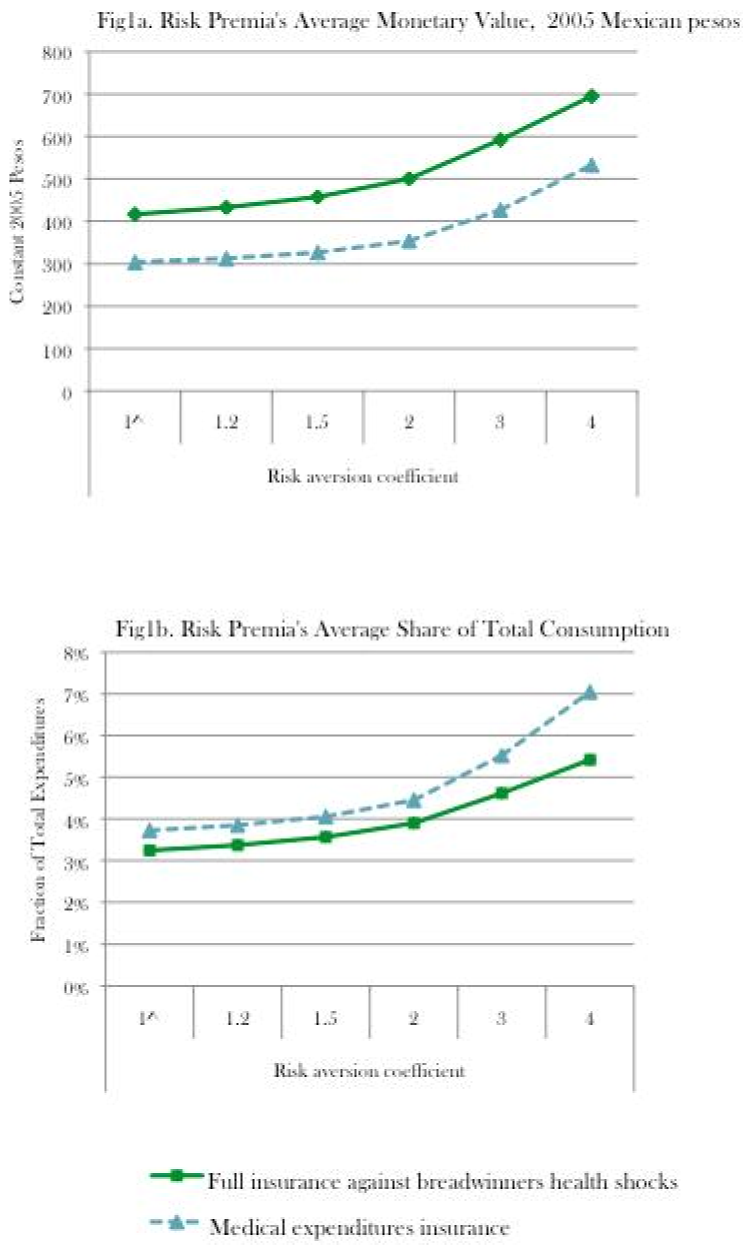


Figure 5: Health insurance risk premia's average share of total consumption, by type of insurance, bottom and top total consumption terciles, uninsured Mexican households, households with male breadwinner between 50 and 70 years old

