ABSTRACT

Title of dissertation: ESSAYS ON THE DETERMINANTS OF PENSIONS SAVINGS AND RETIREMENT MANAGEMENT DECISIONS

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In recent years, governments have become increasingly concerned about the low levels of households wealth accumulation upon retirement, and the capacity of individuals to keep the standard of living they had during their working lives. Among the reasons behind these concerns are the high relative poverty rates among elderly households, the low replacement rates provided by compulsory pension systems, and the higher responsibility placed on individuals to fund their retirement due to changes in pension systems and the increased complexity of financial instruments.

Government officials in various countries have developed a series of policies that aim at encouraging retirement savings among the population. The evaluation of the effectiveness of such policies has been a continuous objective of economists. This dissertation contributes to the public economics literature in accomplishing this objective via two cases whose analysis will hopefully inform policy makers and help better design policies geared towards improving individuals' retirement wealth accumulation.

In chapter 2, I investigate the effect of the introduction of tax free retirement accounts on the savings behavior of Mexican households. This chapter contributes empirical evidence to the debate about whether preferential tax treatment is an effective policy tool to encourage household savings. The empirical strategy is a difference-in-difference approach that utilizes an arguably exogenous change in access to tax free accounts for a well-defined set of workers. The data provide evidence of heterogeneous effects across demographic subgroups and across quantiles of the savings distribution that accord with predictions of a standard model of savings behavior. In particular, the data show an increase in the savings rate of treated workers in the year following the introduction of the accounts. The effect is driven by prime age workers and by high income workers. Among prime age workers, the lower savers experience the largest effects of the policy change. I perform multiple robustness checks on these findings, including estimating propensity score matching models and tests for potential confounding factors such as changes in retirement accounts' returns or fees, or changes in workers' income.

In chapter 3, I analyze whether information framing related to the performance of Pension Funds Administrators affects the retirement management decisions of Mexican workers. I conduct a survey to collect information on recommendations for Fund Administrator made by Mexican workers when faced with randomly framed scenarios. The scenarios feature framing based on choice avoidance and framing exploiting loss aversion. I find evidence that reducing the number of possible choices increases the probability that individuals choose a Fund Administrator with a higher net return or with lower fees. A "loss aversion" framing increases the probability

that individuals choose a Fund Administrator with a higher net returns. Finally, I find evidence that higher levels of financial literacy decrease the effects of framing on Fund Administrator choice.

ESSAYS ON THE DETERMINANTS OF PENSION SAVINGS AND RETIREMENT MANAGEMENT DECISIONS

by

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List of Abbreviations

AFORE	Pension Funds Administrators
BANXICO	Mexico Central Bank
CEX	Consumer Expenditure Survey
CONSAR	National Commission for the Retirement Saving System
CPI	Consumer Price Index
EAP	Economically Active Population
ENEU	National Urban Employment Survey
ENIGH	National Household Survey of Income and Expenditures
IMSS	Mexican Social Security Institute
INFONAVIT	National Institute of Workers' Housing Fund
IRA	Individual Retirement Accounts
ISSSTE	Social Security Institute for the Workers of the State
LSAR	Law of the System for Retirement Savings
MTR	Marginal Tax Rate
MxFLS	Mexican Family Life Survey
SAT	System for Revenue Administration
SCF	Survey of Consumers Finances
SIEFORE	Investment System for Pension Funds
SIPP	Survey of Income and Program Participation

Chapter 1

Introduction

In recent years, governments have become increasingly concerned about the low levels of households wealth accumulation upon retirement, and the capacity of retired individuals to keep the standard of living they had during their working lives. Among the reasons behind these concerns are the high relative poverty rates among elderly households, the low replacement rates provided by compulsory pension systems, and the higher responsibility placed on individuals to fund their retirement due to changes in pension systems and the increased complexity of financial instruments.

In many countries, there is evidence that the elderly are over represented among the poor population. Poverty rates are often used to measure how many people achieve an adequate standard of living. The OECD defines this rate in relative terms and considers an individual poor if her income is less than 50% the median income in the population. Using this measure, the OECD (2011) finds that the number of countries in which the elderly have higher poverty rates than the population as a whole is twice the number of countries where it is not the case (see figure 1.1).[1]

[1]Some recent poverty measures from the U.S. note that the elderly are the population group with the lowest poverty rates. The disparity results from the definition of poverty as having an income below a CPI adjusted income threshold defined by the US Census. I show here measures of poverty as relative measure for purposes of international comparison (OECD [2009]).

A second reason for concern that individuals may not be saving enough for retirement is that they may overestimate the benefits they will receive from their pension plans. Pension benefits are typically expressed in terms of the individuals' perceived income while working (i.e. replacement rates). It is recognized that the retirees' population does not have the same income needs as the general population and a suitable replacement rate is below 100%. For example, the National Retirement Risk Index defines a target replacement rate between 65% and 85% (Munnell et al. [2007]). However, the average replacement rate among the OECD members is 57.3%. The compulsory pension systems in many countries will not provide a replacement rate equal to the lower bound of the suggested target rate (see figure 1.2) and individuals will have to rely on personal saving in order to close the gap. Table 1.1 shows evidence that households in a number of countries are not saving enough for their retirement. Using the OECD average replacement rate as a benchmark, we see that the required contributions, as a percentage of income earnings, that an individual needs to save throughout her career in order to reach this rate exceed the recent savings rates estimates.[2]

The capacity of individuals to keep their standard of living upon retirement also depends on how they handle the recent changes in pension systems and how they invest in the increasingly intricate financial vehicles available today. Governments have shifted away from defined benefit towards defined contribution pension systems to address the financial pressure that relatively older populations entail.[3]

[2]The required contributions column assumes that the individual will save every year of her working life. If this is not the case the problem of low savings will be larger.

[3]There has also been an important shift to defined contribution plans among private employers (see for example Poterba *et al.* [2001]).

The design of a defined contribution system relies on a consistent accumulation of contributions throughout the individual's working life to provide sufficient support upon retirement. Failure to save enough in a timely manner may lead to financial stress in the late stages of the life cycle. Meanwhile, the increase in the availability and sophistication of financial products for savings and credit imposes a high degree of complexity to an individual's consumption and savings decisions. There is evidence that individuals tend to be affected by the *frame* under which information is presented and to rely on rules of thumb to make choices that require costly calculations. In turn, this behavior may put individuals at risk of making suboptimal decisions in their use of financial products and lead to inadequate levels of savings, overindebtedness, and unnecessary financial distress.

In view of this evidence, a list of policies have been developed to encourage retirement savings. Some policies provide economic incentives through tax incentives or matching rates on contributions to retirement accounts. Other policies promote savings via the provision of information in fairs and workshops. The evaluation of the effectiveness of such policies has been a continuous objective of economists. This dissertation contributes to the public economics literature in accomplishing this objective via two cases whose analysis will hopefully inform policy makers and help better design policies geared towards improving individuals' retirement wealth accumulation.

First, I analyze the effectiveness of providing economic incentives in encouraging retirement savings. I study whether the provision of a preferential tax treatment on voluntary contributions made to retirement accounts leads to higher levels

of households' savings. In the second chapter, I conduct a field experiment to investigate the potential of non-standard economic models to explain the outcomes observed in retirement management decisions of Mexican workers. These chapters provide a rigorous evaluation of two types of interventions with features that could be useful in informing the debate on how to provide incentives to help individuals achieve higher retirement wealth.

The second chapter of this dissertation investigates the effect of the introduction of tax free retirement accounts on the savings behavior of Mexican households. This chapter contributes empirical evidence to the debate about whether tax incentives can be an effective policy tool to encourage household savings.

Over the past few decades, governments have attempted various measures to increase household savings rates via targeted tax savings programs. In the US, for example, Individual Retirement Accounts (IRAs) and 401(k) plans were introduced in the 1980s. These accounts offer a preferential tax treatment on contributions and on interest accrued from investments. The proliferation of such programs has given rise to an active economics literature. Studies examining the U.S. and U.K. contexts consistently present evidence of high levels of enrollment in tax deferred savings accounts and of increasing balances in such savings over time. But, authors disagree on the crucial question of whether these balances reflect increased net savings. The major identification challenge facing this empirical literature is to establish that any observed relative increase in savings among tax preferred account holders relative to non-account-holders is not driven by differences in taste for savings. At the individual level, the decision to enroll in a retirement savings account

is often considered endogenous to preferences for savings. A second important data challenge is to establish that savings in such accounts reflect an increase in total or net savings.

This chapter exploits the environment of a 2003 tax policy reform that affected Mexican workers in the private sector to test the causal effect of preferential tax treatment on households savings. The characteristics of this environment help to address a key identification problem that has confronted many previous studies, mostly in the U.S. context. First, savings accounts with preferential tax treatment became available only for a sector of the worker population. Mexican private sector workers and public employees have historically contributed to different pension systems. Because the 2003 reform only affected workers in the private sector, it effectively created a quasi-experiment where private sector workers constitute the "treatment" group. Second, I argue that it is reasonable to assume that a worker's decision of which sector to work for (public or private) is exogenous to their savings preferences. This implies that the potential bias in the estimates from omitting a control for saving preferences should be close to zero. Using several rounds of a nationally representative household survey, I compare the change in the savings rate of private sector workers to the change in the savings rate of public employees before and after 2003. If public employees constitute a valid control group, this difference-in-differences approach yields a valid estimate of the impact of the availability of tax deferred savings accounts on the savings rate.

The analysis finds positive and statistically significant effects on the short term relative savings rate of private sector workers in the year following the policy

change. This estimated effect is driven by prime age and high income households. Quantile regression estimates suggest that the effects of the policy change on the savings rate of the prime age workers is concentrated among the lower half of the savings distribution. The quantile regression results for the young and prime age samples are consistent with a consumption/savings model where heterogeneity in preferences translates into heterogeneous effects of the policy change.

I perform multiple validity and robustness checks on the estimated effects. I present evidence to support the claim that public sector workers constitute a suitable comparison group. In particular, their savings rate seems to follow a similar time trend as private sector employees' savings rate. Moreover, I perform propensity score matching models to account for potential differences in the characteristics of treatment and control groups. I find the results are robust to this estimation method. Finally, I test for potential confounding factors and do not find evidence that the estimated effects are caused by temporary changes in retirement accounts' returns or fees, changes in savings not related to the retirement accounts, nor by changes in workers' income.

In the third chapter I focus on the determinants of retirement management decisions. Retirement management decisions have been largely studied in the behavioral economics literature. There is significant evidence that inertia, hyperbolic discounting, bounded rationality and self control problems can affect individuals' levels of retirement savings or contribution rates in retirement accounts. In this chapter, I investigate whether particular types of framing, based on menu effects and loss aversion, can be causally related to retirement management decisions.

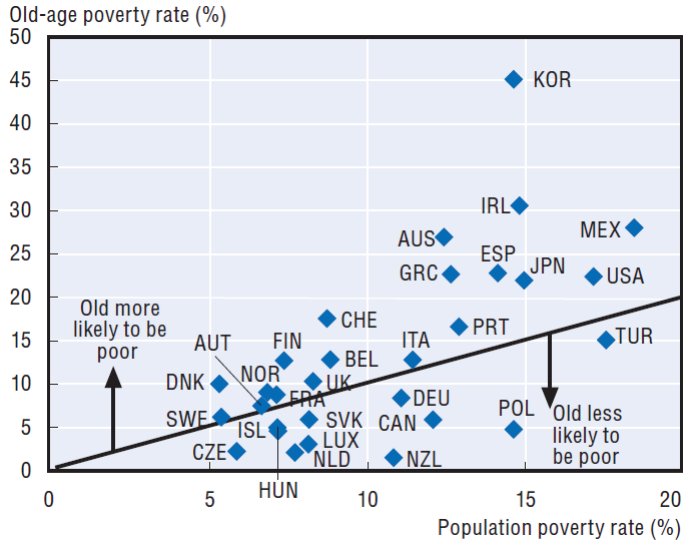
I use the context of the Mexican Pension System to test whether framing can positively affect workers' retirement management decisions. Under the Mexican pension system, workers are required to choose a Pension Fund Administrator to manage their individual retirement account. Currently, the Mexican pension funds market is highly concentrated and the Administrators with higher market shares do not provide the highest net returns or charge the lowest fees. Despite the costless nature of switching affiliation, workers switch very seldom and in many cases they do not switch to an Administrator with lower fees. One potential explanation of these outcomes is that the channels communicating the performance of Pension Fund Administrators are ineffective at helping Mexican workers choose the Administrators that maximize their retirement wealth.

I use data collected from a survey with an embedded experiment to test whether providing information under a specific framing may lead workers to choose an Administrator that is closer to an optimal choice. I ask surveyed workers to analyze hypothetical cases containing information on the returns and fees of Mexican Pension Fund Administrators. The cases feature randomly assigned *frames* based on the concepts of choice avoidance and loss aversion. Choice avoidance relates to the lack of choice observed in individuals when they face overwhelming amounts of information. When processing the information becomes too costly, it triggers inaction on the part of the decision maker. Loss aversion describes how individuals experience a disutility of larger magnitude following a perceived loss than the increase in utility following a perceived gain of the same amount. These two types of frames are cross-randomized across individuals. The randomization helps to pro-

vide causal estimates of the effect of two concepts from behavioral economics on retirement decisions.

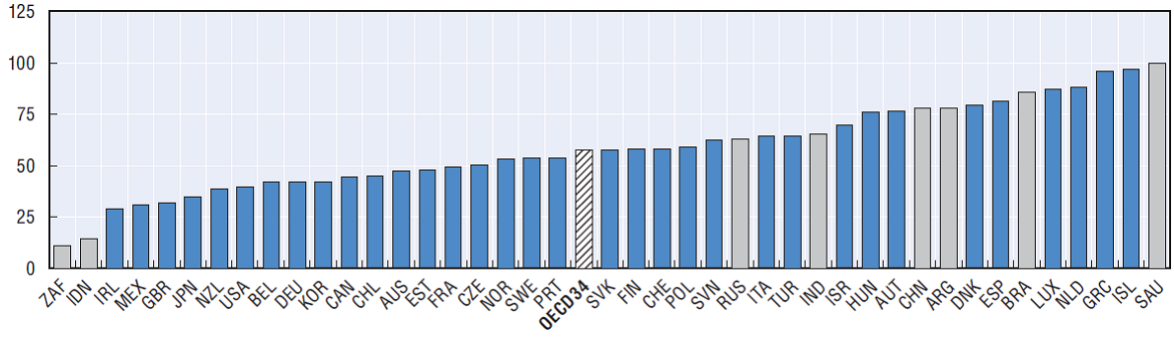
I find evidence that reducing the number of possible choices increases the probability that individuals choose a Fund Administrator with a higher net return or lower fees. The "loss aversion" framing affects only the probability of choosing an AFORE with higher net returns. I also find evidence that higher levels of financial literacy decrease the effects of framing on Fund Administrator choice.

Figure 1.1: Old age and general population poverty rates



Notes: Poverty rates are based on the percentage of the population with incomes below 50% of the country median income. Source: OECD (2011).

Figure 1.2: Replacement rates from compulsory pension systems for average earner



Source: OECD (2011).

Table 1.1: Required contributions to close replacement rate gap

Country	Required contribution[1]	Savings rate[2]
Ireland	7.35%	5.4%
United Kingdom	5.92%	-4.4%
Japan	6.32%	3.6%
New Zealand	4.95%	-14.8%
United States	4.04%	2.2%
Korea	3.51%	2.85%
Canada	3.32%	3.2%
Australia	2.51%	0.8%
Estonia	2.42%	1%
Norway	0.99%	-1.2%
Portugal	0.90%	-0.9%

[1] Required savings as a percentage of income earnings to close the gap between current pension system replacement rate and the OECD average replacement rate. Source: OECD (2011) [2] Sources: *Australia* (2006), *Canada, Korea, USA, United Kingdom* (average 2007-2008), *Japan, Norway* (2007) `http://www.census.gov/compendia/statab/2011/tables/11s1362.pdf`; *Estonia* (2007) `http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-09-029/EN/KS-SF-09-029-EN.PDF`; *Ireland* (average 2007-2009) `http://www.irishtimes.com/newspaper/finance/2010/1029/1224282234801.html`;*Portugal* (2008) OECD Factbook 2010. *New Zealand* (2005) `http://www.rbnz.govt.nz/speeches/2823190.pdf`

Chapter 2

Pension Reforms and the Incentives to Save: Lessons from Mexico

2.1 Introduction

The issue of low household savings rates and insufficient household retirement wealth is a major policy concern in many countries. Over the past few decades, governments have attempted various measures to increase household savings rates. Targeted tax savings programs are among the most common such measures.[1] In the US, for example, Individual Retirement Accounts (IRAs) and 401(k) plans were introduced in the 1980s. In the United Kingdom, Personal Equity Plans and Tax Exempt Saving Accounts have been offered for over two decades. These accounts offer a preferential tax treatment on contributions and on interest accrued from investments. The proliferation of such programs has given rise to an active economics literature. But after more than two decades of research on the topic, economists still disagree as to whether targeted tax savings programs increase net savings at the household level. This chapter contributes to this active debate by examining the impact of a 2003 law in Mexico that introduced preferential tax treatment of retirement savings for a well-defined set of workers. The nature of the 2003 policy reform offers a compelling quasi-experiment to test the causal effect of preferential

[1] Other schemes designed to increase retirement savings include default enrollment programs (Choi *et al.* [2003], Carroll *et al.* [2009]), future enrollment (Thaler and Benartzi (2004]) and matching rates (Papke [1995], Papke and Poterba [1995], Beshears *et al.* [2007]).

tax treatment on household savings. This chapter therefore surmounts the primary identification issue confronting previous empirical studies on the question.

As is well-recognized among economists, a standard economic framework predicts ambiguous effects of tax-deferred accounts on savings. The preferential tax treatment raises the after-tax return on pensions relative to other savings. This creates income effects that would theoretically reduce savings and substitution effects that would theoretically raise savings.[2] The effectiveness of such programs at raising household savings is thus an empirical question, and the empirical evidence on the effectiveness of tax preferred accounts is mixed.

Studies examining the U.S. and U.K. contexts consistently present evidence of high levels of enrollment in tax deferred savings accounts and of increasing balances in such savings over time. But authors disagree on the crucial question of whether these balances reflect increased net savings. The major identification challenge facing this empirical literature is to establish that any observed relative increase in savings among tax preferred account holders relative to non-account-holders is not driven by differences in taste for savings. At the individual level, the decision to enroll in a retirement savings account is often considered endogenous to preferences for savings. In the U.S. and in the U.K., each worker decides whether to have a tax deferred savings account.[3] Thus, if workers with higher tastes for savings are also more likely to enroll in such accounts, the estimates of the effect of tax deferred

[2] A third *wealth* effect may also be created if individuals use the return to discount their stream of future income. Future income in terms of current consumption is reduced and savings are raised (Summers [1981]).

[3] In the US workers can choose to have a retirement savings account such as the 401(k) only if their employer offers one. The decision to work for an employer who offers a 401(k) plan can arguably be endogenous to savings preferences as well (Engen *et al.* [1996]).

savings accounts on savings will be biased upward. A second important challenge is to establish that savings in such accounts reflect an increase in total or net savings. This is a critique to studies that focus exclusively on retirement account balances and do not use comprehensive measures of household wealth. Studies using different datasets, methodologies or making different assumptions about the exogeneity of enrolling in a tax-deferred account find opposing conclusions on the effectiveness of these accounts in increasing households' savings. For example, Poterba, Venti and Wise [1995, 1996, 2001] and Venti and Wise [1986, 1990, 1996] among others, argue in favor of "new" savings; while others present evidence that the observed contributions to such accounts represent shifts away from other types of savings, including Gale and Scholz [1994], Engen *et al.* [1996], Gale [1998] and Attanasio *et al.* [2004] among others. I review this literature below.

This chapter examines the introduction in 2003 of a tax law that affected Mexican workers in the private sector. Mexico's pension system switched from a pay-as-you-go (PAYGO) system to one based on individual retirement accounts in 1997. The retirement accounts were comprised of a compulsory contribution made by the employer and the employee, a state contribution, and voluntary contributions. A few years after the reform, the Congress passed a tax law to provide workers with incentives to increase savings in the private accounts. The tax law provided a *tax-free* status to the voluntary contributions made to retirement savings accounts. The law stipulated that beginning in January 2003, all voluntary contributions made during any fiscal year to the individual retirement account would be tax deductible at tax filing time of the following year. Furthermore, the funds and the returns

earned on the investment could be withdrawn tax free upon retirement.

The environment of the 2003 policy reform provides a quasi-experiment to test the causal effect of preferential tax treatment on household savings. First, savings accounts with preferential tax treatment became available only for a sector of the worker population. Mexican private sector workers and public employees have historically contributed to different pension systems. Because the 2003 reform only affected workers in the private sector, it effectively created a quasi-experiment where private sector workers constitute the "treatment" group. Second, I argue that it is reasonable to assume that a worker's decision of which sector to work for (public or private) is exogenous to their savings preferences. This implies that the potential bias in the estimates from omitting a control for saving preferences should be close to zero. Using several rounds of a nationally representative household survey, I compare the change in the savings rate of private sector workers to the change in the savings rate of public employees before and after 2003. If public employees constitute a valid control group, this difference-in-differences approach yields a valid estimate of the impact of the availability of tax deferred savings accounts on the savings rate. This addresses a key identification problem that has confronted many previous studies, mostly in the U.S. context.

The analysis finds positive and statistically significant effects on the short term relative savings rate of private sector workers in the year following the policy change. This estimated effect is driven by prime age and high income households. The estimates on the difference of the conditional median of the savings rate distribution between private sector workers and public employees in the year after the reform

are between 4.9 and 9.3 percentage points for households whose head is 40 years old or more. The estimate for all high income workers is around 8.3 percentage points, whereas for prime age high income workers the estimate is 13.3 percentage points. To put the magnitude of these effects in perspective, they are equivalent to between one-half and one-third of the standard deviation of the savings rate distribution. Quantile regression estimates suggest that the effects of the policy change on the savings rate of prime age workers are concentrated among the lower half of the savings distribution. The quantile regression results for the young and prime age samples are consistent with a consumption/savings model where heterogeneity in preferences translates into heterogeneous effects of the policy change.

The data do not indicate any permanent change in the savings rate. However, the data also fail to show any subsequent drops in the saving rate among these households. This evidence suggests that the temporary positive shock in the flow of savings leads to a permanent increase in the level of wealth of prime age and high income private sector workers following the 2003 policy change. A back of the envelope calculation estimates this increase to be equal to approximately three months worth of income in 2004.

I perform multiple validity and robustness checks on the estimated effects. I present evidence to support the claim that public sector workers constitute a suitable comparison group. In particular, their savings rate seems to follow a similar time trend as private sector employees' savings rate. Moreover, I perform propensity score matching models to account for potential differences in the characteristics of treatment and control groups. I find that the results are robust to this estimation

method. Finally, I test for potential confounding factors and do not find evidence that the estimated effects are caused by temporary changes in retirement accounts' returns or fees, changes in savings not related to the retirement accounts, nor by changes in workers' income.

The rest of the chapter is organized as follows. Section 2.2 describes the Mexican pension system and the 2003 tax reform. To put this reform in context, this section also includes a comparison between the tax treatment of Mexican Individual Retirement Accounts and the IRA and Roth IRAs offered in the US. Section 2.3 reviews some of the previous literature on pension reforms and the effectiveness of tax deferred savings accounts. Section 2.4 presents a simple theoretical model of saving to motivate the empirical strategy explained in section 2.5. Section 2.6 presents the data. Section 2.7 presents the results. Section 2.8 presents a discussion of the results and section 2.9 concludes.