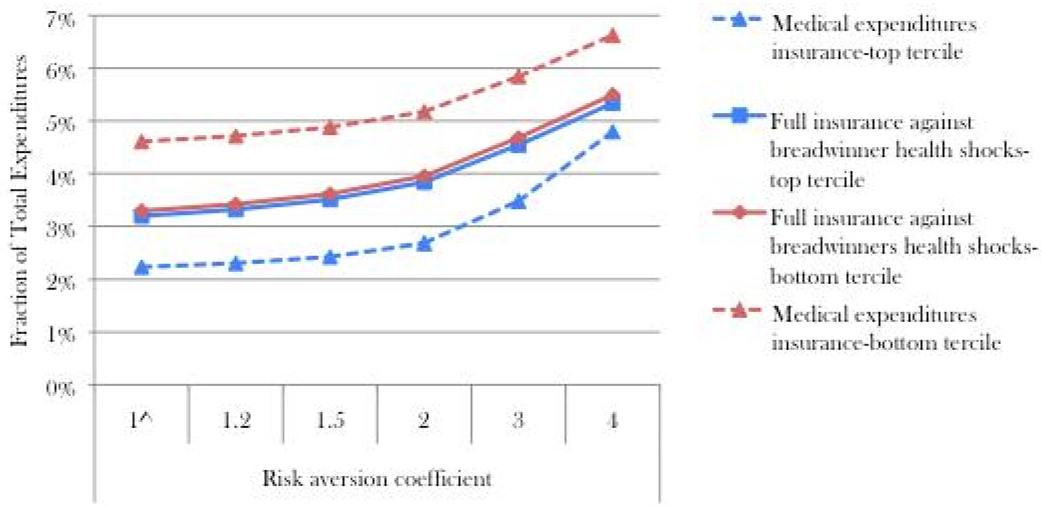
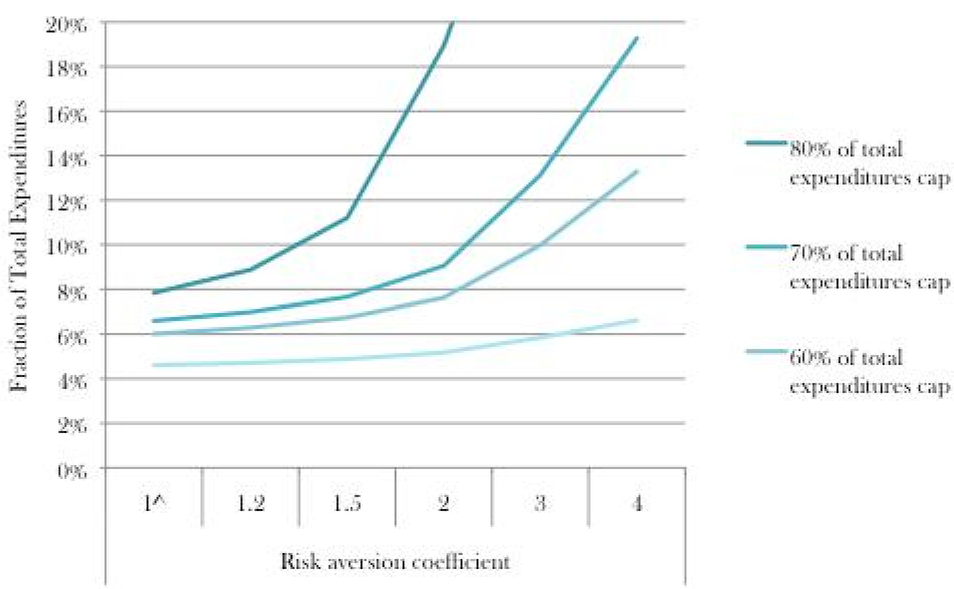


Figure 6: Health expenditures risk premium as a fraction of total expenditures, by health spending cap, bottom consumpion tercile, households with male breadwinner between 50 and 70 years old.



Appendices

Apendix A: Control Variables Used

To estimate the effects of a health shock on household consumption using both the general ADLs index and the basic ADLs index using the following ordinary least squares model:

$$\triangle ln(\frac{C_i}{n_i}) = \alpha_i + \beta_2 \triangle h_{ji} + \beta_3 \triangle ins_i + \delta_1 ins_i + \delta_2 ins_i * \triangle h_{ji} + \sum_k \gamma_k X_{ik} + \varepsilon_i \tag{17}$$

Where X_{ik} is a vector of baseline control variables including:

- household-head characteristics including whether he has no education, elementary education, or secondary education; his marital status, gender and working status at the moment of the 2002 interview.
- household-wealth proxies including :
  - whether in 2002 the household had assets such as car, electro-domestics, electronic devices; a monetary estimation of the value of all the household assets excluding any financial assets or the value of the household;
  - the household had access to basic public services including electricity, sewage, running water, trash recollection and gas;
  - and, finally, whether more than one household member was participating in the labor force in 2002
- household-composition variables including the percentage of household members that in 2002 were within the age ranges of 0 to 4, 5 to 10, 11 to 15, 16 to 25, 25 to 35, 35 to 50 years old and older than 50 years old;
- consumption-information-quality indicators such as:
  - whether, for each survey wave, the interviewer considered that the exactitude of the responses to the consumption questionnaire was excellent or good;
  - whether the respondant to the consumption questionnaire was the same person in 2005 and 2002;
  - the gender of the respondant to the consumption questionnaire.

Apendix B: Labor Costs Labor Substitution and Breadwinners Health Shocks

Labor market outcomes measurement in the MxFLS

In the MxFLS labor market participation was asked to all households members older than fourteen years old. We considered that individuals worked whenever they declared that their main activity during the week that preceeded the interview was either working or looking for a job and that they had worked for at least an hour. All individuals having replied that they did worked were then asked to declare the number of hours worked during the week previous to the interview as well as the total number weeks worked during the previous year for their main job. Individuals were also asked to declare the number of hours per week and number of weeks worked for any secondary job. We find that on average among the working population male and female adults declared to have worked during the previous week 46.13 hours and 37.65 hours respectively.

Labor model specification

Using our change in ADLs measure, we estimate the effect of having a health shock on the labor supply of the breadwinners and that of non-breadwinners living in the household through the following ordinary least squares specifications[21]:

$$Entry_{j,i,t} = \alpha_s + \beta_2 \triangle h_{jit} + \delta ins_{it} + \delta_{2t} ins_{it} * \triangle h_{jit} + \sum_k \gamma_k X_{ki} + \sum_k \varphi_k Z_{kji} + v_{jit} \tag{18}$$

$$Exit_{j,i,t} = \alpha_s + \beta_2 \triangle h_{jit} + \delta ins_{it} + \delta_{2t} ins_{it} * \triangle h_{jit} + \sum_k \gamma_k X_{ki} + \sum_k \varphi_k Z_{kji} + v_{jit} \tag{19}$$

$$L_{j,i,t} = \alpha_s + \beta_2 \triangle h_{jit} + \delta ins_{it} + \delta_{2t} ins_{it} * \triangle h_{jit} + \sum_k \gamma_k X_{ki} + \sum_k \varphi_k Z_{kji} + v_{jit} \tag{20}$$

$$\triangle L_{j,i,t} = \alpha_s + \beta_2 \triangle h_{jit} + \delta ins_{it} + \delta_{2t} ins_{it} * \triangle h_{jit} + \sum_k \gamma_k X_{ki} + \sum_k \varphi_k Z_{kji} + v_{jit} \tag{21}$$

Where:

[21] For the case of the categoric dependant variables, a Probit model was also estimated finding similar results than with the OLS estimation strategy.

$\triangle h_{j,i,t}$ refers to the change in the index of ADLs of the household head between period t, in this case t=2005 and the baseline year 2002.

$Exit_{j,i,t}$ is a dummy variable indicating whether j the head of household i , exits the labor market between the baseline year 2002 and period t, in this case t=2005.

$Entry_{j,i,t}$ is a dummy variable indicating whether j the head of household i , enters the labor market between the baseline year 2002 and period t, in this case t=2005.

$L_{j,i,t}$ refers to the labor supply of the head j of household i in terms of his weekly hours worked.

$\triangle L_{j,i,t}$ refers to the change in labor supply of the head j of household i in terms of the change in the number of hours worked per week between and period t, in this case t=2005 and the baseline year of 2002.