2.2 The Mexican Pension System

2.2.1 A brief history

The Mexican Social Security Institute (IMSS) has historically been in charge of providing health services and managing the pension accounts of all private sector workers in Mexico. The IMSS is the largest retirement pension institution in Mexico, providing pensions to 2.57 million people in 2008.[4]

[4]By comparison, the second largest institution providing pensions is the Social Security Institute for the Workers of the State (ISSSTE). This institute provides pensions to retired public employees. In 2008, the number of pensioners covered by ISSSTE was 290,000. (Presidencia de la República, 2009).

The Mexican pension system was created in the mid 1940s as a PAYGO system. The pension fund received contributions from employers and employees. The contributions were a fixed percentage of the worker's salary. To apply for pension benefits, a person had to be at least 65 years old, currently working, and have contributed for at least 500 weeks to the system. The worker's pension amount was calculated as a percentage of her average nominal wage in the last five years, plus a fraction for each year of contribution in excess of ten years (Grandolini and Cerda [1998]).

The pension system was designed to be supported by a relatively young population. In 1960, 55% of Mexico's population was younger than 20 and 5.6% were older than 60, and there were 4 pensioners per one hundred contributors. However, important changes in the demographic composition occurred in the following decades. By 1994, there were 12.5 pensioners per one hundred contributors. Also in that year, the expected annual rate of growth in the number of pensioners over the next decade was 5.7%, whereas the most optimistic forecast for growth of contributors was 2.6% (Sales-Sarrapy *et al.* [1998]). These changes in the composition of the population and poor management of pension funds pushed the pension system into severe financial disequilibrium that threatened its viability.[5] Between 1984 and

[5]The IMSS pension program started as a partially-funded scheme with contributions coming from employees, employers and the state. For several years, the pension system reported a surplus as a large number of young workers were contributing to the system whereas the number of pensioners was relatively small. This surplus was to be invested by the IMSS and paid out as future pensions of current workers. Instead, the surplus generated by the pension program was often used to finance infrastructure requirements, to pay hospitals' maintenance and operational costs, and to finance health insurance provision and maternity insurance of the IMSS beneficiaries. That is, the IMSS used the pension program surplus to cross subsidize large expenditures in areas unrelated to the pension system. Other changes to the system rules increased the financial pressure on the system. In 1989 pensions were indexed to changes in the minimum wage, and in 1995, the minimum pension guaranteed by the government rose from 35% to 100% of the minimum wage

1994, the IMSS' pension expenditures rose by 150 percent as a percentage of GDP (from 0.22% to 0.56%). According to the IMSS' calculations in 1995, the pension system would fall into deficit as early as 2003 (Sinha and Yañez [2008]).

2.2.2 The pension reform attempt in 1992

When the possibility of bankruptcy of the pension system was first recognized, the Congress enacted the Retirement Savings Law (LSAR) in May 1992. This law aimed to reform the pension system and lessen the burden on public finances. The 1992 LSAR mandated the creation of workers' individual accounts that would complement the contributions made to the IMSS through two channels. First, employers were required to open a retirement savings account on behalf of their employees and to deposit in them a new mandatory contribution. Second, employees had the option to make voluntary contributions to their retirement savings account. To promote such savings, the government guaranteed a 2% annual return on realized contributions. Notwithstanding these changes, the 1992 reform had very important shortcomings and did not meet its objectives: the majority of workers were not aware of the LSAR or did not trust the system; the perception of the pension scheme as just another payroll tax did not change; and the financial deficit of the pension system did not decrease (Grandolini and Cerda [1998]).[6]

(Sales-Sarrapy *et al.* [1998]).

[6]Grandolini and Cerda (1998) identify the most important shortcomings of the 1992 LSAR. First, there was significant lack of information among the population of employees regarding the retirement savings accounts. Employers decided where to open their employees' retirement accounts. Thus, many employees ignored whether they already had an individual account or in which bank it was held. Second, there was no regulatory framework for the retirement accounts. The National Commission for the Retirement Saving System, which would later regulate the pension accounts, was created only in 1994, two years after the LSAR approval in Congress. In turn,

2.2.3 The 1997 reform

After the failed 1992 LSAR reform, a new Retirement Savings Law was passed in December 1995 and came into effect in September 1997. The Law introduced two major changes into the pension system. First, the pension system changed from being a defined benefits system to a defined contributions system. All retirement contributions would now be accumulated in an individual retirement account, and upon retirement, the worker would buy an annuity with the balance on her account. Second, retirement contributions would no longer be managed by the IMSS, but by specialized financial institutions.

Since the 1997 reform, the individual retirement accounts receive contributions from three sources. The first source is a mandatory contribution made by the employer and employee equivalent to a fixed percentage of the worker's wage. The second source is a government contribution called the "social quota", equal to 5.5% of the price-indexed minimum wage in Mexico City in 1997. Finally, voluntary contributions can also be made to the Retirement Account. Table 2.1 presents a summary of the major changes of the 1997 reform.

The new pension law set out the structure and powers of a regulatory commission (CONSAR). The law also provided guiding principles for the establishment, operation and supervision of Pension Fund Administrators (AFOREs). Under the new scheme, all workers were required to choose an AFORE to manage their retirement

there was no consistent supervision of accounts held by commercial banks. Finally, there was poor account administration and collection by commercial banks. Banks had little incentives to administer LSAR pension accounts meticulously due to the low commissions charged and the relatively small size of such accounts.

account. Additionally, the AFOREs were required to provide their customers with a bi-annual statement of contributions received, fees charged and returns earned.

The reform went into effect on September 1, 1997 and covered 11.5 million private sector workers, including current workers, the newly reemployed, and those entering the workforce for the first time.[7] Workers contributing to the IMSS at the time the law came into effect (the *transition* workers) would continue to contribute to the pension system, but now their contributions would be deposited in their individual retirement account. Transition workers were also entitled to receive pension benefits under the regime of their choice. That is, upon retirement, they could choose to receive their pension according to the rules of the old regime, or to buy an annuity with the balance accumulated in their AFORE retirement account. All workers entering the workforce for the first time in September 1997 and onwards would receive benefits according to the new regime. The reform did not change benefits received by current pensioners.

The 1997 reform transformed the pension system of individuals working in the private sector only. Historically, public and private sector workers have contributed to separate pension systems. The IMSS managed the pension system of private sector workers until 1997.[8] The Social Security Institute for State Employees (ISSSTE) has managed the pensions of public employees since 1925. No reforms to the ISSSTE pension system occurred during this period.

[7]The reform covered almost 80 percent of the labor force in the formal sector (Edmonds [1996], cited in Sales-Sarrapy *et al.* [1998]).

[8]Marrufo (2001) and Aguila (2005, 2008) analyze some of the implications of the 1997 reform. See more on these studies below.

2.2.4 The 2003 Tax Law

Following the 1997 reform, only a small share of private sector workers made contributions beyond those mandated by law. This raised two concerns. First, individuals could have been overestimating the pension they would attain from their compulsory contributions. Second, because the reform stipulated a government guaranteed minimum pension, the larger the number of workers with low balances in their individual retirement accounts, the larger the number of pensioners who would have to be supported by the government.[9]

To encourage savings in the private accounts, in 2002 the Congress passed a tax law giving special treatment to voluntary contributions. The tax law provided *tax free* status to the voluntary contributions made to the retirement accounts. The law stipulated that beginning in January 2003, all voluntary contributions made during any fiscal year to an individual retirement account would be tax deductible the following year. That is, the amount contributed voluntarily to the pension account could be deducted from the Adjusted Gross Income (AGI) at tax filing time of the following year. The total amount that could be deducted was capped, however. The cap was set equal to ten percent of the individual's AGI, or the yearly income of an individual earning five times the minimum wage, whichever is less. Finally, the law also allowed the contributions and the returns earned on investments to be withdrawn tax free upon retirement.

The new tax breaks benefited all private sector workers, regardless of the

[9]This guaranteed pension is equal to one CPI-indexed minimum wage for all workers who do not have enough funds to buy a similar annuity upon retirement.

pension regime under which they choose to receive benefits. Voluntary contributions made to the individual retirement account are managed by the AFOREs in a similar manner as compulsory contributions. However, the AFOREs keep track of voluntary contributions and the interest accrued on them using a specific sub-account. Upon retirement, every worker receives a lump-sum payment equal to the balance on their voluntary contribution sub-account. This one-time transfer to the worker is made independently of whether the worker chooses to retire under the old or new pension regime.

The 2003 Tax Break Law effectively turned the individual retirement accounts in Mexico (MxIRA) into a vehicle that can be usefully compared to the Traditional IRA and Roth IRA found in the United States.[10] Consider a saver who plans to withdraw assets for consumption in T years, when he reaches the minimum age to claim pension benefits.[11] Suppose that the net interest rate is r and the marginal tax rate is τ. The value in T periods of one dollar of pre-tax income invested today in a conventional savings account is

$$V_{conventional} = (1 - \tau_{today})(1 + r(1 - \tau_{working}))^T \tag{2.1}$$

If the dollar is invested in a tax deductible IRA, the value is

$$V_{IRA} = (1 - \tau_{retirement})(1 + r)^T \tag{2.2}$$

[10]This discussion of tax deferred savings accounts is based on Poterba *et al.* (1995). The tax regimes for IRA and Roth IRA are described in IRS (2008a, 2008b).

[11]MxIRA funds can be withdrawn without penalty once the individual reaches 60. For IRA and Roth IRA this threshold is $59\frac{1}{2}$.

If the dollar is invested in a Roth IRA, the value would be

$$V_{RothIRA} = (1 - \tau_{today})(1 + r)^T \tag{2.3}$$

Finally, if the dollar is invested in a MxIRA, the value is

$$V_{MxIRA} = (1 + r)^T \tag{2.4}$$

Ignoring the possibility of early withdrawals or changes in the tax code, equations (2.1) through (2.4) show how the MxIRA provides stronger incentives to save than a conventional savings account, or a Traditional or Roth IRA. The ratio of the MxIRA yield to any of the other accounts shows that the strength of these incentives increases with the interest rate, the marginal tax rate, and the number of years the funds are left in the account.[12]

Attanasio *et al.* (2004) provide another useful way to compare saving vehicles based on the timing of the taxes. Resources put into financial instruments can be taxed at three moments: income may be taxed before the individual has the possibility to allocate it to some type of saving; returns may be taxed when they accrue as capital gains or interest; and withdrawals from the assets can be taxed. If we denote 'T' for Taxed and 'E' for Exempt, a traditional savings account can be described as *TTE*, an IRA as *EET*, and the Roth IRA as *TEE*. The tax regime for MxIRA can be defined as EEE. That is, the MxIRA is a *tax-free* account and

[12]See Venti and Wise (1990) for a comparison of saving vehicles in the US under continuous compounding.

not a *tax-deferred* saving account.[13] The first stage is 'Exempt' because voluntary contributions can be deducted at tax filing time. In addition, contributions and interest accrued can be withdrawn tax-free upon retirement.

This chapter analyzes the impact of the availability of the MxIRA on the savings of Mexican households. I now turn to a review of the existing literature on the relationship between tax-deferred savings accounts and household savings.

2.3 Previous literature

2.3.1 Tax-deferred savings accounts in the United States

There exists a large literature in public economics about the effect of the availability of tax-deferred savings accounts on the saving rate of households in the US.[14] The main question in this literature is whether the observed increases in the accumulation of savings in accounts with preferential tax treatment reflect new savings or a crowd out of other forms of private saving.

The debate over the effects of tax-deferred savings accounts in the United States can be characterized by a series of papers by Poterba, Venti and Wise on the one side and Engen, Gale and Scholz on the other side.[15] The former authors tend to argue that such accounts have increased overall household savings; the latter set

[13] A tax-free saving account was made available in Canada in the early 1980s. This account, however, was targeted to increase savings intended for a home purchase (see Engelhardt [1996]).

[14] Here I mention only papers that analyze the relationship of tax-deferred savings accounts and household savings. A related literature has developed the relationship between pension wealth and savings (Gale [1998], Attanasio and Brugiavini [2003], Attanasio and Rowhedder [2003], Engelhardt and Kumar [2007], Khitatrakun *et. al* [2001]) and the optimality of retirement wealth accumulation (Hubbard *et al.* [1995], Scholz *et al.* [2006], Skinner [2007]).

[15] For a thorough review of this literature see Bernheim (2002).

of authors tend to argue that the accumulation of wealth in such accounts represents shifts from alternative sources of savings, and hence does not reflect new savings.

Poterba *et al.* (1995) analyze whether the introduction of 401(k) savings accounts had an impact on personal savings of US households. The authors argue that a key obstacle in determining the saving effect of 401(k)s is heterogeneity in tastes for savings. If some people tend to save more than others, savers may be disproportionately represented among families with 401(k) accounts, and thus, a comparison of assets between contributors and non-contributors will yield an upward biased estimate of the saving effect of 401(k)s. Poterba *et al.* (1995) address this issue in two ways. First, they argue that conditional on household income and other demographic characteristics the probability of working at a firm offering a 401(k) plan is exogenous and, moreover, independent of the household's saving behavior.[16] This implies that the saving effect of the plan can be obtained from comparing the assets of eligible and non-eligible families. Using the Survey of Income and Program Participation (SIPP 1987 and 1991), the authors show that the median of total assets of eligible families is higher than for non-eligible families at each percentile of household income. The second approach to address heterogeneity in saving tastes divides individuals into "like" saving groups based on 401(k) eligibility and IRA contribution status and follows them across time. The authors find that individuals who are "exposed" to 401(k) and IRAs for a longer period of time have more assets and roughly the same level of non-401(k) assets than individuals with less exposure. This finding is consistent with 401(k) savings not being a substitute for other assets.

[16] This assumption is found in the authors' previous work (see for instance Venti and Wise [1986]).

In a related paper, Venti and Wise (1996) compare younger and older cohorts with different lengths of exposure to personal retirement saving programs. The authors find that exposure to personal retirement saving plans adds substantially to the personal financial assets of older families.

Engen, Gale and Scholz (EGS 1994, 1996, 1998) present evidence that previous authors' estimates of the impact of retirement accounts on wealth are biased upward due to the failure to correctly account for the heterogeneity in tastes, to include the debt levels of contributors in the calculation of wealth, and to recognize differences in the macroeconomic environment across time. Gale and Scholz (1994) estimate saving equations by regressing the level of IRA and non-IRA financial savings on demographic factors and IRA contribution status. They find evidence that households with IRA accounts have different savings functions than those without an IRA account. The authors also find evidence of a positive relationship between debt levels and IRA financial savings. Moreover, once mortgage debt is accounted for as part of household wealth, IRA contributors had the same level of wealth as non-contributors. In other words, since individuals are acquiring debt at the same time they are contributing to the tax-deferred accounts, the net impact on savings is null.[17] Finally, Engen *et al.* (1996) note that the large difference in asset accumulation between young and old cohorts in the 1990s can be mostly explained by the boom in the stock market and the high real interest rates that young cohorts experienced, and not by a change in household savings behavior.

[17]These results have been questioned by other authors, who argue that if a tax-deferred saving account would displace other saving, it is more likely to reduce the accumulation of financial assets than to encourage greater borrowing against homes (Bernheim [2002]).

More recently, studies have allowed for heterogeneous impacts of the tax deferred savings accounts on wealth accumulation. Engen and Gale (2000) show that the assumption of exogeneity in 401(k) eligibility is less stringent if the impact on savings is allowed to vary across earnings categories. The authors find that contributions by low-income households are likely to be new savings, whereas contributions from higher income households are more likely to be shifts from other forms of savings. Benjamin (2003) uses propensity score subclassification to account for differences in 401(k) eligibility status, as opposed to relying on a comparison of eligible versus ineligible households. Using the 1991 SIPP, he creates ten subclassifications for households according to the probability of being 401(k) eligible. The author estimates that about half of the 401(k) balances are new savings. He finds evidence that households who typically save little are more responsive and 401(k) eligibility increases their overall wealth, whereas households with higher taste for savings fund their 401(k) with shifts from other saving vehicles. Chernozhukov and Hansen (2004) analyze the effect of 401(k) participation on wealth using 1990 SIPP data and Instrumental Variable Quantile Regression analysis.[18] The authors use the conditional exogeneity of 401(k) eligibility status to instrument 401(k) contribution status and estimate the conditional quantile distribution of several measures of wealth. They find suggestive evidence that 401(k) participation increased the total wealth of households in the lower tails of the wealth distribution, but lead to substitution from other forms of wealth in the upper tail of the distribution.

[18]This approach was first used by Abadie (2003). Chernozhukov and Hansen (2004) expand Abadie's approach by analyzing other points on the wealth distribution besides the median and the mean.

A consensus view of the effect of tax-preferred savings accounts on household savings has not been reached as studies using alternative data sources have contested previous evidence. Attanasio *et al.* (2004) analyze the impact on savings rates of tax deferred accounts in the US and in the UK. For the US case, they argue that if IRA contributions represent new savings, an individual who begins contributing to an IRA must experience a negative change in her consumption pattern. The authors use the Consumer Expenditure Survey (CEX) for the 1982-1986 period and do not find statistically significant changes in the consumption of new IRA contributors.[19] For the UK case, the authors use the British Panel Study for 1991-2001 to analyze whether there has been a change in the average saving rate after the introduction of the Individual Saving Accounts (ISA). They do not find any evidence of this. Pence (2006) estimates the effect of 401(k) eligibility on savings using the Survey of Consumer Finances (SCF). The author attempts to overcome a problem faced by previous studies that focus on the effect of 401(k) on the percentage change in wealth. She notes that a log transformation leads to the dropping of many observations with non-positive values of wealth and proposes an alternative transformation. Applying the inverse hyperbolic sine transformation to several wealth measures allows the inclusion of observations with non-positive values of wealth in the econometric estimation. She does not find conclusive evidence of the effect of 401(k) eligibility on savings.[20]

[19]This approach has been criticized since consumption growth rates have been found to be poor indicators of savings (Bernheim, Skinner and Weinberg [2001], cited in Bernheim [2002]).

[20]In unpublished work Pence (2001) addresses the heterogeneity in tastes for savings by including subjective measures of savings tastes as controls in her estimations. The results suggest that 401(k)s have little to no effect on savings.

2.3.2 Pension reforms and savings in the Latin American context

For Latin American countries, previous studies have only analyzed the effect on household savings when pension systems switched from PAYGO to a system based on Individual Accounts. Coronado (2002) investigates the Chilean pension reform of 1981. The reform created a new pension system based on defined contributions that became optional to all Chilean workers. The author's identification strategy is motivated by two facts. First, the majority of household heads under 40 years old contributed to the new system, whereas the majority of older heads decided to keep contributing to the old one. Second, the pension system in Chile covers salaried workers while the self employed have historically been excluded. These two facts create four mutually exclusive groups from which a difference-in-differences estimator can be obtained. Using a nationally representative expenditure survey, the author finds that the reform provided a stimulus for net-of-social security household saving, increasing household saving rates between 5 and 10 percentage points.[21]

Several studies have analyzed the 1997 pension reform in Mexico, but they have mostly been descriptive (Edmonds [1996], Rodríguez [1999], and Sales-Sarrapy *et al.* [1998]). A few exceptions are notable. Marrufo (2001) analyzes the pension system reform and its effects on wages. In a study more related to the present analysis, Aguila (2008) studies the impact of the 1997 reform on households' savings using a Life Cycle Hypothesis framework. Her analysis closely follows Attanasio and

[21]The effect of the Chilean pension reform (and subsequent regulations) on other outcomes such as contribution rates, contribution patterns, and choice of Administrator of Pension Funds have been studied in the literature as well. See for example Mitchell *et al.* (2007), Todd and Vélez-Grajales (2008) and Krasnokutskaya *et al.* (2008).

Rohwedder (2003), who analyze pension reforms in the UK. The author finds that the reform led to an increase of pension wealth for private sector individuals who earn up to five times the minimum wage. Using two way propensity score matching, she finds evidence of a crowd-out effect on households who experienced a change in pension wealth.[22] The estimates show a significant positive change in household consumption and a marginally significant negative impact on household savings. In line with the predictions of the Life Cycle Hypothesis, the author finds stronger (marginally significant) effects for older cohorts, defined as having a household head above age 40. She interprets this result as evidence that the older a person is, the closer a substitute pension wealth is for other types of savings. One potential concern about the author's estimation is that the majority of private sector workers did not have an individual retirement account until July of 2001, the deadline set by law for workers to choose an AFORE. The number of workers contributing to the new system in 1998 was around 880,000, less than 2% of the Economically Active Population (EAP). Thus, the author's preferred interpretation requires the assumption that even though the workers did not take the effort and time to choose an AFORE, they understood the changes implied by the reform and changed their consumption-savings behavior in anticipation of future participation. By way of comparison, the policy change analyzed here occurred in 2003. The number of workers contributing to the new system in that year was 12.6 million, 30% of the EAP (Sinha and Yañez [2008]).

[22] I apply two way propensity score matching to test the robustness of my results (see section 2.7). A detailed description of this methodology is found in Dearden *et al.* (2001) and Blundell *et al.* (2004).

To my knowledge, this is the first study analyzing the impact of a preferential tax treatment within a defined contribution pension system. I use Mexico's 2003 law providing tax breaks to voluntary contributions. This chapter is intended to contribute to the literature on the impact on households savings of tax-deferred saving accounts in a setting different from the US. The identification strategy in this paper relies on the sudden availability of savings accounts with preferential tax treatment and the differential access to these accounts for private and public sector workers. These unique features help overcome the identification issues that have been noted in previous studies in the US context. I continue by describing a simple theoretical model of the effects of tax-deferred accounts on savings.

2.4 A simple theoretical framework

I describe a simple theoretical model to illustrate how a change in the rate of return leads to heterogeneous (yet ambiguously signed) effects on the savings rate of an individual. Also, I explore some of the model's implications that help motivate the empirical strategy in the next section. The model presented below is based on Attanasio and Brugiavini (2003), Attanasio and Rohwedder (2003) and Attanasio *et al.* (2004). Assume that an individual lives for three periods: young, prime age and retirement. She works in the first two and retires in the third. The individual makes consumption and saving decisions to maximize her lifetime discounted utility. For simplicity, the utility function exhibits Constant Elasticity of Substitution. The individual chooses her consumption (savings) level in periods 1 and 2. Savings

accrue at an exogenous net interest rate of r. In the third period the individual receives retirement benefits b and consumes all her savings. There are no bequests. The individual solves the following maximization problem:

$$\max_{c_i} \frac{1}{1-\gamma} c_1^{1-\gamma} + \beta \frac{1}{1-\gamma} c_2^{1-\gamma} + \beta^2 \frac{1}{1-\gamma} c_3^{1-\gamma} \tag{2.5}$$

subject to

$$c_1 = y_1(1-\tau_1) - s_1 \tag{2.6}$$

$$c_2 = y_2(1-\tau_2) - s_2 + (1+r)s_1 \tag{2.7}$$

$$c_3 = b + (1+r)s_2 \tag{2.8}$$

where y_i represent earnings in periods 1 and 2, τ_i is the marginal tax rate in periods 1 and 2, β is the time discount factor, and $^1/_\gamma$ is the elasticity of intertemporal substitution. The solution to this problem yields the following savings rate in periods 1 and 2:

$$SR_1 = 1 - \frac{1}{(1+\delta+\delta^2)y_1(1-\tau_1)} \left[y_1(1-\tau_1) + \frac{y_2(1-\tau_2)}{(1+r)} + \frac{b}{(1+r)^2} \right] \tag{2.9}$$

$$SR_2 = 1 - \frac{[\beta(1+r)]^{1/\gamma}}{(1+\delta+\delta^2)(y_2(1-\tau_2)+(1+r)s_1)} \left[y_1(1-\tau_1) + \frac{y_2(1-\tau_2)}{(1+r)} + \frac{b}{(1+r)^2} \right] \tag{2.10}$$

where $\delta = \beta^{\frac{1}{\gamma}}(1+r)^{\frac{1-\gamma}{\gamma}}$. The introduction of tax-deferred savings accounts could be represented by a change in the net interest rate r. A change in r yields the following partial derivatives:

$$\begin{aligned}\frac{\partial SR_1}{\partial r} = \frac{1}{y_1(1-\tau_1)}\Bigg[&\frac{(1+r)^{-1}}{(1+\delta+\delta^2)^2}\left(\frac{1-\gamma}{\gamma}\right)(\delta+2\delta^2)PDVI \\ &+ \frac{1}{1+\delta+\delta^2}\left(\frac{y_2(1-\tau_2)}{(1+r)^2}+\frac{2b}{(1+r)^3}\right)\Bigg]\end{aligned} \tag{2.11}$$

$$\begin{aligned}\frac{\partial SR_2}{\partial r} = \frac{1}{y_2(1-\tau_2)+A_1}\Bigg(&\frac{\delta}{(1+\delta+\delta^2)^2}\left(\frac{1-\gamma}{\gamma}\right)(\delta+2\delta^2)PDVI \\ -\frac{\delta}{1+\delta+\delta^2}&\left[\frac{1}{\gamma}y_1(1-\tau_1)+\left(\frac{1}{\gamma}-1\right)\frac{y_2(1-\tau_2)}{(1+r)}+\left(\frac{1}{\gamma}-2\right)\frac{b}{(1+r)^2}\right]\Bigg)\end{aligned} \tag{2.12}$$

where $PDVI$ is the present discounted value of the individual's income.[23] Note that at time 2, the individual's accumulated assets are fixed: $A_1 = (1+r) * s_1$.