X_{ik} is a vector of baseline household control variables including:

- household-wealth proxies includding wheather in 2002 the household had assets like car, electrodomestics, electronic devices; a moneatry estimation of the value of all the household assets excluding any financial assets or the value of the household; the household had access to basic public services including electricity, sewage, runing water, trash recollection and gaz; and, finally, wether there was more than one household member participating in the labor force in 2002;
- household-composition variables including the percentage of household members that in 2002 were within the age ranges of 0 to 4, 5 to 10, 11 to 15, 16 to 25, 25 to 35, 35 to 50 years old and older than 50 years old.
- consumption-information-quality indicators includding whether for each survey wave, the interviewer considered that the exactitud of the consumption related responses was exellent or good; wether the person that responded the consumption questionaire was the same in 2005 than in 2002 as well as that person's gender.

Z_{jik} is a vector of individual control variables including:

- wether the household-head has no education, elementary education, or secondary education;
- household-head marital status,

- household-head gender and
- household-head working status in 2002.

α corresponds to state fixed effects

ins_{it} indicates the insurance status of hosuehold i at time t where t={2005}.

Labor Market Results

Extensive margin results

Labor outcomes Tables 9 to 12 show the impact of health shocks on the households' heads labor decision, at both the extensive and intensive margins. Table 9 show the effect of a change on the general ADL. As expected, there is a positive correlation between (positive) health shocks and the head's working status. We can also see that heads that suffer a negative health shock are more likely to exit the labor market, especially if they are younger than 70 years old. Consistent with our previous discussion, these effects are not affected by insurance, which suggests that insurance allows agent to keep their consumption constant even if they are forced out of the labor force. Table 10 repeats the exercise for changes in the basic ADL (which can indicate more serious decreases in health), finding similar results.

Intensive margin results

Tables 11 and 12 analyze the effect of health shocks on the intensive margin. Negative health shocks reduce hours worked among those households that remain in the labor market, with the results being very similar across both ADL measures. According to hour estimates, a change from 1 to 0 in the heads' general ADLs index implies that on average the head will decrease his weekly hour worked by 15.8 hours. A Similar change in the heads Basic ADLs index corresponds to a decrease in his hours worked of 19.7 hours per week. These magnitudees are large but considering that among the heads that suffered a negative shock in their health, the average change in their general and basic ADLs indexes were -0.24 and -0.19 correspondingly, the magnitudees fit our expectations. On average, the heads that suffered a negative shock on their health decrease their labor supply by 3.7 hours while the heads that suffered a major negative shock on their health (measured by a negative change in the basic ADLs index) decreased their labor supply by 5.7 hours. Somehow surprisingly, agents that have insurance are less exposed to a reduction in hours worked. These results could to point out the differences in the types of occupation that prevail between the population that counts with social security and the population that does not, an hypothesis that we will test in the following stage of this research.

Table B3: OLS estimates of the effect of breadwinner health's shocks on spouses labor supply

	Spouse's △weekly hours worked	Spouse's Entry into labor market	Spouse's Exit from labor market
Breadwinner△General ADL index	3.4416	-0.0354	-0.0705
	(4.5422)	(0.0864)	(0.2983)
Breadwinner's△General ADL*Soc.Sec.2005	-6.2837	0.0452	0.2242
	(5.8204)	(0.1104)	(0.3826)
N non-head workers in the household 2002	-3.9959***	-0.0211	-0.0030
	(0.6838)	(0.0154)	(0.0406)
n members in the household	2.0189***	0.0012	-0.0181
	(0.4660)	(0.0095)	(0.0289)
Other SES controls	yes	yes	yes
N	1004	770	239
Adjusted R^2	0.0430	0.0338	0.0820

Standard Errors In Parentheses

Table B1: OLS estimates of the effect of changes in the general ADLs index on breadwinners' labor supply

	(1)	(2)	(3)	(4)	(5)	(6)
dependent variable:	Current working status	Exit	Entry	Δweekly hours worked	Δweekly hours worked *if worked in 2002*	Δweekly hours worked *if worked in 2002 and still works in 2005*
Mean for the relevant group:	.8108	.1865	.3290	35.48	43.91	44.94
△General ADL	0.2242*	-0.1996	0.2256	24.4716***	27.4312***	29.5743***
	(0.0912)	(0.1126)	(0.1649)	(5.7508)	(7.3053)	(7.6175)
Current Social Security Insurance	-0.0497	0.0213	-0.1218	-1.1583	-0.8570	-1.1076
	(0.0306)	(0.0322)	(0.0826)	(2.0731)	(2.4673)	(2.4444)
Current Soc.Security Insurance*△General ADL	-0.0661	-0.0053	-0.0522	-18.4517*	-19.6398*	-28.5632**
	(0.1229)	(0.1516)	(0.2193)	(7.2104)	(9.2707)	(9.7947)
△ Social Security Insurance Status	0.0543	-0.0348	0.1492	1.6434	1.1737	0.7631
	(0.0285)	(0.0304)	(0.0875)	(2.0044)	(2.2801)	(2.2636)
Other socio-economic controls	yes	yes	yes	yes	yes	yes
N	1238	1011	227	1201	977	796
Adjusted R^2	0.2340	0.0604	0.1622	0.1106	0.0233	0.0312

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B2: OLS estimates of the effect of changes in the basic ADLs index on breadwinners' labor supply

	(1)	(2)	(3)	(4)	(5)	(6)
dependent variable:	Current working status	Exit	Entry	Δweekly hours worked	Δweekly hours worked *if worked in 2002*	Δweekly hours worked *if worked in 2002 and still works in 2005*
Mean for the relevant group:	.8108	.1865	.3290	35.48	43.91	44.94
△Basic ADL	0.1844	-0.1094	0.3143*	24.4843***	25.2862**	35.5068***
	(0.1043)	(0.1347)	(0.1399)	(6.1844)	(7.9530)	(8.7132)
Current Social Security Insurance	-0.0483	0.0183	-0.1288	-1.1941	-0.8877	-1.4837
	(0.0309)	(0.0325)	(0.0825)	(2.1063)	(2.4948)	(2.4599)
Current Soc.Security Insurance*△Basic ADL	-0.0641	-0.0734	-0.1855	-21.8410**	-24.3073*	-41.7583***
	(0.1356)	(0.1745)	(0.1996)	(7.7120)	(10.5217)	(11.2632)
△ Social Security Insurance Status	0.0540	-0.0369	0.1398	1.5603	1.2346	0.7804
	(0.0286)	(0.0304)	(0.0884)	(2.0293)	(2.3073)	(2.2772)
Other socio-economic controls	yes	yes	yes	yes	yes	yes
N	1238	1011	227	1201	977	796
Adjusted R^2	0.2307	0.0554	0.1650	0.1076	0.0174	0.0329

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B4: OLS estimates of the effect of moderate healthshocks on male household members labor supply-extensive margin.

	(1) all	(2) breadwinners	(3) all	(4) breadwinners
△General ADL	-0.1218	-0.3119*		
	(0.0842)	(0.1389)		
△ADL*insurance 2005	0.1880	0.3413		
	(0.1101)	(0.1811)		
△BasicADL			-0.1373	-0.3533*
			(0.0895)	(0.1507)
Basic△ADL*insurance 2005			0.1684	0.3521
			(0.1160)	(0.1974)
Socio-economic controls	yes	yes	yes	yes
N	2179	1241	2179	1241
Adjusted R^2	0.1448	0.1367	0.1446	0.1370

Table B5: OLS estimates of the effect of moderate healthshocks on female household members labor supply-extensive margin.

	(1) all	(2) breadwinners	(3) all	(4) breadwinners
△ General ADL	0.0251	0.0061		
	(0.0827)	(0.1354)		
△General ADL*insurance 2005	-0.0727	-0.0491		
	(0.1082)	(0.1767)		
△ADLBasic			-0.0106	0.0364
			(0.0879)	(0.1470)
△BasicADL*insurance 2005			-0.0064	-0.0698
			(0.1140)	(0.1926)
Socio-economic controls	yes	yes	yes	yes
N	2179	1241	2179	1241
Adjusted R^2	0.1970	0.2180	0.1969	0.2180

Table B6: OLS estimates of the effect of moderate healthshocks on male household members' aggregated labor supply-intensive margin