A few notable results follow from equations (2.11) and (2.12). First, a change in r may differentially affect individuals living in period 1 (young workers) and those living in period 2 (prime age workers). Second, the effect of a change in the net interest rate r depends on the interaction of the time discount factor, the individual's income and the intertemporal substitution elasticity ($^1/_\gamma$). Third, the heterogeneity in tastes for savings leads to heterogeneous effects after a change in r and provides some guidance for the expected pattern of such effects. To see this

[23]The discounted lifetime income of the individual is $PDVI = y_1(1-\tau_1) + \frac{y_2(1-\tau_2)}{(1+r)} + \frac{b}{(1+r)^2}$.

consider the following examples.[24] Take two individuals who solve the maximization problem described above. One has an intertemporal elasticity of substitution ($1/\gamma$) greater than 1. The other has preferences such that $1/\gamma = 1$ (i.e. Cobb Douglas preferences). For the second individual the optimal savings rate while young is

$$SR_{Cobb} = 1 - \frac{1}{(1+\beta+\beta^2)y_1(1-\tau_1)}\left[y_1(1-\tau_1) + \frac{y_2(1-\tau_2)}{(1+r)} + \frac{b}{(1+r)^2}\right] \quad (2.13)$$

and the corresponding partial derivative after a change in r is

$$\frac{\partial SR_{Cobb}}{\partial r} = \frac{1}{y_1(1-\tau_1)(1+\beta+\beta^2)}\left[\frac{y_2(1-\tau_2)}{(1+r)^2} + \frac{2b}{(1+r)^3}\right] \quad (2.14)$$

Equations (2.9) and (2.13) show how, all else equal, higher levels of $1/\gamma$ lead to higher savings rates. Moreover, equations (2.11) and (2.14) show how individuals with higher tastes for savings (as reflected in a higher savings rate) could experience a larger effect following a change in r. These conclusions hold as well if we compare an individual with $1/\gamma > 1$ to an individual with $1/\gamma < 1$.

Heterogeneity in tastes for savings can also translate into heterogenous effects for the case of prime age workers. Individuals with higher tastes for savings will arrive with higher levels of assets (A_1) into period 2. Thus, we can characterize how the effect of a change in r on savings will vary at different levels of accumulated

[24]Heterogeneity in preferences for savings has been modeled in other ways before. For example, Zeldes (1989) includes a family tastes parameter in the utility function that shifts preferences for consumption. Alternatively, Mankiw (2000) assumes there are two types of individuals in the society: those who save some part of their income and those who spend all their income. For ease of presentation, here I follow Bernheim (2002) and show the implications of different levels of $1/\gamma$ on the savings rate. I also show some implications of different levels of accumulated assets.

assets using the following cross partial:

$$\begin{aligned}\frac{\partial^2 SR_2}{\partial r \partial A_1} &= -\frac{1}{(y_2(1-\tau_2)+A_1)^2}\Bigg(\frac{\delta}{(1+\delta+\delta^2)^2}\left(\frac{1-\gamma}{\gamma}\right)(\delta+2\delta^2)PDVI \\ &\quad -\frac{\delta}{1+\delta+\delta^2}\left[\frac{1}{\gamma}y_1(1-\tau_1)+\left(\frac{1}{\gamma}-1\right)\frac{y_2(1-\tau_2)}{(1+r)}+\left(\frac{1}{\gamma}-2\right)\frac{b}{(1+r)^2}\right]\Bigg) \\ &= -\frac{1}{(y_2(1-\tau_2)+A_1)}\frac{\partial SR_2}{\partial r}\end{aligned} \tag{2.15}$$

Equation (2.15) shows that higher tastes for savings, reflected in higher accumulated assets from period 1, lead to decreasing (increasing) positive (negative) effects of a change in r on the savings rate. That is, if the effect of the introduction of the tax-deferred savings accounts is positive for prime age workers, those with higher tastes for savings will respond less than those with lower tastes for savings.[25]

The model presented in equations (2.5) - (2.10) is a simplified version of reality. There are no changes to pension wealth, no uncertainty and no bequests. Although these margins could affect the savings decision of the individual, concerns arising from these simplifications could be lessened by the following facts. First, this chapter analyzes a period in which no changes other than the 2003 tax law were made to the pension system. Second, there is no reason to believe that uncertainty (about income or health expenditures) would change differentially between private and

[25]It could be argued that the level of A_1 could differ across two individuals as a result only of differences in the timing they receive their income and not because of different taste for savings. Here, however, I assume that the stream of income is the same but other exogenous factors related to tastes for savings affect the accumulation of savings. In Section 2.7, I empirically estimate heterogenous effects of the policy at different points of the conditional savings distribution. I do this as a proxy for an analysis based on heterogeneity in tastes for savings. As a specification check, I test whether controlling for income affects the results. The estimates are qualitatively similar when income is included as a regressor.

public sector workers in the period analyzed. Only the private sector workers were affected by the tax break law whereas public employees continued contributing to a different pension system.

The objective of the model described above is to illustrate the theoretical ambiguity and probable heterogeneous effects on savings of the introduction of the Mexican Individual Retirement Accounts. To be clear, I do not propose that the model above is unique at defining the consumption/savings decision nor do I seek to estimate the intertemporal elasticity of substitution or any other structural parameter. Instead, I use the model's general implications on the potential for heterogenous responses along various dimensions as a guide for the empirical work that follows. I empirically allow for heterogeneous policy effects across subgroups of the workers' population based on income, marginal tax rate, age, and taste for savings. I describe in more detail the empirical strategy in the next section.

2.5 Empirical approach

To estimate the effect of the tax break law on household savings I use a difference in differences (DID) approach.[26] The standard model for the DID design is the following. Individual i belongs to group $G_i \in \{0, 1\}$, where group 1 is the "treatment" group experiencing an intervention. Also, individual i is observed in time period $T_i \in \{0, 1\}$, where period 1 refers to the post-policy period. Letting the outcome of interest be Y_i, the observed data are the triple (Y_i, G_i, T_i). Rubin

[26]The description of the standard difference-in-differences model follows the presentation in Athey and Imbens (2006).

(1974, 1978) defined the potential outcome notation found in the treatment effect literature: let Y_i^N denote the outcome of individual i in the absence of treatment, and Y_i^I the outcome for the same individual if the treatment is received. Thus, if I_i is an indicator of treatment, the observed outcome for individual i is

$$Y_i = Y_i^N \cdot (1 - I_i) + I_i \cdot Y_i^I \tag{2.16}$$

where in a two-group-two-period setting $I_i = G_i \cdot T_i$. Finally, the model for the realized outcome is

$$Y_i = \alpha + \delta \cdot T_i + \beta \cdot G_i + \tau \cdot I_i + \epsilon_i \tag{2.17}$$

where δ represents a time effect, β is a group-specific time invariant effect, and τ is the DID estimator.

The outcome of interest is household i's savings rate ($Savings_i$) and the treatment group consists of private sector households (*privatesec*). The "control" group is comprised of households whose head is a public employee. Recall that this group was not assigned individual retirement accounts in 1997 nor were they affected by the 2003 tax break law. Public sector employees' pension system switched to private retirement accounts in 2007.

The tax break policy change became effective in 2003. The pre and post policy periods can be represented by the years 2002 and 2004, respectively.[27] As is common

[27]Ideally, the year 2003 would be included as the post-policy period. Unfortunately there are no data available for this year. See more details about the data in Section 2.6.

in the treatment effect literature, I extend the standard DID model to include a set of economic and demographic characteristics to control for other factors that may affect saving and cloud the estimate of the effect of the policy. In this extended DID model, the equation to be estimated is the following:

$$\begin{aligned} Savings_{it} =& \alpha + \delta \cdot T(2004)_{it} + \beta \cdot G(privatesec)_{it} + \tau \cdot I(2004 \cdot privatesec)_{it} \\ &+ X'_{it}\gamma + \nu_{it} \end{aligned} \tag{2.18}$$

where $t = \{2002, 2004\}$ and τ is the DID coefficient.[28] If the policy change increased saving, τ will be positive and the 2003 tax break law positively impacted the savings of households whose head belongs to the private sector. X'_{it} is a vector of household characteristics. The household characteristics include a quadratic of the age of the household head, education attainment, gender of the household head, family size, number of jobs held by the head, marital status, occupation and state of residence. ν_{it} constitutes an error term.

The causal interpretation of τ as the effect of the policy requires some identifying assumptions. First, the treatment and control groups' savings rate follow a common trend. The effect of time will be controlled for by the common coefficient δ. Second, there are no other shocks in 2004 that affect public and private sector workers differently, aside from the tax break. Finally, once we control for X'_{it}, there is no selection into treatment. That is, workers with higher tastes for savings did not change jobs across sectors and switched to the private sector to take advantage

[28] It is worth emphasizing that τ is intented to capture the overall effect of the policy and not any structural parameter presented in equations (2.5) - (2.10).

of the preferential tax treatment.[29]

I estimate equation (2.18) using median regression analysis. In the context of this chapter, median regression may be preferred to the more common approach based on Ordinary Least Squares (OLS) for three reasons. First, results from median regression are more robust to the presence of outliers than OLS. Median regression is also a less arbitrary approach than dropping a given percent of observations in the tails of the distribution and estimating the parameters with OLS using the truncated sample (Koenker and Hallock [2000]). Second, the median performs better than the mean as a measure of central tendency when the distribution of interest is not normal.[30] Finally, median regression has been used to analyze saving rates in previous studies. Coronado (2002) used median regression to analyze the effect of the Chilean pension reform on household savings. Poterba *et al.* (1995) also focused on the median total assets of comparable groups to measure the impact of tax deferred accounts on savings. Finally, Pence (2001) describes median regression analysis as the "standard procedure" in the tax-deferred savings accounts literature.

I perform estimations of equation (2.18) for the entire sample as well as for subgroups of the population based on age, income or marginal tax rate. The model described in equations (2.5) through (2.10) illustrates how young and prime age workers may be affected differentially by the availability of tax-deferred savings accounts. Furthermore, previous studies find that different age cohorts have different

[29]Treatment and control groups could also have different levels of tastes for savings. This difference does not impose an identification problem as long as the difference is time-invariant.

[30]This seems to be the case here. Figure 2.1 shows the distribution of saving rates for the years 2000, 2002, and 2004. The distribution of savings rates is negatively skewed. Jarque Bera and Shapiro-Francia normality tests rejected the null hypothesis of normality.

savings functions (Gale and Scholz [1994]) and are expected to react differentially to changes in pension wealth (Aguila [2008]). It is not clear *a priori* which age group would experience a larger impact as a result of the policy change. For example, if transition workers from older cohorts already decided by 2003 to receive future pension benefits under the old regime (Marrufo [2001]), they could have become inattentive to changes to the current pension system. This group of workers may have not experienced a change in r (see section 2.4) and the estimated effect on the savings rate ($\hat{\tau}$ in the equation (2.18)) would be close to zero. Additionally, prime age workers may have not been affected by the policy change due to low levels of financial literacy (Lusardi and Mitchell [2007]). There are reasons, however, to expect the effect on the savings rate of prime age workers to be different from zero. Given the proximity to retirement, the illiquidity of pension savings is a smaller issue than for younger cohorts. In turn, the degree of substitutability between current "non-pension" savings and pension savings is much higher and this potentially leads to a higher response to the policy change. In regards to younger individuals, we could expect a high impact of the policy because they may be more financially literate and will contribute most of their working lives to the new system. On the other hand, they may have scarce experience with the tax system and may not be aware of the potential benefits of the law.

I estimate equation (2.18) for subsamples based on income. The estimations that divide the sample by income groups use an income threshold equivalent to five times the minimum wage. That is, households whose head earns less than five times the minimum wage are considered *low income* households. Households

whose head earns above this threshold are considered *high income* households. This income threshold is motivated by the following fact. Levy (2008) suggests that low income groups will be insensitive to changes in the pension system due to the high probability that individuals in this group will fall back into the government's Minimum Guaranteed Pension. I explore this possibility by estimating the pension wealth that workers could expect to obtain upon retirement.[31] I estimate the pension wealth a worker is entitled to receive under both pension regimes (before and after 1997) for several income levels. I find that workers earning less than five times the minimum wage obtain a larger pension under the new regime. Moreover, given the low estimated wealth accumulated in their MxIRA, the pension they receive is actually the Minimum Guaranteed Pension. If low income workers realize that they will receive the Guaranteed Pension and become inattentive to changes in the pension system, the effect of the 2003 tax policy change may be zero.[32] Estimation for the high income subsample is also of interest as workers with higher incomes (and higher marginal tax rates) face higher incentives to change their saving behavior, holding other factors constant.

I also estimate Marginal Tax Rates (MTR) for workers in the sample based on the income information provided in the data.[33] I use subgroups based on the MTR to estimate equation (2.18). I split the sample into workers who face a zero MTR and workers with a positive MTR. Mexican workers with relatively low income are

[31] A similar exercise is performed in Aguila (2008). Details of the pension wealth calculation are included in Appendix A.1.

[32] It is worth noting that my own calculations show a high overlap between low income workers and workers facing a zero marginal tax rate. Given the nature of the policy, a large share of low income workers would be expected not to be affected by the policy. See below.

[33] See Appendix A.2.

given a "Crédito al Salario" (*Salary credit*) which can yield an effective MTR of zero. Furthermore, the tax breaks of the MxIRA are non-refundable. Thus, workers who face a zero MTR should not be affected by the policy, and the estimate $\hat{\tau}$ for these workers should be statistically equal to zero.

Finally, I extend the analysis based on median regression and estimate quantile regressions for other points of the savings distribution. The 2003 policy may have had heterogeneous effects due to the individuals' observable and unobservable characteristics. The subgroups of workers described above allow to estimate the heterogeneous effects based on observable characteristics. To explore heterogeneous effects based on unobservable characteristics, I obtain regression estimates at different conditional quantiles of the outcome distribution (Buchinsky [1998]). These estimates may provide a description of the effects induced by a policy change when observably equivalent individuals have different unobservable preferences for saving. From a policy perspective, the analysis of the distributional effects of the implementation of tax-deferred savings accounts is of special interest. Policy makers may be concerned about the policy effects on the lower parts of the savings distribution where workers are more likely to have low levels of retirement wealth (Chernozhukov and Hansen [2004] and Levy [2008]).

Multiperiod effects

Data availability for other years, both before and after the 2003 policy change, allows me to expand equation (2.18) to include additional time periods in the es-

timation. This expansion increases the statistical precision of the estimates of γ. Moreover, the inclusion of additional time periods allows me to test for differences in pre-policy trends between private and public sector workers' savings rates and for multiperiod effects of the policy. Thus, instead of having one interaction term (I_i in equation (2.17)), the equation contains a set of interaction terms between the time effects and the treatment group. The equation to be estimated is:

$$\begin{aligned} Savings_{it} =& \alpha + \sum_{t=2002}^{2006} \delta_t \cdot T(t)_{it} + \beta \cdot G(privatesec)_{it} \\ &+ \sum_{t=2002}^{2006} \tau_t \cdot I(t \cdot privatesec)_{it} + X'_{it}\gamma + \nu_{it} \end{aligned} \tag{2.19}$$

where $t = \{2000, 2002, 2004, 2005, 2006\}$. The year 2000 constitutes the omitted category. The main coefficient of interest is τ_{2004}. This is the policy effect estimate for the year following the introduction of the MxIRA. If the effect of the policy had spillovers on the relative savings rate of private sector workers in subsequent years, τ_{2005} and τ_{2006} should be statistically different from zero. Equation (2.19) includes the series of year dummies ($T(t)_{it}$) and the vector of household characteristics (X'_{it}). ν_{it} constitutes an error term. Equation (2.19) is estimated using median regression analysis.

2.6 Data

The analysis of household savings is based on the National Households' Income and Expenditure Survey (ENIGH). The ENIGH is a nationally representative survey conducted every two years. It is a repeated cross section and contains detailed

information on income, expenditures, household characteristics, and demographic characteristics of all members. The information is collected mainly during November and December, and refers to the three and six months prior to the survey month. The data are standardized and presented for the last reference quarter. I use information for the years 2000, 2002, 2004, 2005 and 2006.[34] For each survey year, the ENIGH contains information on households' sampling weights. These weights account for the sampling procedure followed to collect the survey and are used in calculations to be representative at the country level. I define the household saving rate as the difference between total income and total expenditures divided by total income. Total income includes after tax labor income, business income, government transfers, private transfers, and other income. I do not include the imputed value of rental income. Total expenditures include expenditures on both durable and non-durable goods. This saving measure has been used in other studies on household savings behavior (Aportela [1999], Attanasio and Brugiavini [2003], Attanasio *et al.* [2004], Aguila [2008]) and is a flow measure. The calculation of savings is based only on monetary income and expenditures. The savings rate is calculated at the household level. That is, I account for the income and expenditures of all household members. Finally, I do not include in the estimations observations who have a savings rate lower than -100% or over 100%.[35]

[34]The ENIGH is also available for the years 1989, 1992, 1994, 1996 and 1998. Although it was planned to be conducted every two years, a government surplus combined with a desire to have income-expenditure data for the same year as the II Population Count made the ENIGH 2005 possible.

[35]The results do not change qualitatively when observations with savings rate below -100% or above 100% are included. I also perform estimations including non-monetary income and expenditures. The results closely follow the ones presented here.

The survey also contains information about the pension institute to which each worker contributes. Private sector workers contribute to the IMSS, whereas public employees contribute to the ISSSTE. To classify households as private or public contributors, I rely on the household head's information. In the estimation, I restrict the sample to include only workers who work for a salary, are Mexican residents, either contribute to the IMSS and report having a pension account, or contribute to the ISSSTE, and belong to the "transition generation".[36] Estimations for the years 2002 and 2004 use a sample of 7,323 households (out of 39,392). The estimations for long term effects use a sample of 17,433 households (out of 93,280) across five years of data.

Table 2.2 presents summary statistics for sample households for the years 2000, 2002, 2004, 2005 and 2006. Statistics for households headed by private sector workers and public sector workers are presented separately. It is notable that public employees have higher levels of income and expenditures in all years. Heads working in the public sector tend to be older, better educated and are more likely to be female. Other demographic characteristics do not seem to differ much between the two groups. In the estimations I control for all these variables.

[36]Workers earning a salary or working for an hourly wage are included. Workers that do not work for pay are excluded from the analysis. Omitting workers that did not contribute to IMSS or ISSSTE is equivalent to dropping all informal workers from the sample. In the ENIGH, only current contribution status to the IMSS or ISSSTE is available. The transition generation refers to workers who had contributed to the pension system before the 1997 reform took place. In principle, I would want to look at individuals who have been working since the 1997 reform and continuously contributed to the system. Since only current contribution status is available, I must assume this is the case despite the high mobility between the formal and informal sector of some low income groups of Mexican workers (Levy [2008]). I leave this strong assumption as a caveat.

2.7 Results

2.7.1 Main results

Table 2.3 presents results for the median regression estimation of equation (2.18) using the ENIGH 2002 and 2004 data with the corresponding sampling weights. The table is divided into three columns. Column [1] presents the results for the entire sample. Column [2] presents the results for the young workers sample, i.e. households whose head is less than 40 years old. Column [3] presents results including households whose head is at least 40 years old (prime age workers). The estimation results presented in all columns include controls for the state of residence, type of occupation and other demographic characteristics. The standard errors used for inference in all regressions are calculated using bootstrap methods (Koenker and Hallock [2000]).The bootstrapped standard errors reported in this paper are obtained using 1,000 iterations.

For the complete sample (column [1]) there is evidence of an increase in the savings rate after the implementation of the policy. The conditional median saving rate of private sector workers is around 5.9 percentage points (pp) higher than that of public employees in the year 2004. The difference is statistically significant at the 5% level. Next, the sample is divided by age of the household head. The estimates suggest that the policy change did not affect the sample of young workers. After controlling for covariates (column [2]), the conditional median of private sector workers is 1.8 pp higher than that of public sector workers but not statistically significant. In contrast, prime age workers seem to have been affected by the policy

change. The conditional median of the savings distribution of private sector prime age workers in 2004 is 9.3 pp higher and statistically different from that of public employees (column [3]). To put this result in perspective, the effect of the policy is equivalent to one third of a standard deviation of the savings rate distribution.

Table 2.4 presents the median regression results of estimating equation (2.18) and splitting the sample by MTR or income levels. It is clear that the effects found for the complete sample are driven by workers who have a positive MTR (column [2]). There is evidence of a statistically significant 6.6 pp difference in the conditional median savings rate for private sector workers with a positive MTR. The effect for workers with a MTR of zero (column [1]) is statistically insignificant.[37] Similar results are found when we use subgroups of the workers population based on income. For high income workers, the conditional median of the savings rate of private sector workers is 8.6 pp higher than for high income public sector workers (column [4]). The difference is statistically significant at the 1% level. There is no evidence that the conditional median of the savings rate distribution of low income workers is statistically different between private and public sector workers.