	(1) all	(3) breadwinners	(4) all	(6) breadwinners
△ADL	-4.7522	-14.3502*		
	(4.2006)	(6.8820)		
△ADL*insurance 2005	8.0410	15.6008		
	(5.4965)	(8.9765)		
△basicADL			-5.7768	-16.7021*
			(4.4630)	(7.4660)
△basicADL*insurance 2005			9.7190	19.9652*
			(5.7878)	(9.7828)
Socio-economic controls	yes	yes	yes	yes
N	2179	1241	2179	1241
Adjusted R^2	0.0847	0.0992	0.0850	0.0998

Table B7: OLS estimates of the effect of moderate healthshocks on female household members' aggregated labor supply-intensive margin

	(1) all	(3) breadwinners	(4) all	(6) breadwinners
△ADL	-1.7857	-1.3573		
	(3.8361)	(6.3194)		
△ADL*insurance 2005	-1.6316	-4.5604		
	(5.0195)	(8.2427)		
△basicADL			-0.7628	2.8837
			(4.0766)	(6.8582)
△basicADL*insurance 2005			-2.5398	-8.9355
			(5.2868)	(8.9864)
Socio-economic controls	yes	yes	yes	yes
N	2179	1241	2179	1241
Adjusted R^2	0.1279	0.1403	0.1277	0.1403

Apendix C: Risk Aversion estimates

In order to allow for heterogeneity in individual's risk aversion, I use data from the 2005 wave of the Mexican Family Life Survey (MxFLS3) to construct an individual-level risk aversion coefficient. The second the wave of MxFLS waves introduces a new module on preferences. Among such preferences, it measures a person's degree of risk aversion by successively asking participants to choose between two binary gambles: one with a sure payoff (a risk-free gamble), and one with a high and a low payoff (equally likely) and an expected value higher than the risk-free gamble. Successive choices present participants with the gambles of distinct risk levels measured through their corresponding coefficient of variation and succesfully higher expected value every time, but also higher variance. The different choices are presented to the participant until she opts for the safer option, thus indicating her maximum tolerance to risk. Table20 illustrates the basic payoff matrix presented to subjects in the MxFls 2005 experiments.

Following Holt and Laury (2002) who devised a simple experimental measure for risk aversion using a multiple price list (MPL) design, the choices recorded on the set of lottery options allows me to assess relative tolerance to risk. Therefore, I use the risk aversion section of the MxFLS to assign to each person a measure of risk aversion. and Figure3 presents what was the strategy to classify individuals from highly risk averse to very low risk averse.