The results from Tables 2.3 and 2.4 may raise the concern that there is significant overlap between, say, the prime age workers and the high income samples. To

[37]Given the incentive structure of the policy change, one could expect to find heterogeneous effects that depend not only on whether the worker has a positive MTR, but also on the magnitude of the MTR. Holding all things equal, workers facing a higher MTR may have higher incentives to change their behavior as a result of the policy change. In results not shown here, I test this hypothesis by estimating a modified version of equation (2.18) that includes a dummy (and the corresponding time and private sector interactions) for each of three MTR groups: MTR greater than zero and smaller than 10%, MTR greater than 10% and smaller than 20%, and MTR greater than 20%. I find evidence that the higher the MTR the larger the estimated difference in the conditional median between private and public sector workers. However, the coefficients are very imprecise.

address this concern I re-estimate equation (2.18) and allow for a differential effect between low income and high income workers. I estimate a expanded version of equation (2.18) that also includes as controls: a dummy variable taking the value 1 if the individual is a high income worker, an interaction of this variable with the year 2004 dummy, an interaction of the high income dummy with the private sector dummy, and a triple interaction between private sector, year 2004 and high income dummies. Table 2.5 presents the results for this specification.[38] Column [1] presents the results for the entire sample. Columns [2] and [3] present the results for the young and prime age workers samples, respectively. Column [1] confirms a result found previously. The policy change seems to have affected the high income private sector workers. The conditional median is 9.3 pp higher for high income private sector workers and statistically significant. There is no evidence that the policy change affected low income workers. Also, there is no evidence that the policy change affected low income young workers nor high income young workers. Finally, the effect of prime age workers is driven by high income individuals. The conditional median of the savings distribution of private sector workers is 13.3 pp higher than for that of comparable public employees. The conditional median for low income prime age workers is not statistically significant.

The results from Tables 2.3-2.5 suggest that the policy lead to a permanent increase in the stock of wealth of private sector households, especially those headed by prime age or high income workers. Assuming a comparable rate of return among

[38]Similar results are found if a dummy variable taking the value 1 for workers with positive MTR is used instead of a high income dummy.

all savings and investments, a back of the envelope calculation yields that a 40 year old individual with median income could expect an increase in her wealth accumulated for retirement equivalent to $1500-$3600 USD. The estimate for a prime age high income worker is between $2400-$5800 USD. On average, this amounts to three months worth of salary income in 2004.

Next, I estimate equation (2.18) at quantiles other than the median. Given that previous results clearly point at differential effects between young and prime age individuals, I perform the quantile estimations for these subgroups separately. Table 2.6 presents the results obtained for the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentiles for the young workers sample. For most of the savings distribution the policy change does not seem to have had an effect. Only private sector workers in the 75^{th} percentile appear to have been affected by the policy. Table 2.7 presents the quantile regressions for the prime age workers sample. There is evidence of a positive and decreasing effect of the policy change across the savings distribution of prime age workers. For prime age workers the savings rate at the conditional 10^{th} percentile of the savings distribution of private sector workers is 14 pp higher than that for public employees. The difference for the 25^{th} and 50^{th} percentiles are 10.5 and 9.3, respectively. All differences are statistically significant at the 5% level. This evidence suggests that the policy had a larger effect on the workers who are relatively low savers.[39] Finally, it is worth noting that the pattern of effects in the

[39]One may be concerned that the evidence found on the lower half of the savings distribution may not reflect the policy effect on the low-savers group because quantile regressions cannot observe the same group of workers across time. There are two facts that should lessen this concern. First, low levels of income mobility in Mexico have been documented in previous studies (Antman and McKenzie [2005]). Since income and savings are highly correlated, we should expect low mobility of workers on the savings distribution across time. This implies that the higher post-policy savings

quantile estimations is consistent with the pattern illustrated in model from section (2.4). I find evidence of higher effects for young workers who are on the upper half of the savings distribution and who probably high higher tastes for savings. Also, I find evidence of a positive and decreasing policy effect along the savings distribution of prime age workers. It is plausible that this empirical finding comes from prime age workers saving up to a target. Hence, the closer they are to that target at the time the tax breaks for retirement accounts are introduced, the smaller their reaction to them.

2.7.2 Multiperiod effects

The results found in Tables 2.3 through 2.7 provide strong evidence that the tax break policy had a positive effect on the savings rate of certain groups of the private sector worker population in the year following the policy change. In the absence of other changes to r, however, we could expect the effects of the policy on savings rates to spillover to subsequent years. The availability of data for 2005 and 2006 allows me to expand the previous analysis and estimate equation (2.19).

Table 2.8 reports results from estimating equation (2.19) using median regression. Inference is based on bootstrapped standard errors using 1,000 replications. For the complete sample (column [1]), the savings rate at the conditional median

rate found for the conditional percentiles in the lower half of the savings distribution refer to workers who were relatively low savers before the policy change. A second fact that could lessen the concern of the non-tractability in time of low-savers is the pattern of effects found in the estimations. My results show a relative increase on the lower half and a non significant effect on the upper half of the conditional savings distribution. These findings are only consistent with an increase in the relative savings rate of pre-policy low-savers and independent of any changes experienced by high-savers.

of the savings distribution for private sector workers is 6.1 percentage points higher than that of public employees in the year 2004. There is no evidence of a difference in trends in the pre-policy period. The dummy for private sector workers in the baseline year and the interaction term for the year 2002 are not statistically significant. This result provides evidence that the savings effects from the 2003 tax law are not affected by changes in pension wealth due to the 1997 Pension Reform. Also, the positive shock to the savings rate in 2004 seems to be "transitory". The interaction terms for the years 2005 and 2006 are not statistically significant. Columns [3] and [5] present the results for the specifications that include only high income or prime age workers, respectively. The results replicate those found in the complete sample. The estimated effects of the policy are statistically significant (at the 5% and 10% level) the year following the policy change, whereas the interactions for subsequent years and the years before the policy change are not statistically different from zero. There is no evidence of an effect of the policy change on the savings rate of young or low income private sector workers in the short or long term.

2.7.3 Matching estimators

Previous studies criticize the estimation of equations such as (2.18) because it does not allow for τ to depend on X' and does not ensure the existence of suitable comparison groups for the treated individuals (Blundell *et al.* [2004]). One way to address both problems is to estimate the average treatment effect on the treated (ATT) by propensity score matching (Rosenbaum and Rubin [1983], Dehejia and

Wahba [1998, 1999], Heckman *et al.* [1998], Smith and Todd [2005]) adapted for the case of difference-in-differences. In the present case, there are two sources of non-randomness. One relates to the treatment status (private or public sector worker) and the other relates to the relevant time period (pre or post-2003). Note that this creates four groups of individuals: non-treated pre-policy, treated pre-policy, non-treated post-policy, and treated post-policy. I define the latter group as the "effectively treated" (EFT) group. The estimation of the ATT is done in four steps (Dearden *et al.* [2001], Aguila [2008]). First, two propensity scores are estimated. I use a probit model to construct two propensity scores $P_{priv}(X')$ and $P_{2004}(X')$, one for each source of non randomness. Second, common support is imposed across the four groups by removing treated (post-policy) units that have a propensity score lower than the minimum or greater than the maximum of the non-treated (pre-policy) units. Third, counterfactual outcomes are estimated for each individual in the EFT group. I assign counterfactual outcomes by applying weights using a Gaussian Kernel function, or by using a Epanechinikov Kernel function. The "distance" between an individual in the EFT group and her potential matches in each of the non-EFT groups is represented by the Euclidean distance with respect to the two propensity scores (Blundell *et al.* [2004]). The Gaussian Kernel is defined as $K(u) = (1/\sqrt{2\pi}) \exp[-u^2/2]$ for all u. The Epanechinikov Kernel weight is defined as $K(u) = ({}^3/_4)(1 - u^2)$ for all $|u| < 1$ and 0 otherwise. The Epanechinikov Kernel is estimated using two bandwidths (0.02 and 0.03). The final step is to estimate the ATT as the difference between the average difference of the savings rate of private sector workers after and before the policy change minus the average difference of

the savings rate of public sector workers after and before the policy change.

I present Figures 2.2 and 2.3 to illustrate how the matching works on the propensity score distribution of the four groups of individuals. Figure 2.2 presents the density of the estimated propensity scores ($\hat{P_{priv}}(X')$ and $\hat{P_{2004}}(X')$) before matching. Figure 2.3 presents the density after matching based on the Epanichinikov kernel (bandwidth = 0.03). A comparison of the densities before and after the matching provides some evidence that the propensity score matching did a good job at finding comparable individuals for workers in the EFT group. Imposing common support drops 4.25% of the observations.

Table 2.9 presents the ATT estimates for relevant subgroups of the population. The ATT estimates using Gaussian Kernel weights are shown in the first row. The second and third rows use the Epanechinikov Kernel function to create the counterfactual outcomes. I use two bandwidths to test the robustness of the results.[40] It is notable that the propensity score matching estimates for the complete sample, the high income workers sample and prime age workers sample replicate the results found using median regression. There is a positive and significant ATT in all three samples and the estimates are close in magnitude to the median regression coefficients. Following column [1], private sector workers have a higher savings rate (3.3-6.3 pp) than public sector workers. The relative savings rate of high income private sector workers (column [3]) is between 6.7 and 9.4 percentage points higher than the savings rate of comparable public employees. In column [5] we find that

[40]Silverman (1986) provides a rule of thumb to define the bandwidth. The rule is expected to provide an optimal bandwidth when the distribution is unimodal, fairly symmetric and does not have fat tails. Here I do not follow the proposed rule because the distribution of the propensity score in my estimations does not seem to have such characteristics.

prime age private sector workers have a savings rate between 4.7 and 10 percentage points higher than that of prime age public employees. Only one result is not in line with previous findings. The sample of young workers presents a positive and marginally significant effect when the Epanechinikov kernel (bandwidth = 0.03) is used. However, as this estimate is not robust across estimators, I am hesitant to conclude much from it.

2.8 Discussion, interpretation and validity tests

In this chapter, I estimate the impact of Mexico's introduction of a preferential tax treatment on retirement savings in 2003. This law affected all private sector workers by making voluntary contributions to their personal retirement accounts tax-free. The results found here provide evidence of a positive impact of the tax break on household saving. The impact is driven by prime age and high income households. The estimated difference of the conditional median of the savings rate distribution between private sector workers and public employees in the year after the reform is between 4.9 and 9.3 percentage points for households whose head is 40 years old and over. The estimate for high income workers is around 8.6 percentage points, whereas for prime age high income workers the estimate is 13.3 percentage points. The estimates of the effect of the policy are equivalent to between one-half and one-third of the standard deviation of the savings rate distribution. The effects of the policy change on the savings rate of prime age workers seem to be concentrated in the lower half of the distribution. The quantile regression results

for the young and prime age samples are consistent with a consumption/savings model where heterogeneity in preferences translates into heterogeneous effects of the policy change.

The positive effect on savings of the 2003 tax break appears to be a one time impact and is not reversed in the years following the change in policy.[41] If we use these results and assume a comparable rate of return among all savings and investments, the temporary positive shock in the flow of savings implies a permanent increase in the stock of wealth of private sector households, especially prime age and high income households. A 40 year old individual with median income could expect an increase in her wealth accumulated for retirement equivalent to three months worth of salary income in 2004.

Some of the results in this paper differ from findings in other studies. In particular, I find that tax incentives affected the saving behavior of high income households but not that of lower income households. Other studies (Engen and Gale [2000], Benjamin [2003], Chernozhukov and Hansen [2004]) have found that tax deferred accounts affect the saving behavior of households in the lower tails of the income distribution, whereas households in the upper tails only shuffle their holdings among different types of saving vehicles. Although the non-refundable nature of the tax incentives of 2003 in Mexico could account for the non-response of

[41] One could argue that the effect of lowering taxes on increasing savings could be taken as evidence of Ricardian equivalence. However, Ricardian equivalence refers to changes in lump-sum tax liabilities and not, as is the case here, changes in distortionary taxes. In addition, according to Ricardian equivalence, individuals save all the "unspent" taxes to be able to pay future tax hikes. The change in taxes of 2003 was permanent. For the equivalence to hold, we should observe a permanent change in individuals' savings rate. The pattern of results found in this paper does not show evidence of this.

low income households, it is notable that high income households were significantly affected by the policy change. On the other hand, I find evidence of larger responses of older workers (relative to younger cohorts) to tax incentives, which is consistent with other studies (Aguila [2008], Gale and Scholz [1994]).

There are two data limitations to my study. First, there is a lack of information in the ENIGH on household wealth or the value of assets. It has been noted in other studies that some measure of wealth is necessary to evaluate the relationship between pension wealth and savings (Gale [1998], Pence [2001]). For example, studies that have focused on the accumulated balances in tax deferred savings accounts to assess the effect of these accounts on savings may have produced biased estimates. The problem is that this approach overlooks the potential crowding out of other types of savings or increased household debt. The dependent variable used in my estimations is not affected by this problem. The ENIGH allows me to estimate the overall savings rate, defined as the difference between total income and total expenditures divided by total income. If there was a shift in balances across different types of savings vehicles or if debt was increased to increase the balance in the tax deferred savings accounts, the wealth level of the household would be left unchanged. Moreover, the measure of savings used here would also be unchanged.

The Mexican Family Life Survey (MxFLS) is the only survey for Mexico with data on households' assets and debts. After working with MxFLS, I found that the large non-response rate for questions regarding self assessment of wealth and the way these questions were asked prevent me from conducting a similar analysis as the one presented here using the ENIGH. Tabulations of the data (see Tables

2.10 and 2.11) show that less than 600 households (out of 8440) have useful wealth information from which estimations similar to the ones presented in this chapter can be performed. The sample size is substantially smaller when income or age subgroups are defined. For example, for the year 2002 there are only 100 observations of salaried workers earning more than five times the minimum wage with complete information on value of assets owned. Besides the small sample size, there is another potential concern of using the MxFLS. In this survey, questions on assets owned by the household and their value are asked to all members of the household. In many cases there are significant disparities between the answers provided by different members. Also, it is not always clear that the respondents are referring to the same asset when answering about its value. The MxFLS follows this same approach to collect information on household debt. Unfortunately, this approach affects the potential analysis of the data. An example of this concern is as follows. Tables 2.10 and 2.11 present the estimated change in net wealth for selected subgroups of the population based on income and age, respectively. The samples include workers with similar characteristics to the ones used in my estimations: they work for a salary, are at least 20 years old, and contribute to either the IMSS or ISSSTE. The net wealth is calculated using two sources for debt. The row *Net wealth - Ind* applies the information provided individually about the debt levels of all members of the household. The row *Net wealth - HH* uses information provided by the household head. It is clear that using one measure versus the other could have important effects on the conclusions derived from the analysis.

A second data limitation is that I cannot confirm that the finding of increased

household savings is coming from an increase in pension wealth. To investigate this possibility, I look at aggregate data. Figure 2.4 presents the ratio of the flow of voluntary pension contributions to the flow of compulsory contributions for the years 2000-2006. This series is disaggregated by AFORE. Figure 2.5 presents the ratio of voluntary to compulsory contributions weighted by AFOREs market share. The figures present evidence that the savings effects found previously may in fact reflect an increase in the flow of voluntary contributions after the tax break policy came into effect. The ratio of voluntary contributions to compulsory contributions is 3% in the year 2002, and it increases to 12.2% in 2003. Furthermore, in line with the findings presented here, the ratio is still higher in 2004 (5.7%) than in 2002 though the difference is smaller, and decreases in the following years.

There are also caveats with regards to the interpretation of the main results. First, there is the possibility that compositional changes arising after the implementation of the policy may bias the estimates of treatment effects. For instance, some public employees may have switched to the private sector after the introduction of the 2003 tax breaks. One could argue that the costs of switching jobs may have prevented this type of behavior. Nonetheless, I explore this possibility and use the National Urban Employment Survey (ENEU). The ENEU is a rotating panel that collects information on the interviewees' job characteristics. Using the ENEU for the years 2002-2004, I do not find evidence of an increase in switching between the public and private sectors. This result cannot guarantee that the workers who switched have higher tastes for savings than the median private sector worker. However, the absence of an increased inflow of workers could help lessen this concern.

Another potential concern about the interpretation of my results is that the data suggest that the 2003 tax break reform helped to *buffer* a decrease in the savings rate of private sector households rather than increasing savings per se. To see this, I calculate the fitted values of the savings rate from equation (2.19) and plot the median estimated savings rate for private and public sector workers. Figures 2.6 through 2.9 present these results for low income workers, young workers, high income workers and prime age workers, respectively. Figures 2.6 and 2.7 present the median of the fitted values for two groups that were not affected by the policy. The estimated savings rate of private sector and public sector workers follow a common trend in both the low-income and young groups. Figures 2.8 and 2.9 present the fitted values for high income and prime age workers. It seems that the MxIRA provided an alternative and attractive savings vehicle to private sector workers that prevented the drop in the savings rate observed for public employees.[42]

The drop in the 2004 savings rate of prime age and high income public employees may raise the concern that the relative increase in savings among private sector workers is not a policy-induced response. I have investigated this possibility and have determined a number of reasons why the effect is unlikely to be spurious. First, the drop in savings is observed in all other subgroups of the working population (private and public sector) and hints at a general drop in the Mexican households' savings rate. To be clear, a general drop in the households' saving rate would not represent a problem for the identification strategy in my analysis. Sec-

[42]This drop in the savings rate was hinted in some of the tables of results where the estimated time effect for the year 2004 was negative, and statistically and economically significant.

ond, the decrease in 2004 in the median savings rate of high-income and prime age public employees does not appear to deviate systematically around the oscillating trend observed for private and public workers in Figures 2.6 and 2.7.

To probe the matter further, I examine the major price indexes in Mexico to see if there are any striking patters around 2004. Figure 2.10(a) presents the evolution of three price indexes in Mexico for the period of analysis: the CPI, the Food Price Index (a major component of the CPI) and an index for the Minimum wage. All indexes are normalized to the year 2005. During this period all three indices are increasing, but they are doing so at different rates. I present Figures 2.10(b) and 2.10(c) to compare the evolution of the different growth rates. Figure 2.10(b) presents the percentage change of each of the indexes for each of the years included in the estimations. Figure 2.10(c) presents the difference between the percentage changes of the minimum wage and the percentage changes in the overall and food price indexes. The minimum wage is increasing in real terms during the 2000-2002 period. The minimum wage drops in real value between 2002-2004, increases again in 2005 and decreases slightly in 2006. This fluctuating trend in the real value of the minimum wage mimics the households' saving rate shown in Figures 2.6 and 2.7.

One might be concerned that the evolution of food prices and minimum wages cannot help explain the observed changes in savings rates across working sectors. For instance, private sector workers may have different spending patterns than public workers. I test this using ENIGH's expenditure data. I find evidence that households' food expenditure as a share of income is similar in magnitude across working sectors and remains constant during the period of analysis. Another concern might

be that changes in the minimum wage may be less relevant for high income workers or completely so for public employees because their salaries are typically set during revisions of collective contracts. Fairris *et al.* (2008) show evidence that in Mexico the minimum wage serves as a norm for wage setting throughout the economy during the early 1990's. If minimum wages continued to have this role during this period of study, then changes in the minimum wage have the potential to affect the behavior of both high income and public employees. While showing a causal relationship between the evolution of real income and the savings rate is beyond the scope of this chapter, the patterns shown in Figures 2.10 provide some suggestive evidence that the observed pattern in savings rate between groups does not reflect a specific shock to public sector workers.

Finally, for my results to be invalid, any shock that might have differentially affected public and private sector workers in 2004 must have also affected only high income and older cohorts of workers. In estimations not shown here, I test the possibility of a differential decrease in the level of income of public sector workers in 2004. I do not find any evidence of this. I have also extensively investigated the institutional background and did not find changes in the pension system of public employees, nor was there any other policy change that affected differentially public and private sector workers.

2.8.1 Why are there no multiperiod effects?

Standard savings models as the one defined in equations (2.5) - (2.10) would predict that any effect on the savings rate due to the policy change should be reflected in all subsequent years following the change. However, the findings in Table 2.8 present evidence against this prediction. One possible explanation is that the estimated effect reflects a "one-period" change in r unrelated to the 2003 policy change. In the model, the parameter r includes all variables that affect the net returns to savings. Thus, any temporary shock that affects the returns or fees of the MxIRA could be driving the effects found in this study. The following evidence suggest this is not the case here. Figures 2.11, 2.12 and 2.13 present information on returns and fees for several AFOREs and show no evidence that changes in AFOREs' net return are driving my results. Figure 2.11 presents the weighted average annual return of all AFOREs and the annual return for major individual AFOREs during the period of study. There is no evidence of a one period increase in the return in 2003 - 2004 that could have led to an increase in voluntary contributions. Figure 2.12 shows the management fees charged by AFOREs on the flow of contributions to the retirement accounts, whereas Figure 2.13 shows the fees charged on the retirement account balance. If there was a significant temporary drop in AFORE fees, contributions to retirement accounts could have been temporarily affected. I find no evidence of a sharp change in the fees charged by the AFOREs in the 2003-2004 period.

The absence of multiperiod effects on the relative savings of private sector

workers is difficult to explain under a simple consumption/savings framework. For many models where individuals have some preference for smoothing consumption, we would not expect a one-time increase in the savings followed by a return to the previous savings rate trend. Alternative frameworks that incorporate changes in individuals' expectations or perceptions may help explain the observed effects. Suppose that workers expected the tax breaks to be temporal and to last for only one or two years. Based on this belief, they may have temporarily changed their behavior to take advantage of the breaks while they lasted (in the years 2003 and 2004) and immediately go back to the savings rate trend (in 2005 onwards). However, this behavior cannot explain the fact that in 2005, workers should have realized that the tax breaks were still in effect and that could be applied for the year 2006 as well. Acknowledging this fact should have potentially increased their savings rate in 2006.

Another possible explanation for the pattern of results may be related to the perceptions of Mexican private sector workers regarding the benefits of the retirement accounts. The literature has noted previously that advertising may play an important role in the contribution levels to tax deferred savings accounts (Thaler [1994], Bernheim [2002], Hrung [2004]). In Mexico, the number of radio and TV spots paid by CONSAR increased from 2001 through 2004, but was reduced in 2005. Although most of the spots were intended to provide general information about the Mexican pension system, it is possible that the decreased salience of the MxIRA and its tax benefits affected workers' retirement saving behavior.

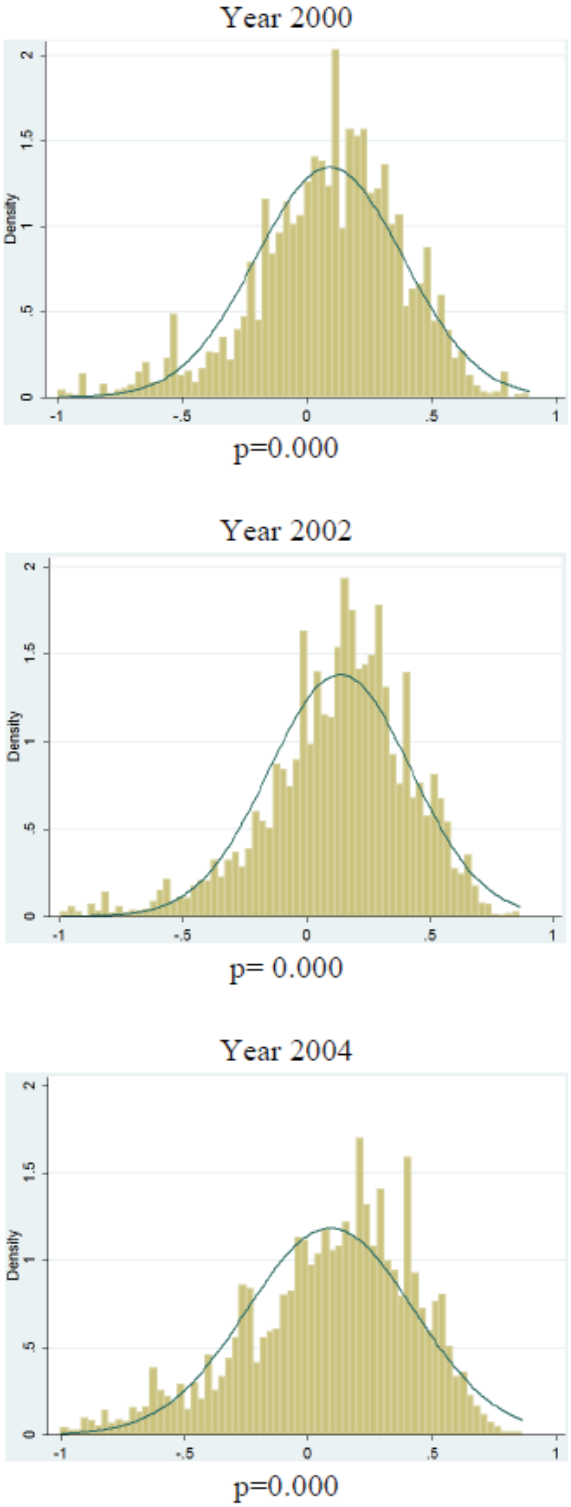
2.9 Conclusion

The effectiveness of tax-deferred savings accounts in increasing savings is a long debated issue for which a consensus has yet to be reached. I exploit an exogenous change in the Mexican Tax Law that provided tax-free retirement accounts for all private sector workers. I find that the tax incentives of the policy effectively increased the relative savings rate of high income workers and older workers, but only for one period. I provide evidence that the temporary effect is a response to the introduction of the policy and cannot be explained by changes in retirement accounts' returns, fees or workers' income. The policy change did not affect the saving behavior of low income and younger workers. The findings regarding the differential effect of the policy change by income level are in opposition to previous findings in the literature. This result may be due to the unique features of the MxIRA compared to tax deferred accounts in other countries. On the one hand, the tax-free nature of the MxIRA provides larger incentives to save than the retirement accounts in other countries. On the other hand, the benefits of the MxIRA are non-refundable. This may explain why I found no effects of the policy for low income workers or for workers with a zero MTR.