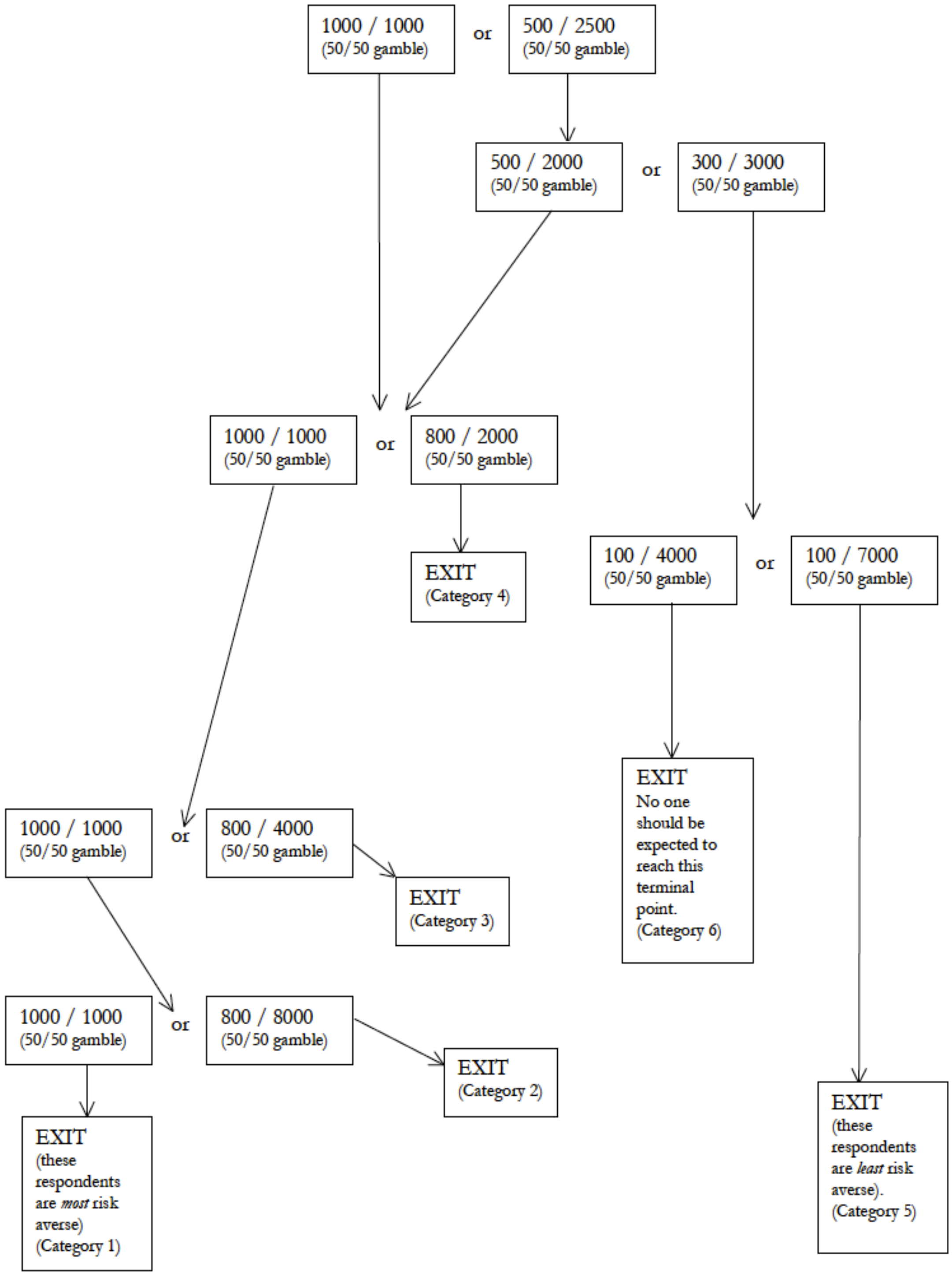
Table C1: Money Lotteries Measuring Respondents' Risk Aversion (MxFLS 2005 questionnaire)

Choice	Lottery A			Lottery B			EV^A	EV^B	Difference	Coefficient of variation		
	p	pesos	pesos	p	pesos	pesos	(pesos)	(pesos)	(pesos)	CV^A	CV^B	DIF
1_1	**0.5**	**1000**	**1000**	0.5	500	2000	1000	1250	250	0	0.85	0.85
1_2	0.5	500	2000	0.5	300	3000	1250	1650	400	0.85	1.16	0.31
1_3	0.5	100	4000	0.5	100	7000	2050	3550	1500	1.35	1.37	0.03
2_1	**0.5**	**1000**	**1000**	0.5	800	2000	1000	1400	400	0	0.61	0.61
2_2	**0.5**	**1000**	**1000**	0.5	800	4000	1000	2400	1400	0	0.94	0.94
2_3	**0.5**	**1000**	**1000**	0.5	800	8000	1000	4400	3400	0	1.16	1.16

Note: $CV_i = \frac{1}{\bar{\pi}_i}\sqrt{(\pi_i^h - \bar{\pi}_i)^2 + (\pi_i^l - \bar{\pi}_i)^2}$

Figure7: Binary Choices over Hypothetical Money Lotteries and Risk aversion Coefficient

(MxFLS 2005 questionnaire)



Source: Hamoudi (2006)

Appendix D: Additional tests of consumption full insurance using alternative measures of health shocks.

Consumption model using self-reported Health Shocks.

$$\triangle ln(\frac{C_i}{n_i}) = \alpha_s + \sum_{q=-3}^{3} \lambda_{t_0-q} Shk_{i,t_0-q} + \sum_{t=t_0}^{2005} \delta_{1t} ins_{it} + \sum_{t=t_0}^{2005} \sum_{q=-3}^{3} \delta_{2t} ins_{it} * Shk_{i,t_0-q} + \sum_{k} \gamma_k X_{isk} + v_i \quad (22)$$

Where Shk_{i,t_0-q} is a dummy variable indicating that the household i sufferd an economic shock related to the health of one of its members at time $t_0 - q$ with $t_0 = 2005$ and $q = 0, 1, 2, 3$ so that we consider effect of reported economic shocks occurred in 2005, 2004, 2003 and 2002.

Table D1 highlights the advantage of a using an objective measure of health, such as the ADL, instead of subjective, self-reported indicators. When relying on self-reported, dichotomic measures of presence of illness symptomes, there are no significant effects of the appearance of illness symptomes on household non-medical consumption whether the symptomes reported are related to suffering infectious diseases or chronic diseases. A similar conclusion can be taken from Table8 results: families' self-reports of the occurance of an economic shock related to the sickness of a household member during the current year, the year before the current year or two years before the current year does not seem to provoke any long lasting effect on household non-medical consumption levels, relative to the household baseline level, preceeding the reported shocks. Perhaps reported health economic shoks refer to acute events that not necessarely reflect changes in the household productive capacity. In any case self-reported instruments of health events or illness status do not show any statistically significant relation to household variations in non-medical consumption.

Table C2: Consumption per equivalent adult change vs Reported Economic Shocks related to Illness-by year reported, over50yrsold

	Household with a household head over 50 years old			
	(1)	(2)	(3)	(4)
Economic shocks related to illness main effects:				
eco shock year t_0 (current year)	-0.2000	-0.1581	-0.1963	-0.1396
	(0.1120)	(0.1768)	(0.1120)	(0.1599)
eco shock year t_0-1	0.1188	-0.2737	0.1205	-0.1520
	(0.1139)	(0.1859)	(0.1139)	(0.1843)
eco shock year t_0-2	0.2947*	0.5486*	0.2888*	0.3630
	(0.1446)	(0.2392)	(0.1447)	(0.2562)
eco shock year t_0-3	-0.0623	-0.1332	-0.0666	0.2161
	(0.1960)	(0.2963)	(0.1960)	(0.3202)
2002 Insurance effects:				
Any type of insurance 2002		-0.0324		
		(0.0453)		
Insurance 02*eco shock year t_0 (current year)		-0.0937		
		(0.2284)		
Insurance 02*eco shock year t_0-1		0.6365**		
		(0.2340)		
Insurance 02*eco shock year t_0-2		-0.4083		
		(0.2991)		
Insurance 02*eco shock year t_0-3		0.1231		
		(0.3943)		
2005 Insurance effects:				
Social Security insurance 2005			0.0694	0.0661
			(0.0441)	(0.0456)
SSec 05*eco shock year t_0 (current year)				-0.1414
				(0.2251)
SSec 05*eco shock year t_0-1				0.5387*
				(0.2369)
SSec 05*eco shock year t_0-2				-0.2728
				(0.3099)
SSec 05*eco shock year t_0-3				-0.4488
				(0.4133)
Seguro Popular insurance 2005			0.0213	0.0107
			(0.0732)	(0.0772)
SegPop.05*eco shock year t_0 (current year)				0.2186
				(0.4702)
SegPop.05*eco shock year t_0-1				-0.0716
				(0.3612)
SegPop.05*eco shock year t_0-2				0.4639
				(0.4133)
SegPop.05*eco shock year t_0-3				-0.5088
				(0.8407)
N	1640	1639	1636	1636
r2	0.0647	0.0702	0.0666	0.0727
adjusted r^2	0.0407	0.0433	0.0414	0.0428

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$