Understanding the determinants of retirement savings decisions is a crucial public policy issue. Given the limitations of standard models to account for the observed behavior, it is important to complement the analysis by studying variables not related to returns and fees that could potentially affect individuals' financial decisions. In chapter 3 in this dissertation I explore this line of research and test

whether the framing of information affects retirement management decisions of Mexican workers.

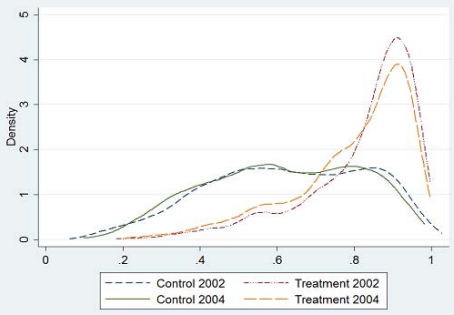
Figure 2.1: Histograms of savings rate, by year



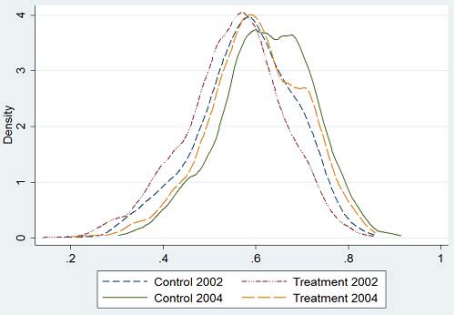
Notes: Histograms are plotted using the sampling weights corresponding to the respective ENIGH year. A normal density line is superimposed. P values refer to the Shapiro-Francia normality test. Source: Own calculations using ENIGH data.

Figure 2.2: Density distributions of the unmatched sample, by propensity score

(a) Propensity score - Treatment



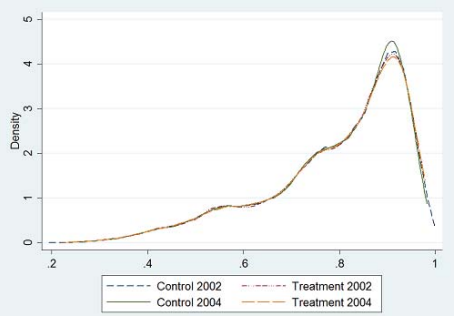
(b) Propensity score - Time



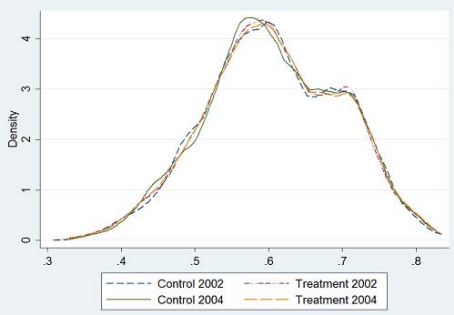
Source: Author's calculations using ENIGH data for the rounds 2002 and 2004. Treatment individuals are workers from the private sector. Control individuals are workers from the public sector.

Figure 2.3: Density distributions of the matched sample, by propensity score

(a) Propensity score - Treatment

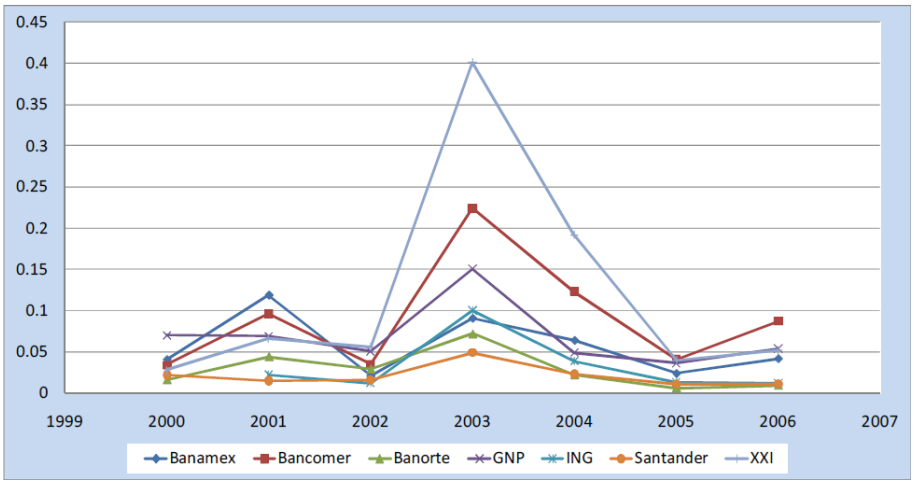


(b) Propensity score - Time



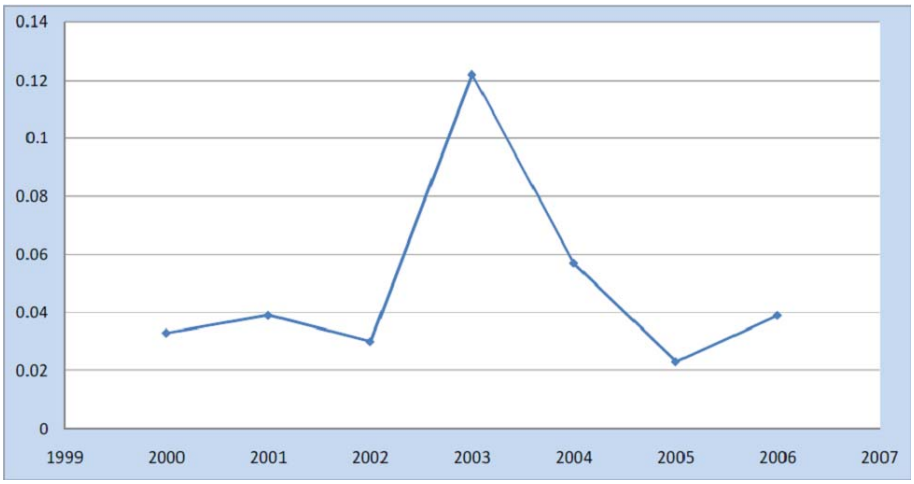
Source: Author's calculations using ENIGH data for the rounds 2002 and 2004. Treatment individuals are workers from the private sector. Control individuals are workers from the public sector. Matching is performed using the Epanechinikov kernel and a bandwidth of 0.03.

Figure 2.4: Ratio of voluntary to compulsory contributions, by AFORE



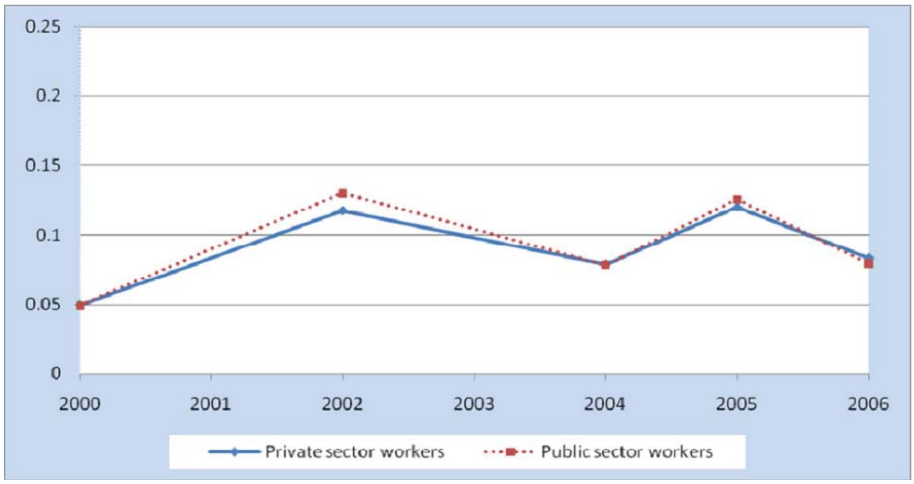
Source: Own calculations using CONSAR data.

Figure 2.5: Ratio of voluntary to compulsory contributions, weighted average across AFOREs, by year



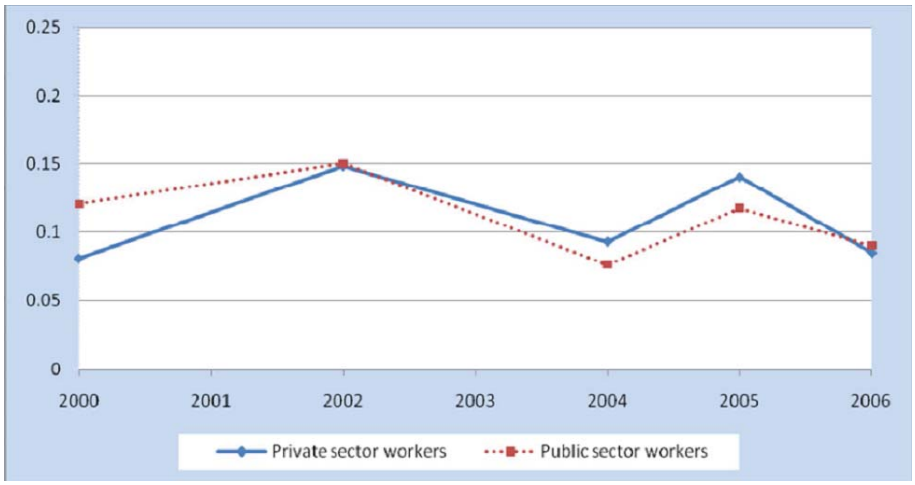
Source: Own calculations using CONSAR data.

Figure 2.6: Median fitted value of savings rate for low income workers, by working sector



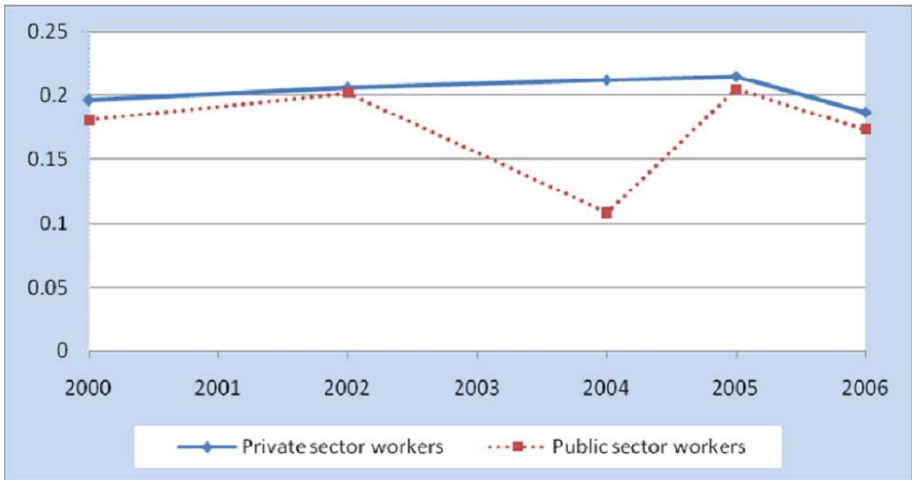
Source: Own calculations using the ENIGH 2000-2006. Low income workers include household heads who earn less than five times the minimum wage.

Figure 2.7: Median fitted value of savings rate for younger workers, by working sector



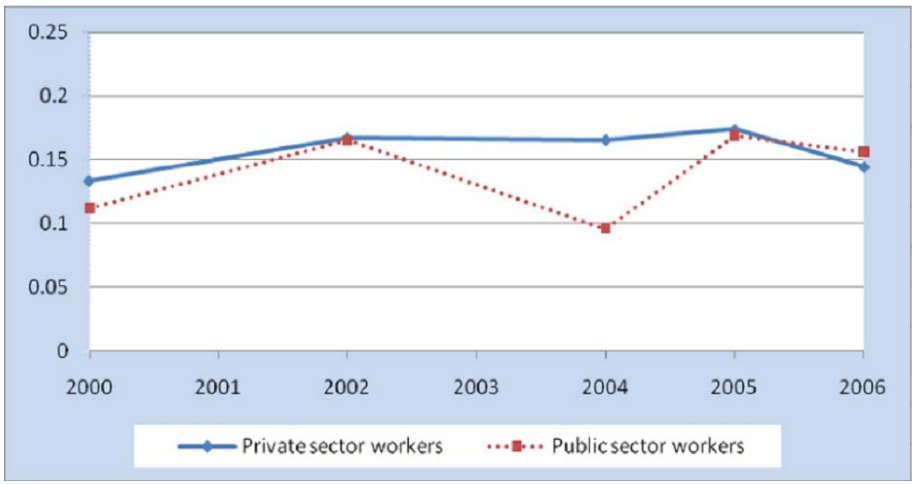
Source: Own calculations using the ENIGH 2000-2006. Young workers include households heads who are less than 40 years old.

Figure 2.8: Median fitted value of savings rate for high income workers, by working sector



Source: Own calculations using the ENIGH 2000-2006. High income workers include household heads who earn at least five times the minimum wage.

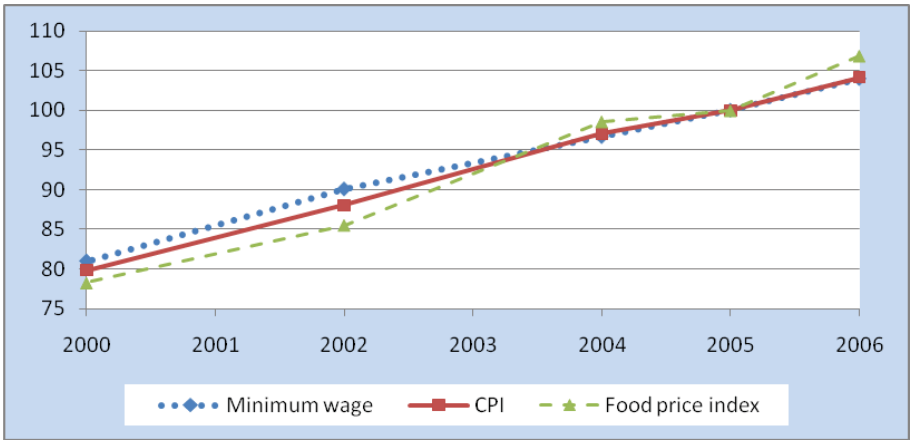
Figure 2.9: Median fitted value of savings rate for prime age workers, by working sector



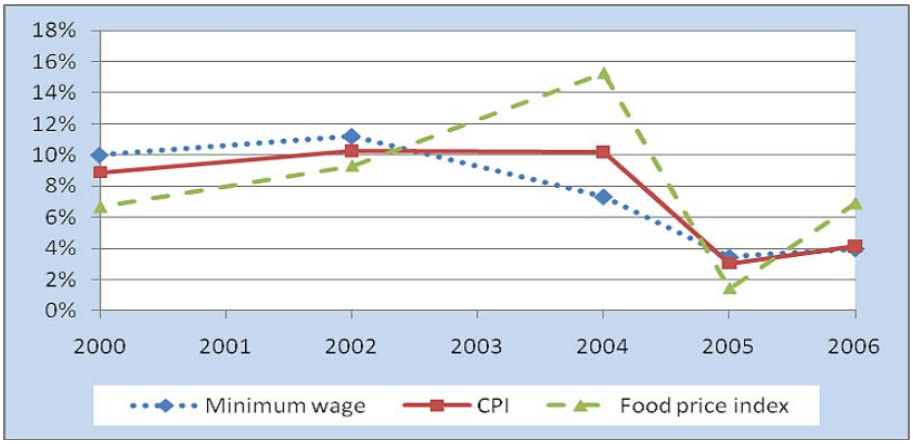
Source: Own calculations using the ENIGH 2000-2006. Prime age workers include household heads who are 40 years old and over.

Figure 2.10: Price indexes for Mexico

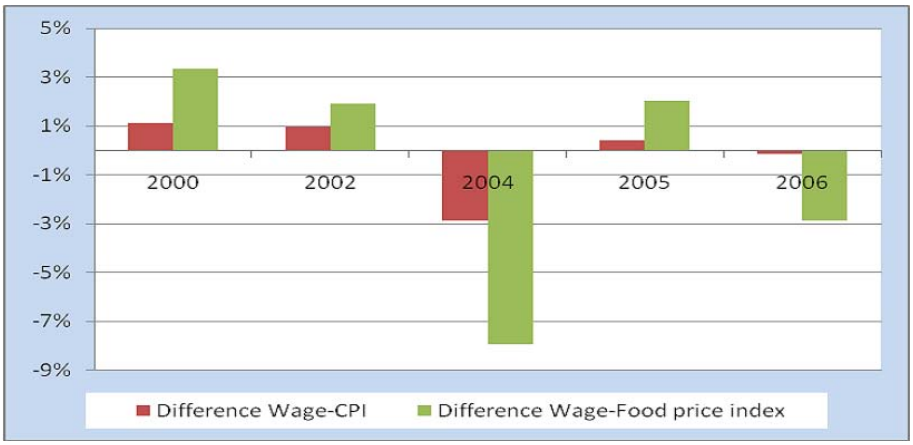
(a) By year (2005=100)



(b) Percentage changes over time

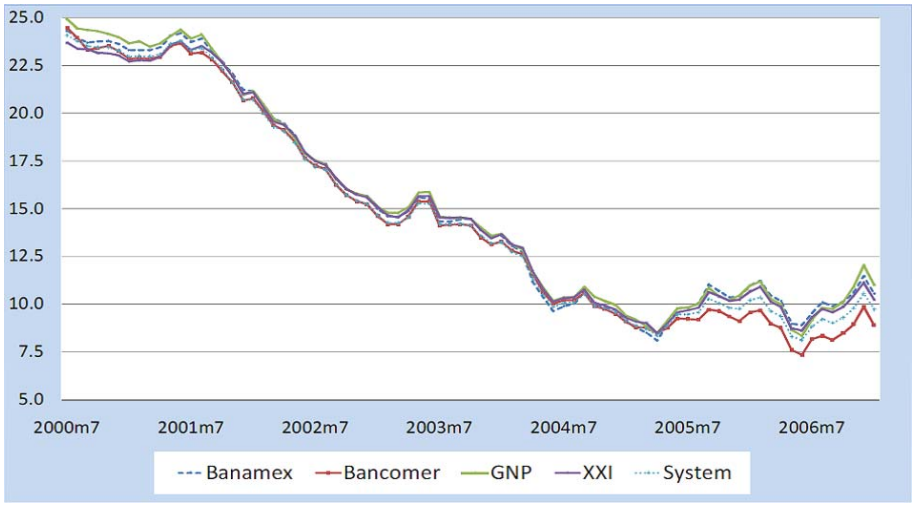


(c) Difference between changes in minimum wage and indexes, by year



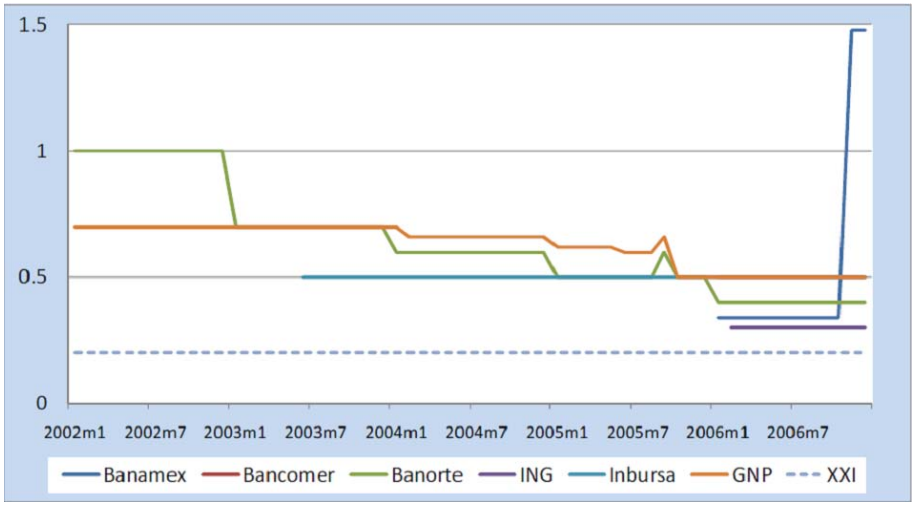
Source: Author's calculations using Banxico and SAT data.

Figure 2.11: Annualized returns (%), by AFORE



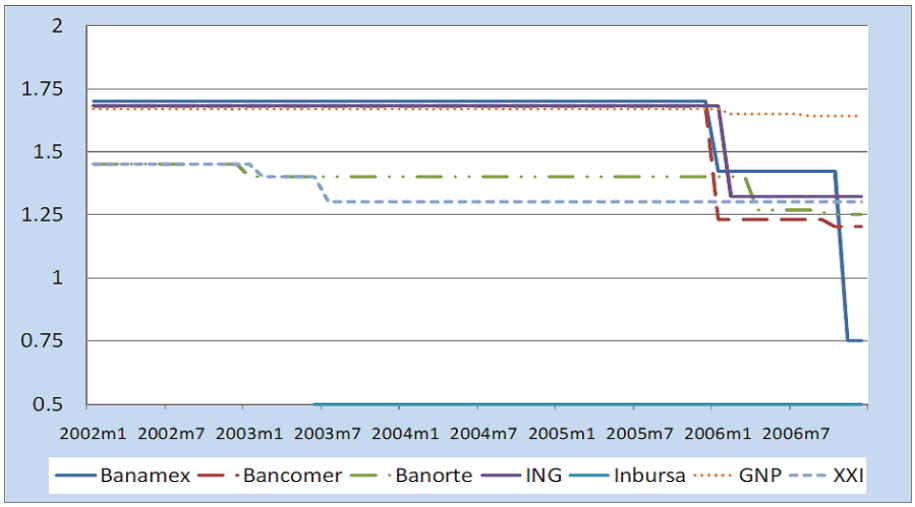
Notes: Only AFOREs with the highest market shares are presented. "System" is the weighted average return of all AFOREs. Source: Own calculations using CONSAR data.

Figure 2.12: Balance fee (%), by AFORE



Notes: Only AFOREs with the highest market shares are presented. Source: Own calculations using CONSAR data.

Figure 2.13: Flow fee (%), by AFORE



Notes: Only AFOREs with the highest market shares are presented. "System" is the weighted average return of all AFOREs. Source: Own calculations using CONSAR data.

Table 2.1: Comparison of old and new pension system

	OLD SYSTEM	NEW SYSTEM
A.INSTITUTIONAL RESPONSABILITIES		
Old age and Severance (RCV)	IMSS	Contributions to chosen pension fund administrator (AFORE) Benefits provided by AFORES if new system, or IMSS if old system is chosen at retirement (only transition workers)
Disability and Life Insurance (IV)	IMSS	IMSS
B. CONTRIBUTIONS (%wage)	15.5	16.5 - 21.0 (average 17.5)
	to IMSS: Old age and severance 3 Disability and life insurance 3 Reserves for pensioner's health 1.5 Administrative expenses 0.6 Social Assistance 0.4 Retirement contribution to central bank: 2 Housing contribution to INFONAVIT: 5	to AFORES: Old age and severance 4.5 Retirement sub account 2 Social quota (per day) 5.5% of one min. wage Housing contributions to INFONAVIT: 5 Health insurance contributions to IMSS: Disability and life insurance 2.5 Reserves for pensioner's health 1.5
C. ELIGIBILITY REQUIREMENTS		
Old Age Severance	500 weeks and 65 years old 500 weeks and 60 years old	1250 weeks and 65 years old 1250 weeks and 60 years old
D. BENEFITS		
Old age: Amount of pension	(i) benefits accrued under PAYGO system (a percentage of the average wage of last 5 years in nominal terms plus a fraction for each year in excess of 10 with a maximum of the above mentioned average wage; indexed to changes in minimum wage); (ii) accumulated INFONAVIT contributions;	New workers receive accumulated balances in individual accounts (AFORE and INFONAVIT) since 9/97. Transition workers choose upon retirement the highest between: (i) benefits under current system or (ii) accumulated balances in individual accounts (AFORE + INFONAVIT) since 9/97.
Old age: withdrawals	N/A	- Gradual withdrawals from individual acount in the AFORE - Annuity bought from an insurance company
Minimum Pension Guarantee (MPG)	Equivalent to one Mexico city minimum wage level indexed to actual minimum wage	Equivalent to one Mexico City minimum wage on 7/1/97 indexed to the CPI

Source: Grandolini and Cerda (1998).

Table 2.2: Summary statistics by year and employment sector

	2000		2002		2004		2005		2006	
	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public
Saving rate†	0.11	0.12	0.16	0.17	0.15	0.10	0.16	0.17	0.12	0.15
	(0.30)	(0.31)	(0.29)	(0.29)	(0.34)	(0.35)	(0.32)	(0.35)	(0.33)	(0.34)
Log(income)	9.81	10.20	9.99	10.25	10.03	10.25	10.02	10.34	10.09	10.38
	(0.70)	(0.70)	(0.71)	(0.66)	(0.69)	(0.68)	(0.67)	(0.65)	(0.67)	(0.70)
Log(consumption)	9.66	10.05	9.75	9.96	9.80	10.02	9.74	10.00	9.86	10.14
	(0.64)	(0.65)	(0.70)	(0.63)	(0.69)	(0.69)	(0.66)	(0.65)	(0.65)	(0.69)
Age of HH head	37.63	42.69	39.73	43.73	39.90	42.71	40.80	44.05	40.87	44.59
	(9.33)	(8.31)	(9.31)	(8.35)	(8.58)	(8.06)	(8.63)	(7.78)	(8.01)	(7.62)
Years of schooling (head)	9.45	13.19	9.66	12.93	9.99	12.78	9.83	12.82	10.01	13.28
	(4.13)	(4.22)	(4.34)	(4.30)	(4.19)	(3.87)	(4.10)	(3.99)	(4.05)	(3.78)
Head is a woman	0.10	0.22	0.12	0.19	0.13	0.24	0.15	0.22	0.17	0.24
	(0.30)	(0.41)	(0.33)	(0.39)	(0.33)	(0.42)	(0.35)	(0.42)	(0.37)	(0.43)
Household size	4.06	4.12	4.16	4.07	4.13	3.95	4.18	3.98	4.16	4.00
	(1.60)	(1.63)	(1.64)	(1.52)	(1.61)	(1.52)	(1.55)	(1.63)	(1.65)	(1.72)
# of children	1.99	2.04	2.02	1.99	2.00	1.86	2.03	1.93	2.01	1.90
	(1.35)	(1.34)	(1.27)	(1.24)	(1.27)	(1.21)	(1.24)	(1.23)	(1.27)	(1.26)
# working members	1.64	1.81	1.74	1.68	1.75	1.69	1.78	1.76	1.80	1.81
	(0.87)	(0.92)	(0.94)	(0.82)	(0.87)	(0.82)	(0.92)	(0.83)	(0.94)	(0.87)
Living in city with +100,000	0.73	0.63	0.74	0.63	0.65	0.60	0.70	0.61	0.71	0.64
	(0.44)	(0.48)	(0.44)	(0.48)	(0.48)	(0.49)	(0.46)	(0.49)	(0.45)	(0.48)
Married	0.74	0.68	0.73	0.73	0.72	0.66	0.73	0.68	0.67	0.63
	(0.44)	(0.47)	(0.44)	(0.45)	(0.45)	(0.48)	(0.44)	(0.47)	(0.47)	(0.48)
Observations	1497	459	2333	772	3277	941	2889	1117	2765	879

Source: Own calculations with ENIGH 2000-2006. Only salaried working household heads who contribute to a pension system are included. Individuals living in households with a savings rate below -100% or above 100% are excluded. Weighted averages and standard deviations (in parenthesis) are shown. † Median is shown.

Table 2.3: Median regression results. Dependent variable: household savings rate

VARIABLES	(1) Complete sample	(2) Young workers	(3) Prime age workers
Year 2004 dummy	**-0.0816*** **	-0.051	**-0.1016*** **
	(0.022)	(0.034)	(0.027)
Dummy = 1 is private sector worker	**-0.0425** **	-0.0162	**-0.0471** *
	(0.018)	(0.031)	(0.028)
Private sector worker*Year 2004	**0.0594** **	0.0187	**0.0934*** **
	(0.025)	(0.038)	(0.032)
Constant	-0.1803	-0.3368	-0.2719
	(0.162)	(0.427)	(0.553)
Observations	7323	3595	3728
R-squared	0.0715	0.108	0.0754
Median Dep. Var.	0.15	0.139	0.162
Standard deviation Dep. Var.	0.314	0.318	0.31

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$ Bootstrapped standard errors using 1000 replications are presented in parenthesis. All regressions include state of residence dummies, dummies for occupation of the household head and other demographic characteristics. Column (2) includes only households whose head is younger than 40. Column (3) includes household heads who are 40 years old or over. Data comes from ENIGH 2002 and 2004. Sample weights are used in all estimations.

Table 2.4: Median regression results by income groups. Dependent variable: household savings rate

VARIABLES	(1) Zero MTR	(2) Positive MTR	(3) Low income	(4) High income
Year 2004 dummy	**-0.0724** *	**-0.1173*** **	-0.0294	**-0.0813*** **
	(0.043)	(0.024)	(0.033)	(0.026)
Dummy = 1 is private sector worker	0.0045	-0.0227	0.0063	-0.0449*
	(0.027)	(0.024)	(0.030)	(0.024)
Private sector worker*Year 2004	0.0154	**0.0663** **	-0.006	**0.0869*** **
	(0.044)	(0.029)	(0.034)	(0.033)
Constant	**-0.3712** **	0.0836	**-0.3513** **	0.0173
	(0.160)	(0.247)	(0.168)	(0.223)
Observations	3502	3776	4565	2758
R-squared	0.113	0.0821	0.105	0.0711
Median Dep. Var.	0.121	0.195	0.119	0.202
Standard deviation Dep. Var.	0.304	0.323	0.311	0.313

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$ Bootstrapped standard errors using 1000 replications are presented in parenthesis. All regressions include state of residence dummies, dummies for occupation of the household head and other demographic characteristics. Column (1) uses workers with an estimated Marginal Tax Rate (MTR) of zero. Column (2) uses individuals with a positive MTR. Column (3) uses individuals earning less than five times the minimum wage. Column (4) includes workers who earn at least five times the minimum wage. Data comes from ENIGH rounds 2002 and 2004. Sample weights are used in all estimations.

Table 2.5: Median regression results with income level interactions. Dependent variable: household savings rate

VARIABLES	(1) All workers	(2) Young workers	(3) Prime age workers
Year 2004 dummy	-0.031	-0.055	-0.035
	(0.036)	(0.049)	(0.042)
Private sector worker dummy	-0.014	-0.064	0.007
	(0.03)	(0.039)	(0.037)
High income dummy	**0.149*** **	0.038	**0.193*** **
	(0.032)	(0.046)	0.0425)
High income*Private sector	-0.035	**0.105***	**-0.1303*** **
	(0.036)	(0.056)	(0.0482)
High income*Year 2004	-0.094	-0.027	**-0.111****
	(0.099)	(0.069)	(0.056)
Private sector worker*Year 2004	0.003	0.016	0.017
	(0.040)	(0.053)	(0.046)
Private sector*Year2004*High Income	**0.0926***	0.0117	**0.1337****
	(0.056)	(0.081)	(0.068)
Constant	-0.1999	-0.1151	0.0729
	(0.154)	(0.400)	(0.550)
Observations	7323	3595	3728
R-squared	0.0804	0.118	0.0836
Median Dep. Var.	0.15	0.139	0.162
Standard deviation Dep. Var.	0.314	0.318	0.31

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$ Bootstrapped standard errors using 1000 replications are presented in parenthesis. "High income" represents a dummy variable taking the value of 1 if the individual earns more than five times the minimum wage. Regressions also include state of residence dummies and type of occupation of the household head dummies. Demographic characteristics of the household and the household's head are included. Only individuals from the transition generation and working in the formal sector are included. Column (1) does not impose further restrictions. Column (2) only includes households whose head is younger than 40. Column (3) includes households whose head is 40 years old or over. Data comes from ENIGH rounds 2002 and 2004. Sample weights are used in all estimations.

Table 2.6: Quantile regressions results for young workers sample. Dependent variable: household savings rate

VARIABLES	(1) 10th percentile	(2) 25th percentile	(3) 50th percentile	(4) 75th percentile	(5) 90th percentile
Year 2004 dummy	-0.0722	-0.0632	-0.051	**-0.09*** **	-0.0385
	(0.063)	(0.046)	(0.034)	(0.033)	(0.046)
Private sector worker dummy	0.009	-0.0069	-0.0162	0.0236	0.0489
	(0.059)	(0.039)	(0.031)	(0.027)	(0.043)
Private sector worker*Year 2004	-0.0543	-0.0413	0.0187	**0.0792** **	0.0496
	(0.070)	(0.050)	(0.038)	**(0.036)**	(0.049)
Constant	-0.0953	0.2498	-0.3368	0.0533	0.6686
	(0.851)	(0.512)	(0.427)	(0.460)	(0.581)
Observations	3595	3595	3595	3595	3595
Pseudo R2	0.138	0.126	0.108	0.107	0.122

Notes: $***p < 0.01$, $**p < 0.05$, $*p < 0.10$ Bootstrapped standard errors using 1000 replications are presented in parenthesis. Observations with savings rate lower than -100% or above 100% were not included. Only households whose head is less than 40 years old are included. All regressions include state of residence dummies, dummies for occupation of the household head and other demographic characteristics. Column's head indicate the quantile estimated. Data comes from ENIGH 2002 and 2004. Sample weights are used in all estimations.

Table 2.7: Quantile regressions results for prime age workers sample. Dependent variable: household savings rate

VARIABLES	(1) 10th percentile	(2) 25th percentile	(3) 50th percentile	(4) 75th percentile	(5) 90th percentile
Year 2004 dummy	**-0.2393*** **	**-0.1176*** **	**-0.1016*** **	-0.0087	0.039
	(0.044)	(0.034)	(0.027)	(0.026)	(0.024)
Private sector worker dummy	**-0.0738** *	**-0.0586** *	**-0.0471** *	**-0.0416** **	0.0012
	(0.041)	(0.032)	(0.028)	(0.019)	(0.024)
Private sector worker*Year 2004	**0.1412*** **	**0.1049** **	**0.0934*** **	0.0377	-0.0057
	(0.054)	**(0.042)**	**(0.032)**	(0.031)	(0.030)
Constant	-2.0288*	-0.9635	-0.2719	**0.8868** *	**0.9177** *
	(1.120)	(0.759)	(0.553)	(0.517)	(0.490)
Observations	3728	3728	3728	3728	3728
Pseudo R2	0.145	0.0935	0.0754	0.0824	0.0827

Notes: $***p < 0.01$, $**p < 0.05$, $*p < 0.10$ Bootstrapped standard errors using 1000 replications are presented in parenthesis. Observations with savings rate lower than -100% or above 100% were not included. Only households whose head is 40 years old or over are included. All regressions include state of residence dummies, dummies for occupation of the household head and other demographic characteristics. Column's head indicate the quantile estimated. Data comes from ENIGH 2002 and 2004. Sample weights are used in all estimations.

Table 2.8: Median regression results for multiperiod analysis. Dependent variable: household savings rate

VARIABLES	(1) Complete sample	(2) Low income workers	(3) High income workers	(4) Young workers	(5) Prime age workers
Year 2002 dummy	**0.057*** **	**0.07** **	**0.042***	**0.049***	**0.062*** **
	(0.02)	(0.03)	(0.025)	(0.03)	(0.02)
Year 2004 dummy	-0.03	0.012	**-0.063** **	-0.008	-0.016
	(0.02)	(0.033)	(0.03)	(0.034)	(0.027)
Year 2005 dummy	0.04*	**0.064** **	0.034	0.032	**0.055*** **
	(0.02)	(0.03)	(0.028)	(0.041)	(0.021)
Year 2006 dummy	0.01	0.029	-0.001	0.036	0.037
	(0.025)	(0.036)	(0.025)	(0.037)	(0.026)
Private sector worker dummy	-0.008	0.002	0.004	-0.001	0.017
	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
Private sector worker*Year 2002	-0.008	-0.015	-0.028	0.003	-0.021
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Private sector worker*Year 2004	**0.061** **	0.006	**0.081** **	0.032	**0.049***
	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)
Private sector worker*Year 2005	-0.002	-0.021	-0.010	0.020	-0.010
	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Private sector worker*Year 2006	-0.004	-0.024	-0.004	-0.040	-0.031
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)
Constant	-0.039	-0.130	**0.369*** **	**0.518***	-0.092
	(0.08)	(0.10)	(0.14)	(0.29)	(0.35)
Observations	17433	10883	6550	8248	9185
Pseudo R2	0.0565	0.0748	0.0415	0.0735	0.0581

Notes: $***p < 0.01$, $**p < 0.05$, $*p < 0.10$ Bootstrapped standard errors using 1000 replications are presented in parenthesis. Only individuals from the transition generation and working in the formal sector are included. Observations with savings rate lower than -100% or above 100% were not included. All regressions include state of residence dummies, dummies for occupation of the household head and other demographic characteristics. Column (1) does not impose further restrictions. Column (2) includes only households whose head earns less than five times the minimum wage. Column (3) includes only high income households. Column (4) includes households whose head is younger than 40. Column (5) includes household heads who are 40 years old or over. Data obtained from ENIGH rounds 2000-2006. Sample weights are used in all estimations.

Table 2.9: Estimated Average Treatment Effect on the Treated, by Propensity Score Matching Procedure. Dependent variable: household savings rate

Matching procedure	(1) Complete sample	(2) Low income workers	(3) High income workers	(4) Young workers	(5) Prime age workers
Gaussian Kernel	**0.033*****	0.017	**0.067*****	0.0173	**0.0469*****
	(0.015)	(0.0214)	(0.018)	(0.023)	(0.016)
Epanechinikov	**0.0636*****	0.0335	**0.094****	0.065	**0.101*****
(bandwith = 0.02)	(0.024)	(0.0365)	(0.048)	(0.041)	(0.035)
Epanechinikov	**0.0622*****	0.0269	**0.0896*****	**0.064***	**0.0707*****
(bandwith = 0.03)	(0.02)	(0.0321)	(0.0338)	(0.034)	(0.029)

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$ The Gaussian Kernel weight is defined as $K(u) = (1/\sqrt{2\pi})exp[-u^2/2]$ for all u. The Epanechinikov Kernel weight is defined as $K(u) = (^3/_4)(1-u^2)$ for all $|u| < 1$ and 0 otherwise. Bootstrapped standard errors using 200 replications are presented in parenthesis. For each private sector individual in the post-policy period, three matches are found based on two propensity scores - one for time and one for treatment status. Propensity scores are estimated by Probit models. Demographic characteristics of the household and the household head are also included. Data obtained from ENIGH rounds 2002 and 2004.

Table 2.10: Median wealth estimations for Mexican households, by employment sector and income groups

		Private sector workers			Public sector workers		
		Less than five	More than five	Total	Less than five	More than five	Total
2002	Net wealth - Ind	109,800	333,700	155,450	177,200	461,000	248,000
	Net wealth - HH	108,500	333,700	155,500	203,800	466,000	241,350
	Observations	309	80	389	56	21	77
2005	Net wealth - Ind	165,592	427,362	206,160	265,885	584,468	386,661
	Net wealth - HH	160,327	391,970	213,681	289,332	592,432	383,564
	Observations	351	87	438	58	55	113
Change	Net wealth - Ind	50.81%	28.07%	32.62%	50.05%	26.78%	55.91%
	Net wealth - HH	47.77%	17.46%	37.42%	41.97%	27.13%	58.92%

Source: Own calculations using the MxFLS 2002 and 2005. Wealth measures come from the summation of self assessed values of the house owned by the family, financial and other assets, motor vehicles, etc. Self assessed level of debt is subtracted from the wealth measure to calculate net wealth. Median wealth is presented for each classification. Only salaried workers who contribute to IMSS or ISSSTE are included. Only household heads who are 20 years old or over and who have information on the value of all their assets are included. Income groups are based on whether the household head's labor income is above or below five times the minimum wage. All figures are in Pesos of December 2002.

Table 2.11: Median wealth estimations for Mexican households, by employment sector and age groups

		Private sector workers			Public sector workers		
		Young	Old	Total	Young	Old	Total
2002	Net wealth - Ind	105,700	243,950	155,450	166,100	264,500	248,000
	Net wealth - HH	111,100	245,600	155,500	231,650	264,500	241,350
	Observations	240	149	389	30	47	77
2005	Net wealth - Ind	168,821	277,210	206,160	237,128	462,121	386,661
	Net wealth - HH	160,327	297,295	213,681	237,128	470,275	383,564
	Observations	270	168	438	33	80	113
Change	Net wealth - Ind	59.72%	13.63%	32.62%	42.76%	74.71%	55.91%
	Net wealth - HH	44.31%	21.05%	37.42%	2.36%	77.80%	58.92%

Source: Own calculations using the MxFLS 2002 and 2005. Wealth measures come from the summation of self assessed values of the house owned by the family, financial and other assets, motor vehicles, etc. Self assessed level of debt is subtracted from the wealth measure to calculate net wealth. Median wealth is presented for each classification. Only salaried workers who contribute to IMSS or ISSSTE are included. Only household heads who are 20 years old or over and who have information on the value of all their assets are included. Young workers are less than 40 years old. All figures are in Pesos of December 2002.

Chapter 3

Information Framing and Retirement Management Decisions: Evidence from a Field Study in Mexico

3.1 Introduction

In the past few years, the increase in the availability and sophistication of financial products for savings and credit, and major changes in pension arrangements have placed more responsibility on individuals for making decisions regarding savings, investments and planning for retirement (OECD [2005]). This larger responsibility has raised concern about whether individuals are making ever complex decisions optimally. The psychology and economics literature, for example, have shown evidence that individuals tend to be affected by the *frame* under which information is presented and to rely on rules of thumb to make choices that require costly calculations. In turn, this type of behavior may put individuals at risk of making suboptimal decisions in their use of financial products, leading to inadequate levels of savings, overindebtedness, and unnecessary financial distress.[1]

Retirement management decisions have been largely studied in the behavioral economics literature. There is significant evidence that inertia, hyperbolic discounting, bounded rationality and self control problems can affect individuals' levels of retirement savings or contribution rates in retirement accounts (Carroll *et al.* [2009],

[1]See for example Ausubel (1999), Benartzi and Thaler (2002), or Choi *et al.* (2006).

Thaler and Benartzi [2004]). In this chapter, I investigate whether particular types of framing, based on menu effects and loss aversion, can be causally related to retirement management decisions.

This chapter uses the context of the Mexican Pension System to test how framing can affect workers' retirement management decisions. Mexican workers are required to contribute to a Defined Contribution pension system and choose a Pension Fund Administrator to manage their individual retirement account. Currently, the Mexican pension funds market is highly concentrated and the Administrators with higher market shares do not provide the highest net returns or charge the lowest fees. Despite the financial costless nature of switching affiliation, workers switch very seldom, and when they switch they often do not switch to an Administrator with lower fees. One potential explanation for this behavior is that the channels communicating the performance of Pension Fund Administrators are ineffective at helping Mexican workers choose the Administrators that maximize their retirement wealth.

I use data collected from a survey with an embedded experiment to test whether providing information under a specific framing may lead workers to switch Administrator affiliation. Surveyed workers are asked to analyze hypothetical cases containing information on the returns and fees of Mexican Pension Fund Administrators. The cases feature randomly assigned *frames* based on the concepts of choice avoidance and loss aversion. Choice avoidance relates to the lack of choice observed in individuals when they face overwhelming amounts of information. When processing the information becomes too psychologically costly, it triggers inaction on the

part of the decision maker. Loss aversion describes how individuals experience a disutility of larger magnitude following a perceived loss than the increase in utility following a perceived gain of the same amount. These two types of frames are cross-randomized across individuals. The randomization helps to provide causal estimates of the effect of two concepts from behavioral economics on retirement decisions.

The Mexican Pension System provides an advantageous context to study retirement management decisions. Choi et al. (2006) argue that in the U.S. the decision to contribute to a retirement savings account is not simple. It involves deciding whether to participate, deciding on an appropriate contribution rate and on an appropriate asset allocation. In Mexico, a worker does not need to calculate whether and how much money she will put into her retirement account to have a choice about which Fund Manager she will choose. By focusing on a straightforward choice and providing a simple way to compare across Fund Managers, the probability of affecting the worker's behavior should be high.

I find evidence that reducing the number of possible choices increases the probability that individuals choose a Fund Administrator with a higher net return or lower fees. A "loss aversion" framing increases the probability of choosing an Administrator with higher net return. I also find evidence that higher levels of financial literacy decrease the effects of framing on Fund Administrator choice.

The rest of the chapter is structured as follows. Section 3.1 presents the background of the Mexican Pension System. Section 3.2 includes a brief review of literature on behavioral economics relevant to the present analysis. The field experiment is described in section 3.4. Section 3.5 presents the results and section

3.6 concludes.

3.2 Background

The Mexican pension system is a defined contribution system based on individual retirement accounts. Retirement accounts are composed of a compulsory contribution made by employers and the employee equivalent to a fixed percentage of the worker's wage, a government contribution, and voluntary contributions. Upon retirement, the balance in this account is used to buy an annuity that effectively becomes the worker's pension.

Retirement accounts are managed by specialized financial institutions commonly called AFOREs. The AFOREs invest the workers' contributions, deposit the returns in the workers' accounts, and charge fees for their services. Mexican workers are required to choose an AFORE to manage their accounts. Currently, every four months workers receive from this institution an individualized statement indicating the contributions made to the worker's account, the returns earned and the fees charged during the period. The statement also includes a table showing a ranking of AFOREs based on their net return. The net return is calculated as the difference between the gross returns and the fees charged. The worker's current affiliation is highlighted (see Figure 3.1). The design of the ranking table is regulated by law and is the same across all AFOREs. Workers can change their affiliation at any moment by calling a toll-free number, going online or by going to the office of the Fund Administrator of their choice.

Despite the workers' ability to choose their AFORE freely and the information they receive, there is suggestive evidence that workers are not choosing the Administrator that will provide the highest possible pension wealth. For example, in the last two years, three of the five AFOREs with the largest market shares have been ranked in the lower half of the net returns distribution. In addition, workers rarely switch AFORE (Hastings and Tejeda-Ashton [2008]), and in over 25% of the cases they affiliate to one with higher fees (Duarte and Hastings [2009]).

One explanation for the observed outcomes in the Mexican pension fund market is that there are unobservable characteristics of certain AFOREs that attract workers. For example, those who charge the highest fees may also be the ones who provide better customer service or have a valuable brand name (Hortaçsu and Syverson [2004]). Another explanation is that low levels of financial literacy prevent workers from obtaining a correct comparison across AFOREs. I propose an alternative explanation. The information provided to Mexican workers in their AFORE statements may fail to help them to actively compare AFOREs and choose affiliation due to the way it is framed. The psychology and behavioral economics literature have pointed out how the context and the framing of the situation matters for how people make decisions (DellaVigna [2009]). In our context, the inaction of Mexican workers at choosing AFOREs could be due to the abundance of available choices or the presentation of potential returns as gains and not losses. First, the number of AFOREs available to Mexican workers has been around 16 in the last couple of years. If workers perceive the comparison of all possible choices as costly, they may experience choice avoidance and will not change affiliation despite the possible gains

in terms of expected retirement wealth. Second, Mexican workers receive a statement from their AFORE containing a table that compares the returns, fees and net returns of each AFORE. The worker can then use this table to estimate the potential gains from being affiliated to each AFORE and, in principle, switch affiliation if he so desires. I hypothesize that framing the differences across AFOREs as losses -and not potential gains- would affect the probability that people actively choose their Fund Administrator. I now turn to a brief review of the literature exploring these issues.

3.3 A brief literature review

This chapter focuses on the analysis of two framing devices in the context of retirement decisions. The first device is choice avoidance. In the behavioral economics literature, the impact that the number of choices or some of their irrelevant characteristics have on individual's decisions are defined as *menu effects* (DellaVigna [2009]). Choice avoidance, a form of menu effects, states that when individuals face decisions that involve comparing several alternatives, they end up avoiding the choice altogether. To the best of my knowledge, there are only a few studies of choice avoidance in the context of retirement management decisions. Iyengar and Jiang (2003) and Iyengar et al. (2003) conduct an analysis with a large dataset of employees in the U.S. and find that a higher number of 401(k) investment choices is negatively correlated with 401(k) participation rates. Other studies have analyzed choice avoidance in other contexts via field experiments. Iyengar and Lepper

(2000) conduct a field experiment in a grocery store where potential customers were randomly offered a menu of 24 or 6 jam choices for free tasting. They find that sales are significantly higher when the set of possible choices is smaller. Bertrand et al. (2010) analyze loan take up rates from invitations sent by a lender in South Africa. The content of the letter including wording, images and interest rates were randomized across recipients. The authors find that, holding other factors constant, suggesting only one example on how the loan money can be spent significantly increased take up rates with respect to suggesting four different examples on how to use the money. Finally, there is a related literature in health economics studying the relationship between the number of choices and individuals' welfare. Abaluck and Gruber (2009) and Lucarelli *et al.* (2009) provide evidence that reducing the number of prescription drug plans for Medicare Part D beneficiaries would affect elders' behavior and could potentially raise welfare.

For many existing models with non-standard preferences, Kahneman and Tversky's (1979) seminal work on prospect theory is the intellectual foundation (DellaVigna [2009]). Kahneman and Tversky (1979) argue that individuals' decision making under uncertainty is characterized by reference dependence, diminishing sensitivity, loss aversion and probability weighting. This implies that the individuals' utility function has *changes* in wealth or welfare as parameters and not final states, is concave for wins and convex for losses, is steeper for losses, and assigns weights to measure the impact of events on the desirability of prospects. Numerous laboratory experiments have empirically tested reference dependence and loss aversion. The implication of these characteristics is sometimes referred to as *endowment effects*

(DellaVigna [2009]). For instance, Kahneman *et al.* (1990) recruit subjects who are randomly assigned into two groups. One group is given coffee mugs and the other group receives nothing. Standard theory suggests that subjects in the group with mugs should present a willingness to sell the mug similar in magnitude to the willingness to pay for the mug of individuals from the no-mug group. The authors find evidence that subjects who were assigned a mug demand a much higher payment for selling the mug they own, than the payment offered by subjects who do not own it. Horowitz and McConnell (2002) survey several similar studies and find that the median willingness to accept and willingness to pay gap is 2.6. Isoni *et al.* (2008) find evidence of the endowment effect for lotteries with goods and money prizes. There are other studies that found evidence of reference dependence and loss aversion in non-experimental settings. For example, Genesove and Mayer (2001) argue that for homeowners, the original purchase price is a clear reference point at the time they decide to sell their house. To test loss aversion, the authors use Boston condominiums sales data to predict listed selling prices. They find that units with a predicted price below the original purchase price are listed with a higher price on average, than comparable units with a predicted price above the original purchase price.

In contrast to previous studies on endowment effects, the second focus of my study is loss aversion as a framing device. I explore whether the perception of a loss can have different effects on individuals' decisions than the perception of potential gains. Loss aversion as framing has been studied in other contexts. Ganzach and Karsahi (1995) conduct a field experiment and partner with a credit card company to

test loss aversion. Credit card customers receive a call from the company promoting the use of the card. The transcript used by the caller to promote the card emphasizes the benefits of using the card or the losses suffered by the customer by using cash or checks. The authors find that the loss-framed message had a stronger impact than the gain-framed message. The percentage of customers using the card under the loss condition was double the percentage of customers using the card under the gain condition.

In this chapter, I test whether reducing the set of choices or framing information as losses have an effect on workers' retirement management decisions. I aim to get a causal effect of menu effects and loss aversion by randomly assigning the frame of the information.

This research is most related to Hastings and Tejeda-Ashton (2008). They conduct a field study in Mexico to test whether financial literacy impacts worker's AFORE choice behavior. Around 700 interviewees are asked to recommend an AFORE for a hypothetical worker based on a randomly assigned scenario. The scenarios present the information in monetary levels (*Mexican pesos*) or percentage terms. They find that financially illiterate workers focus more on fees when choosing between investment funds when fees are presented in pesos.

My study contributes to the understanding of retirement management decisions of workers in multiple novel ways. First, it will analyze the effect of a "forgone earnings versus losses" framing. The increase in the worker's pension wealth accumulation (from switching to an AFORE with higher net returns) will be described as either the potential gains from switching or as the money the worker is losing

every period as a result of her current choice. This framing exploits the analysis of Kahneman and Tversky (1979) where people tend to prefer avoiding losses than to potentially acquiring gains.[2] Second, I will evaluate the role of choice avoidance in the AFORE affiliation. Other studies have found that workers with low financial literacy levels do not seem to use information on fees or returns in their affiliation decision (Hastings and Tejeda-Ashton [2008]). One possible explanation for this is that they may be overwhelmed by the amount of information presented in the AFORE statement. In such a case, the worker may be discouraged to make the effort to find the optimal choice and settle for an easy-to-find, but satisfactory one (Iyengar and Lepper [2000]). In this chapter, I evaluate whether different amounts of information affect the choices workers make. Finally, the chapter also explores whether the effects of framing vary across and within individual investor characteristics. Emphasis is placed on the role of financial literacy and the potential effects of framing. I now describe the field study used to collect data.

3.4 Field experiment

I test whether the framing based on loss aversion and choice avoidance affect the way individuals think about retirement management decisions through the

[2]In a study related to retirement decisions, Choi et al. (*forthcoming*) study whether providing information about losses can affect workers' behavior. They use a large dataset of employees and find that those close to retirement were losing money by not fully exploiting the matching rate of the employer in their 401(k) accounts and its no-penalty for early withdrawal rules. In some cases, an employee could contribute to her 401(k), immediately withdraw the money, and increase her money holdings up to 6% of the worker's salary. They conduct an experiment where they send letters to randomly selected employees with enough information to calculate their forgone earnings. The authors examine whether teaching workers about these losses would induce them to change their behavior and contribute up until the employer's matching rate. The authors did not find any significant effects on contribution rates.

application of a survey with an embedded experiment. Subjects were recruited to participate in the survey in public spaces around Mexico city and online. Only individuals who were working and contributing to a social security institution at the time of the interview are included in the final sample. The survey contains questions about the worker's demographic and economic characteristics. I include questions related to the individual's AFORE affiliation and opinions on retirement and the Mexican pension system. A set of three questions related to financial literacy are presented next. These questions are included as a way to address the evidence found in the literature that individuals with low levels of financial literacy tend to make suboptimal financial decisions (Van Rooij et al [2007], Moore [2003], Campbell [2006], Lusardi and Tufano [2008], Ponce et al. [2009], Stango and Zinman [2008], Lusardi and Mitchell [2009] and Hastings and Tejeda-Ashton [2008]). Appendix A.3 contains a sample of the survey questions.

The final part of the survey embeds an experiment. The interviewee is presented with a series of scenarios regarding three hypothetical workers - Pedro, Pablo and Mari. The scenarios consist of a short introduction with information of a hypothetical worker, a table containing information about several AFORE choices ranked by net returns, and a question. The introduction states the age of the hypothetical worker (fixed to be within 5 years of the interviewee's age) and his/her current affiliation. The table mimics the one shown in the AFORE statements Mexican workers receive every four months. Finally, the respondent is asked to make a recommendation of AFORE affiliation for the hypothetical worker using the information shown. The amount of information and the framing of the question for each scenario varies

depending on the treatment of interest and is randomly assigned. There are two sources of randomization. First, individuals are randomly assigned to receive cases that refer to the potential gains of being affiliated to different AFOREs, or that refer to the losses the hypothetical worker has bore due to her current affiliation. The potential gains were described as follows: "It seems like (NAME) could have accumulated more money in the previous period and have more money for her retirement. If you could give (NAME) some advice, what would you recommend?". The losses frame states: "It seems like (NAME) lost money in the previous period since she accumulated less than what she could have obtained for her retirement savings. If you could give (NAME) some advice, what would you recommend?". Under all scenarios there are gains to switching AFOREs either to one with higher net returns, higher returns, or lower fees. The second source of randomization is the number of choices shown in the ranking table. To keep matters simple, I randomly assigned scenarios to show either 14 or 6 AFORE options. An example of the hypothetical case is presented in appendix A.4.

I use the answers to the hypothetical exercises as a proxy for the behavior that individuals would follow had they received an AFORE statement with similar characteristics. Using hypothetical cases is convenient because it allows me to control for reference points such as current AFORE affiliation and the balance in the retirement account across interviewees. However, I must assume that the interviewee evaluates the hypothetical worker's case by assigning her the same utility function as her own. This assumption has been made implicitly in previous studies (Hastings and Tejeda-Ashton [2008]). The lack of access to interviewees actual AFORE data

before the the implementation of the study constrains me to leave this assumption as a caveat.

The features of the Mexican Pension System provide an advantageous context to study retirement management decisions. For instance, Choi et al. (2006) argue that in the U.S. the decision to contribute in a retirement savings account is not simple. Once the worker decides to participate in the employer's 401(k) plan, she has to decide an appropriate contribution rate and an appropriate asset allocation. The authors test whether simplifying the choice set affects workers' behavior and employ a mechanism called Quick Enrollment^{TM}. They mail to newly hired workers a form that invites the worker to participate in the company's 401(k) plan. The form also states that by enrolling, the worker will contribute a pre-determined percentage of his salary to a pre-determined investment fund. The authors find that Quick Enrollment^{TM} tripled participation rates among new employees three months after hire. They argue that by decoupling the participation decision from the savings rate and asset allocation decisions, the mechanism simplifies the savings plan decision process leading to a higher participation. In Mexico, a worker does not need to calculate whether and how much money she will put into her retirement account to have a choice about which AFORE she will choose. By focusing on a limited choice set and providing a simple way to compare across AFOREs, the probability of affecting the worker's behavior should increase.[3]

[3]Currently, the AFORE ranking table provides a simple way to compare across AFOREs. Before 2007, AFOREs had a complicated fee structure that involved flow fees, balance fees and discounts for tenure in the AFORE. Today, AFOREs can only charge a balance fee and discounts for tenure are transferable across AFOREs.

3.5 Results

Subjects were invited to answer the survey in public spaces at different points in Mexico City. Individuals who were not working at the time of the interview or were not contributing to a social security institution were screened out. A total of 345 individuals agreed to complete our survey. Individuals who are younger than 20 or older than 60 were dropped from the sample.[4] Individuals who declined to answer the hypothetical exercises or had incomplete demographic information were also not used in the estimations. The final sample consists of 292 individuals.

Table 3.1 presents summary statistics for the sample. Just under half (48%) of subjects are men and 50.3% are married. The average age in the sample is 37 years and the median (not shown in table) is 35. About 37% of the sample has a monthly income of at least $10,000 pesos (around $833 USD), which is just under six times the minimum wage for 2010. As a way of comparison, the Mexican 2010 Census yields the following statistics for the population of workers with an AFORE, who are between 20 and 60 years old, and reside in Mexico City: 47.02% are men, 36.9% are married, they are 37 years old on average, and 22.62% report and income above $10,000 pesos. As a result, the conclusions from this analysis may relate to a proportionately richer sector of the workers population.

Table 3.2 shows summary statistics of individuals' characteristics by the number of financial literacy questions answered correctly. A few clear patterns are found. Women tend to answer correctly a higher number of financial literacy ques-

[4]Sixty years is the minimum age at which workers can claim severance pay. In Mexico, the majority of workers choose not to wait until the age of 65 when they are entitled to full pension payments.

tions. Men represent 65% of the group of interviewees who answered all financial literacy questions incorrectly. Among the respondents who answered all financial literacy questions correctly, only 48% are men. Young and high income individuals answered more financial literacy question correctly. The average age among individuals who answered all financial literacy questions incorrectly is 40, whereas for those who answered all correctly the average is 30. Meanwhile, high income individuals account for 9% of workers who did not answer any questions correctly, and 65% of those who answered all of them correctly.

Table 3.3 presents the tests for balanced characteristics across the randomized frames. There are no statistical significant differences between frames for most of individuals' characteristics, but for married status. This difference could raise concern about potential biases in the econometric estimation. However, it is not clear *a priori* on which direction the bias would be. To address this concern, I show evidence that the inclusion of individuals' characteristics as regressors do not affect the estimates of framing on AFORE choice.

I begin by exploring whether some of the observed individuals' characteristics are correlated with the reasons behind workers' AFORE choice, attitudes toward retirement or estimated financial literacy. Table 3.4 presents the results of a series of logit regressions for each of the possible answers the workers enunciated as reason for choosing their AFORE. It is notable that almost none of the regressors are statistically significant. The dummy that accounts for whether the individual is high income (i.e. he earns more than $10,000 MXP) is negatively correlated with the probability that the individual's family or friends recommended his current AFORE

affiliation (column [2]). Being high income is positively correlated with the probability that the individual mentions "high returns" as a reason to choose AFORE (column [10]). The other characteristic that seems to be significantly correlated with some other choices is the level of financial literacy. Columns [7]-[8] and [13]-[14] show that higher levels of financial literacy are negatively correlated with the probability of choosing AFORE that is perceived as stable or because it provides good service.

Table 3.5 presents the results of logit estimations that explore whether workers' characteristics are significantly correlated with attitudes toward retirement or financial literacy. Older individuals tend to think more about their retirement and have a lower probability of saying that they think they are saving enough for retirement (columns [1]-[4]).[5] It is notable that individuals with higher levels of financial literacy have a lower probability of saying they think about their retirement frequently or sometimes. Columns [5] through [7] present results of a logit regression where the dependent variable is equal to 1 if the individual answered correctly each of the financial literacy questions. High income people have a higher probability of answering the discount question correctly. Married individuals show a lower probability of answering the other two questions correctly.

[5]The first question asks "How often do you think about retirement?". If the individual answered frequently or sometimes, the dependent variable is equal to one. The second refers to the following statement: "I think I'm saving enough for my retirement". The dependent variable is equal to 1 if the individual completely agrees or agrees with the sentence.

3.5.1 Framing effects on retirement management decisions

The main objective of this chapter is to estimate whether framing information affects individuals' decision regarding AFORE affiliation. As a proxy for this decision I ask surveyed individuals to make a recommendation regarding AFORE affiliation for three hypothetical workers. The information for each hypothetical worker was randomly assigned a *frame* based on choice avoidance and loss aversion. For each hypothetical scenario, the recommended AFORE, its returns, fees, and net returns were recorded. Given the randomization embedded in the field study, it is straightforward to estimate the effect of the framing on the outcomes of interest. The equation to be estimated is:

$$\begin{aligned} Y_{is} =& \beta_0 + \delta_1 I(ChoiceAv)_{is} + \delta_2 I(LossAv)_{is} + \delta_3 I(ChoiceAv * LossAv)_{is} \\ &+ \gamma X_i' + \epsilon_{is} \end{aligned} \tag{3.1}$$

Equation (3.1) is estimated for three separate dependent variables. Y_{is} is a binary variable that indicates whether individual i in hypothetical exercise s recommended a higher ranked AFORE, the highest ranked AFORE, or an AFORE with lower fees. All scenarios explicitly mention the hypothetical worker's current AFORE affiliation. Thus, Y_{is} is defined according to the current affiliation shown in the scenario. Framing effects are captured by three regressors. First, a dummy that is equal to one if the individual was shown a case with six AFORE options ($ChoiceAv$). Second, a dummy that is equal to one if the case shown had a "loss"

framing ($LossAv$). Third, a dummy that accounts for the interaction of both frames ($ChoiceAv * LossAv$). The omitted category is the scenario that shows 14 AFORE options and describes the hypothetical worker's situation as having potential gains. This scenario is closest in nature to the one provided actual AFORE statements. Some specifications include individual's characteristics as controls (X'). ϵ_i is an error term.

Table 3.6 presents the results from estimating equation 3.1 for the case of recommending a higher ranked AFORE. Panel A shows the results from the logistic regression. Following column [1], we find evidence that individuals who answered hypothetical cases showing six options instead of 14 have a higher probability of recommending a higher ranked AFORE. The estimate for the Choice Avoidance indicator is statistically significant at the 5% level. The indicator for the "loss" framing is not statistically significant at conventional levels. However, the estimation of marginal effects (panel B) provides evidence that both menu effects and loss aversion may affect individuals' retirement decisions. Answering an exercise with a smaller set of AFORE choices increases the probability of recommending a higher ranked AFORE by 6.8 percentage points, whereas the loss aversion framing increases it by 5.2 percentage points.

In column [2] I include individuals' characteristics as regressors to control for potential biases resulting from differences in subjects across treatment groups. None of the individuals' characteristics seem to significantly affect the probability of choosing a higher ranked AFORE. Moreover, the estimates of the average marginal effects for both frames do not change in magnitude or statistical significance.

In the specification in column [3] I include as regressors the number of financial literacy questions answered correctly and the corresponding interactions with the different framing treatments. This specification speaks to the financial literacy literature and the observed tendency of financial illiterate individuals to make suboptimal financial decisions. I find evidence that higher levels of financial literacy yield higher probabilities of choosing a higher ranked AFORE. The coefficient for the number of financial literacy questions answered correctly is positive and statistically significant (at the 10% level). I also find evidence that higher levels of financial literacy are associated with smaller effects from framing. Following Panel B, answering an exercise with a smaller set of AFORE choices increases the probability of choosing a higher ranked AFORE by 13.8 percentage points among individuals who did not answer correctly any of the financial literacy questions correctly. The choice avoidance effect is smaller for the individuals who answered one (8.7 percentage points) and two (3.8 percentage points) questions correctly. Finally, choice avoidance does not seem to affect this probability among individuals with the highest level of financial literacy. The loss aversion framing affects individuals who could not answer any questions correctly (11.2 percentage points) or answered correctly only one question (6.7 percentage points).

Table 3.7 presents results from a similar series of estimations but analyze the probability of choosing the first ranked AFORE. The first ranked AFORE yields the highest net return. This specification is intended to analyze whether individuals follow the heuristic of choosing the best AFORE available.[6] In principle, since the

[6]This could also be indirect evidence that individuals are able to interpret the information

ranking table is the only information the interviewee can use to make a recommendation, the highest ranked AFORE could be regarded as the best option. I find that a reduced number of choices increases the probability of selecting the highest ranked AFORE by 12.7 percentage points. It does not seem that, on average, showing a loss framing significantly increases this probability. In line with previous findings, the framing effects are heterogeneous across financial literacy levels. Following column [3] in panel B, answering an exercise with only six AFORE choices increases the probability of choosing a higher ranked AFORE by 23.4 percentage points among individuals with the lowest financial literacy levels. The estimated marginal effect is 15.6 and 8.3 for the individuals who answered one and two questions correctly, respectively. Choice avoidance does not seem to affect the probability of choosing the top ranked AFORE among individuals with the highest level of financial literacy. The loss aversion framing only affects individuals who could not answer any questions correctly (15.8 percentage points).

Table 3.8 shows results for the probability of selecting an AFORE with lower fees. The probability that an individual chooses an AFORE with lower fees is higher when individuals are shown a case with fewer AFORE options. On average, the choice avoidance frame increases this probability by 6.8 percentage points, holding other factors fixed (columns [1] and [2]). Allowing for differential marginal effects across financial literacy levels, I find that the choice avoidance effect is larger for individuals with lower levels of financial literacy and is not significant for individuals who answered all financial literacy questions correctly. The "loss" framing does

presented in the AFORE statement, even when shown in percentage terms.

not seem to affect the probability of choosing an AFORE with lower fees, but for individuals with the two lowest level of financial literacy. The loss aversion framing increases this probability by 9.6 and 5.6 percentage points among individuals who answered correctly zero and one financial literacy question, respectively.

3.6 Concluding remarks

This chapter aims to provide evidence on the relationship of behavioral economics and retirement decisions. I conduct a field study that tests whether choice avoidance or a form of loss aversion can affect workers' decisions regarding pension fund administrator affiliation. I obtain estimates of this relationship by using as a proxy workers' recommendations of AFORE choice based on hypothetical cases. The information presented in these cases is randomly framed. I find evidence that Mexican workers may be experiencing choice avoidance. Reducing the number of possible choices increases the probability that individuals select an AFORE with higher net returns or lower fees. Loss aversion affects only the probability of choosing an AFORE with higher returns. Finally, framing effects are largest among individuals with low levels of financial literacy.

One of the objectives of this field study is to explore the potential of behavioral economics to nudge individuals into making decisions that may increase their retirement wealth. This chapter presents evidence in favor of the hypothesis that the current design in AFOREs statements may be triggering choice avoidance among Mexican workers. Also, exploiting loss aversion has the potential to encourage work-

ers to choose retirement fund managers providing higher net returns. This evidence is based on a relatively small sample of workers, but given the strength of the findings, future research is warranted to test if these results are robust to additional samples and contexts.

Figure 3.1: Sample of comparative table of AFOREs received in a worker's statement

The higher the NET RETURN, the higher the pension.

SB 1 for people 56 years old or more

NET RETURN INDEX

AFORE	RETURN[1]	FEES[2]	NET RETURN[3]
AFORE 1	9.49%	1.58%	7.91%
AFORE 2	9.02%	1.61%	7.41%
AFORE 3	8.71%	1.42%	7.29%
AFORE 4	7.81%	1.18%	6.63%
AFORE 5	8.26%	1.79%	6.47%
AFORE 6	7.71%	1.45%	6.26%
AFORE 7	7.77%	1.61%	6.16%
AFORE 8	7.61%	1.51%	6.10%
AFORE 9	7.69%	1.81%	5.88%
AFORE 10	7.50%	1.74%	5.76%
AFORE 11	6.83%	1.70%	5.13%
AFORE 12	6.88%	1.96%	4.92%
AFORE 13	6.64%	1.73%	4.91%
AFORE 14	5.81%	1.58%	4.23%

RETURN - FEES = NET RETURN

1.- Returns from the past 36 months
2.- Fees on Balance
3.- Net return is equal to the returns minus fees

Notes: In the example, the worker is affiliated to AFORE 6.

Table 3.1: Surveyed individuals' characteristics

Individual characteristics	Summary Statistics			
	Mean	Std Dev	Min	Max
Gender (=1 if male)	0.48	0.5	0	1
Age	37.39	11.6	20	60
Married	0.503	0.5	0	1
High Income	0.369	0.48	0	1

Source: Author's calculations using data for 292 individuals. High income is a dummy equal to one if the individual's income is more than $10,000 MXP.

Table 3.2: Individuals' characteristics, by number of correctly answered financial literacy questions

Number of correct financial literacy questions	% of men	Mean age	% married	% High income
0	0.652	40.9	0.609	0.091
1	0.473	38.5	0.567	0.372
2	0.485	36.6	0.444	0.344
3	0.484	30.7	0.258	0.655
Correctly answered financial literacy question on percentage				
No	0.525	42.4	0.59	0.183
Yes	0.483	36	0.475	0.418
Correctly answered financial literacy question on compound interest				
No	0.491	37.5	0.532	0.365
Yes	0.494	36.7	0.41	0.383
Correctly answered financial literacy question on credit card minimum payment				
No	0.508	38.3	0.551	0.326
Yes	0.466	35.6	0.414	0.441

Source: Author's calculations using data for 292 individuals.

Table 3.3: Differences among individuals' characteristics, by framing

Individual characteristics	Framing		
	Wins	Loss	Difference
Gender (=1 if male)	0.502	0.474	
	(0.036)	(0.046)	
Married	0.566	0.387	***
	(0.036)	(0.035)	
Age	37.99	36.11	
	(0.86)	(1.02)	
High Income	0.367	0.373	
	(0.035)	(0.047)	

Source: Author's calculations using data for 292 individuals. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 3.4: Predictors of AFORE choice

Variables	Recommended by family / friends		Recommended by coworkers		Recommended by employer		AFORE is stable		AFORE offers high returns		AFORE has low fees		AFORE provides good service	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Gender, =1 male	0.0908	0.1297	-0.1141	-0.0945	0.1278	0.1395	-0.3310	-0.3109	0.4184	0.3761	0.4061	0.4219	0.1492	0.1617
	(0.255)	(0.258)	(0.416)	(0.417)	(0.417)	(0.417)	(0.245)	(0.246)	(0.327)	(0.333)	(0.338)	(0.339)	(0.245)	(0.246)
Married	0.4734	0.4605	-0.6118	-0.6285	-0.6468	-0.6590	0.0532	0.0413	-0.0608	-0.0309	-0.2619	-0.2668	-0.0788	-0.0846
	(0.304)	(0.307)	(0.521)	(0.522)	(0.534)	(0.533)	(0.291)	(0.292)	(0.395)	(0.402)	(0.400)	(0.400)	(0.293)	(0.293)
Age in years	0.0506	0.0491	-0.1023	-0.0924	0.1336	0.1463	-0.0361	-0.0348	0.0245	0.0226	0.1676	0.1670	0.0263	0.0264
	(0.090)	(0.090)	(0.143)	(0.143)	(0.178)	(0.180)	(0.086)	(0.085)	(0.117)	(0.122)	(0.126)	(0.125)	(0.086)	(0.085)
Age squared	-0.0004	-0.0005	0.0009	0.0008	-0.0024	-0.0026	0.0007	0.0006	-0.0004	-0.0003	-0.0022	-0.0022	-0.0001	-0.0002
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Number of correct financial literacy questions	-0.0845	-0.0332	-0.1604	-0.1228	0.3144	0.3487	**-0.5052*****	**-0.4766*****	0.1596	0.0777	0.0136	0.0469	**-0.4661*****	**-0.4483*****
	(0.171)	(0.174)	(0.268)	(0.273)	(0.261)	(0.267)	**(0.167)**	**(0.169)**	(0.212)	(0.219)	(0.218)	(0.221)	**(0.168)**	**(0.170)**
Income >10k		**-0.6599****		-0.3494		-0.2867		-0.3883		**0.9213*****		-0.3531		-0.2236
		(0.285)		(0.449)		(0.442)		(0.261)		**(0.341)**		(0.367)		(0.263)
Constant	-2.1199	-1.8602	0.5834	0.5110	-4.1029	-4.2200	1.0147	1.1409	-2.4192	-2.8136	**-4.7852****	**-4.6459****	-0.5051	-0.4224
	(1.702)	(1.686)	(2.555)	(2.535)	(3.072)	(3.076)	(1.592)	(1.593)	(2.149)	(2.265)	**(2.335)**	**(2.311)**	(1.597)	(1.595)
Observations	292	292	292	292	292	292	292	292	292	292	292	292	292	292

Source: Author's calculations using data for 292 individuals. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 3.5: Predictors of attitudes toward retirement and financial literacy questions correctly answered

Variables	Think about retirement		Do you save enough for retirement?		Answered financial literacy question #1 correctly	Answered financial literacy question #2 correctly	Answered financial literacy question #3 correctly
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Gender, =1 male	0.2726	0.2733	0.2447	0.2415	-0.1990	0.0589	-0.0943
	(0.257)	(0.257)	(0.366)	(0.367)	(0.304)	(0.266)	(0.249)
Married	-0.0613	-0.0618	0.3254	0.3282	0.0728	**-0.5708***	**-0.5016***
	(0.309)	(0.310)	(0.458)	(0.459)	(0.364)	**(0.317)**	**(0.293)**
Age in years	**0.1743***	**0.1744***	**-0.2056***	**-0.2062***	0.0350	0.0283	0.1265
	(0.091)	**(0.091)**	**(0.124)**	**(0.125)**	(0.103)	(0.092)	(0.089)
Age squared	-0.0018	-0.0018	**0.0026***	**0.0026***	-0.0009	-0.0003	-0.0017
	(0.001)	(0.001)	**(0.002)**	**(0.002)**	(0.001)	(0.001)	(0.001)
Number of correct financial literacy questions	**-0.3237***	**-0.3227***	0.0917	0.0880			
	(0.170)	**(0.171)**	(0.244)	(0.246)			
Income >10k		-0.0115		0.0449	**0.9998*****	0.0250	0.3755
		(0.271)		(0.390)	**(0.369)**	(0.279)	(0.258)
Constant	**-2.7462***	**-2.7440***	1.3084	1.3029	1.2702	-1.3783	-2.4745
	(1.656)	**(1.656)**	(2.267)	(2.272)	(1.956)	(1.716)	(1.641)
Observations	292	292	292	292	292	292	292

Source: Author's calculations using data for 292 individuals. Questions 1, 2, and 3 test the concepts of percentage, compound and simple interest, respectively. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 3.6: Logit regression results. Dependent variable: Choose higher ranked AFORE

Variables	Panel A. Logit regression results		
	[1]	[2]	[3]
Choice Avoidance dummy	**0.5295****	**0.5437****	**1.2780*****
	(0.227)	**(0.228)**	**(0.443)**
Loss Aversion dummy	0.3755	0.3258	0.9536
	(0.287)	(0.290)	(0.695)
Choice Avoidance*Loss Aversion dummy	0.6979	0.6996	3.1443
	(0.541)	(0.545)	(2.019)
Dummy =1 if male		-0.3964	-0.3759
		(0.267)	(0.268)
Dummy =1 if married		-0.3395	-0.3354
		(0.330)	(0.331)
Age (in years)		0.0714	0.0599
		(0.094)	(0.095)
Age squared		-0.0010	-0.0009
		(0.001)	(0.001)
Dummy =1 if income is >10,000 MXP		-0.0779	-0.1047
		(0.295)	(0.300)
Number of fin. Lit. questions correctly answered			**0.4139***
			(0.244)
Number of F.L q's correctly answered*Choice Av			**-0.6049****
			(0.280)
Number of F.L q's correctly answered*Loss Av			-0.4855
			(0.377)
Number of F.L q's corr answered * ChoiceAv * Loss Av			-0.8141
			(0.796)
Constant	**1.6260*****	0.4375	0.1252
	(0.161)	(1.681)	(1.686)
Observations	863	863	863
	Panel B. Marginal effects		
Choice Avoidance	**0.068*****	**0.068*****	
	(0.018)	**(0.018)**	
Loss Aversion	**0.052***	**0.047***	
	(0.027)	**(0.027)**	
Choice Avoidance at 0 correctly answered F.L.			**0.138****
			(0.042)
Choice Avoidance at 1 correctly answered F.L.			**0.087*****
			(0.021)
Choice Avoidance at 2 correctly answered F.L.			**0.038***
			(0.021)
Choice Avoidance at 3 correctly answered F.L.			-0.026
			(0.039)
Loss Aversion at 0 correctly answered F.L.			**0.112****
			(0.056)
Loss Aversion at 1 correctly answered F.L.			**0.067****
			(0.031)
Loss Aversion at 2 correctly answered F.L.			0.028
			(0.031)
Loss Aversion at 3 correctly answered F.L.			-0.024
			(0.058)

Source: Author's calculations. The number of observations is 863 instead of 876 (=292*3) because 13 hypothetical exercises were not answered. Standard errors in parenthesis are adjusted for clustering at the individual level. Marginal effects in panel B are estimated from the logit results shown in panel A. Standard errors in panel B are estimated using the delta method. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 3.7: Logit regression results. Dependent variable: Choose the top ranked AFORE

Variables	Panel A. Logit regression results		
	[1]	[2]	[3]
Choice Avoidance dummy	**0.7819*** **	**0.8603*** **	**1.72*** **
	(0.208)	**(0.220)**	**(0.435)**
Loss Aversion dummy	0.1469	0.1636	1.0593
	(0.259)	(0.269)	(0.741)
Choice Avoidance*Loss Aversion dummy	0.2004	0.2057	0.4767
	(0.346)	(0.365)	(1.251)
Dummy =1 if male		-0.4365*	-0.4076
		(0.250)	(0.251)
Dummy =1 if married		-0.4575	-0.4544
		(0.332)	(0.330)
Age (in years)		0.0304	0.0134
		(0.091)	(0.092)
Age squared		-0.0003	-0.0001
		(0.001)	(0.001)
Dummy =1 if income is >10,000 MXP		0.2761	0.2565
		(0.324)	(0.328)
Number of fin. Lit. questions correctly answered			**0.5340** **
			(0.227)
Number of F.L q's correctly answered*Choice Av			**-0.6726** **
			(0.273)
Number of F.L q's correctly answered*Loss Av			**-0.6521***
			(0.384)
Number of F.L q's corr answered * ChoiceAv * Loss Av			0.1582
			(0.590)
Constant	**1.0163*** **	-0.3960	-0.8319
	(0.150)	(1.665)	(1.708)
Observations	863	863	863
	Panel B. Marginal effects		
Choice Avoidance	**0.127*** **	**0.128*** **	
	(0.023)	**(0.023)**	
Loss Aversion	0.031	0.031	
	(0.040)	(0.036)	
Choice Avoidance at 0 correctly answered F.L.			**0.234*** **
			(0.056)
Choice Avoidance at 1 correctly answered F.L.			**0.156*** **
			(0.031)
Choice Avoidance at 2 correctly answered F.L.			**0.083** **
			(0.026)
Choice Avoidance at 3 correctly answered F.L.			0.013
			(0.046)
Loss Aversion at 0 correctly answered F.L.			**0.158***
			(0.082)
Loss Aversion at 1 correctly answered F.L.			0.072
			(0.050)
Loss Aversion at 2 correctly answered F.L.			-0.007
			(0.040)
Loss Aversion at 3 correctly answered F.L.			-0.080
			(0.068)

Source: Author's calculations. The number of observations is 863 instead of 876 (=292*3) because 13 hypothetical exercises were not answered. Standard errors in parenthesis are adjusted for clustering at the individual level. Marginal effects in panel B are estimated from the logit results shown in panel A. Standard errors in panel B are estimated using the delta method. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 3.8: Logit regression results. Dependent variable: Choose AFORE with lower fees

Variables	Panel A. Logit regression results		
	[1]	[2]	[3]
Choice Avoidance dummy	**0.4684****	**0.4814****	**1.1894*****
	(0.230)	**(0.231)**	**(0.448)**
Loss Aversion dummy	0.1848	0.1454	0.7535
	(0.287)	(0.289)	(0.661)
Choice Avoidance*Loss Aversion dummy	0.8886	0.8937	3.3563*
	(0.550)	(0.554)	(2.029)
Dummy =1 if male		-0.4159	-0.3966
		(0.270)	(0.271)
Dummy =1 if married		-0.2692	-0.2647
		(0.323)	(0.325)
Age (in years)		0.0816	0.0705
		(0.095)	(0.096)
Age squared		-0.0011	-0.0010
		(0.001)	(0.001)
Dummy =1 if income is >10,000 MXP		0.0182	-0.0041
		(0.310)	(0.316)
Number of fin. Lit. questions correctly answered			**0.4026**
			(0.245)
Number of F.L q's correctly answered*Choice Av			**-0.5824****
			(0.281)
Number of F.L q's correctly answered*Loss Av			-0.4702
			(0.362)
Number of F.L q's corr answered * ChoiceAv * Loss Av			-0.8310
			(0.798)
Constant	**1.6870*****	0.2075	-0.0976
	(0.164)	(1.705)	(1.707)
Observations	863	863	863
	Panel B. Marginal effects		
Choice Avoidance	**0.068*****	**0.068*****	
	(0.018)	**(0.018)**	
Loss Aversion	0.037	0.033	
	(0.028)	(0.027)	
Choice Avoidance at 0 correctly answered F.L.			**0.134****
			(0.042)
Choice Avoidance at 1 correctly answered F.L.			**0.086*****
			(0.021)
Choice Avoidance at 2 correctly answered F.L.			**0.040***
			(0.021)
Choice Avoidance at 3 correctly answered F.L.			-0.021
			(0.039)
Loss Aversion at 0 correctly answered F.L.			**0.096***
			(0.056)
Loss Aversion at 1 correctly answered F.L.			**0.053***
			(0.032)
Loss Aversion at 2 correctly answered F.L.			0.015
			(0.031)
Loss Aversion at 3 correctly answered F.L.			-0.035
			(0.058)

Source: Author's calculations. The number of observations is 863 instead of 876 (=292*3) because 13 hypothetical exercises were not answered. Standard errors in parenthesis are adjusted for clustering at the individual level. Marginal effects in panel B are estimated from the logit results shown in panel A. Standard errors in panel B are estimated using the delta method. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Appendix A

Appendix

A.1 Pension wealth estimation

I estimate the social security wealth of Mexican workers under two retirement regimes. The first regime is based on the Social Security law of 1973 (PAYGO). The second regime is based on the rules for the new pension system that began in 1997 (MxIRA). The calculations are similar to the procedure presented in Aguila (2008).

The PAYGO retirement wealth is based on the estimated monthly pension the worker will receive at retirement. The IMSS 1973 provides tabulations of the monthly pension a worker should receive according to her income level, years contributed and age at retirement. This information is summarized in Figure A1. The projected age of retirement is 65. However, workers can choose to retire and collect severance payments as soon as they turn 60 years old. Under the PAYGO regime, severance payments provide a replacement rate of 0.75 with respect to the retirement payments a worker would have earned if retired by age 65. According to the IMSS and other related studies, the regime is actuarially unfair after the age of 60 and the vast majority of Mexican workers choose to retire early. The present value (at the moment of retirement) of the social security wealth under the PAYGO system

is calculated according to the following equation:

$$PVSS_{paygo} = \sum_{i=R}^{T} \frac{AP_{paygo}(1 - \pi_{i-R+1})}{1 + \rho^{i-R}} \tag{A.1}$$

where AP_{paygo} is the annual equivalent of the monthly pension the worker will receive according to the 1973 law, T is the life expectancy, R is the year of retirement, π is the inflation loss of the minimum wage, and ρ is the time discount factor.

The 1997 regime retirement wealth is based on the balance accumulated on the MxIRA account. Each worker makes a compulsory contribution to her retirement account. This contribution is complemented by the employer and the government at predetermined rates. On average, the contributions amount to 13% of the worker's salary. The accounts holding the worker's contribution are invested and earn interest. The AFOREs hold and invest these funds and charge a fee for this service. The balance on the account at the point of retirement is calculated with a net annual return of 8.023% on the MxIRA. This rate represents the average net annual return recorded in the pension system from its creation until 2003. To calculate the worker's MxIRA balance at the moment of retirement, I calculate the contributions made throughout the working life and account for the interest accrued every quarter on the account. I assume that the worker's pension is an annuity that depletes her accumulated pension wealth exactly during her lifespan. This is equivalent to assume that there is no cost to obtain an annuity. Finally, the annuities under the 1997 regime are price-indexed so there is no loss due to inflation. The equation to

calculate the present value of the worker's pension wealth under the 1997 regime is:

$$PVSS_{MxIRA} = \sum_{i=R}^{T} \frac{AP_{MxIRA}}{1+\rho^{i-R}} \tag{A.2}$$

where AP_{MxIRA} is the annuity received by the worker according to her MxIRA balance.

The calculations for both regimes use a common set of assumptions. All workers have contributed exactly 25 years towards the social security system and are entitled to receive benefits under any regime. Workers retire at the age of 60 when they are entitled to severance benefits. A discount rate of 1% and an annual drop in minimum wage value of 4.28% are used in the estimations. The drop of the real minimum wage is based on the average drop of value between the new pension system was created and the year the tax break policy was implemented. Life expectancy is set at 93 - the male life expectancy according to IMSS own estimations. The long life expectancy is because a male worker's benefits are transferable to his widow and young children.

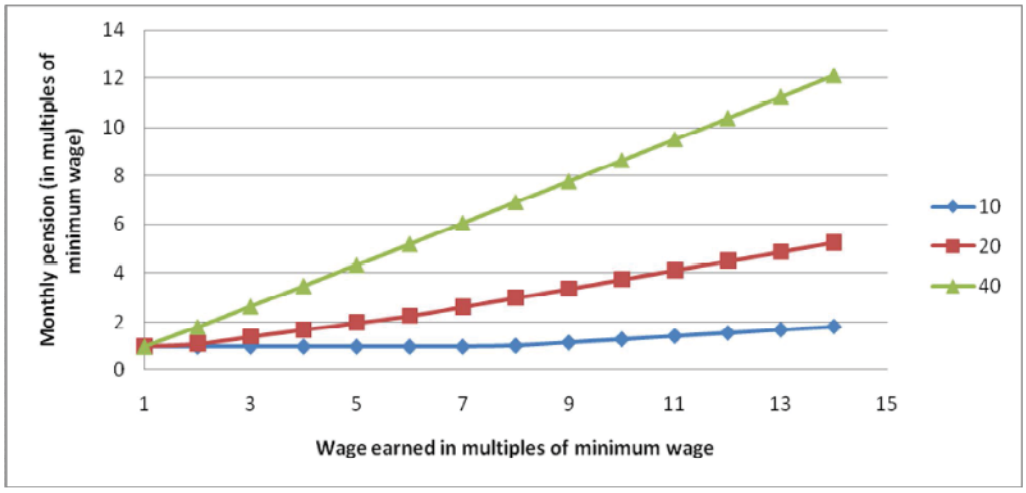
Equations (A.1) and (A.2) are estimated for several cases. The present value of retirement wealth is calculated for a series of income levels (measured in multiples of the minimum wage). For each income level, the present value of retirement wealth is estimated according to the worker's age in 1997 and the number of years remaining until she turns 60. Table A.1 presents an abstract of the results.[1] I find evidence that workers who earn between 1 and 4 times the minimum wage get a

[1]The complete table is available from the author upon request.

higher pension under the 1997 regime. Moreover, these workers fall back on the government's Guaranteed Pension. The amount of $276,040 is the present value of retirement wealth with payouts equivalent to one CPI-indexed minimum wage.

I estimate the retirement wealth under both pension regimes with alternative assumptions: a scenario with a net annual return on MxIRA of 4%; a higher discount rate; and the set of assumptions followed by Aguila (2008) - a net MxIRA return of 8.56%, retirement at the age of 65, an annual drop in minimum wage value of 6.4%. The result where low income workers fall back to the Guaranteed Pension is found in all of them.

Figure A.1: Pension received by earned wages according to the 1973 IMSS law, by years of contribution



Source: Own calculations based on IMSS law.

Table A.1: Estimated pension wealth under the 1973 (PAYGO) and 1997 (MxIRA) pension regimes, by age in 1997 and income level

Age in 1997	Years until retirement	Regime	EARNINGS IN MINIMUM WAGE MULTIPLES			
			1	2	3	4
53	7	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	7	PAYG	112,492	143,968	192,497	240,531
52	8	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	8	PAYG	112,492	143,968	192,497	240,531
51	9	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	9	PAYG	112,492	143,968	192,497	240,531
50	10	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	10	PAYG	112,492	143,968	192,497	240,531
⋮						
37	23	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	23	PAYG	112,492	143,968	192,497	240,531
36	24	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	24	PAYG	112,492	143,968	192,497	240,531
35	25	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	25	PAYG	112,492	143,968	192,497	240,531
34	26	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	26	PAYG	112,492	143,968	192,497	240,531
⋮						
21	39	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	39	PAYG	112,492	143,968	192,497	240,531
20	40	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	40	PAYG	112,492	143,968	192,497	240,531
19	41	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	41	PAYG	112,492	143,968	192,497	240,531
18	42	MxIRA	**276,040**	**276,040**	**276,040**	**276,040**
	42	PAYG	112,492	143,968	192,497	240,531
EARNINGS IN MINIMUM WAGE			1	2	3	4

Source: Author's calculations.

A.2 Calculation of the Marginal Tax Rate

The marginal tax rate (MTR) for Mexican workers used in Table 2.4 is estimated from the detailed information on the workers' income recorded in the ENIGH. Since this analysis focuses on private and public sector employees, only labor income is included in the calculation of the MTR.[2] The calculation was done following several steps that I describe below.

First, I calculate the worker's post-tax monthly income by components. The ENIGH collects information on labor income by components. That is, the interviewee is asked to differentiate between income coming from wages, overtime pay, Christmas bonuses, *vales de despensa*[3], gratifications, holiday bonuses, etc. Each component is recorded quarterly and "post-tax". To get a monthly estimate I divide each component by three.

The next step is to estimate the worker's pre-tax monthly income and corresponding tax rate. To do this I incorporate three features of the Mexican tax code. First, the taxes withheld in each worker's paycheck depends on her income level and on the ratio of taxable income to total income of the firm she works for. Each year, the Mexican Treasury publishes a table of tax rates for each possible ratio (going from 0.50 to 1.00). Each ratio tax table (RTT) presents income bins that define the tax rate to be applied to the worker's income. The second feature of the tax code is that each component of labor income has a different taxable share. For example,

[2]Excluding households whose non-labor income represents a significant share of total household income changes the sample size only negligibly.

[3]The *vales* are food vouchers given to workers that can be used as cash in stores to buy food products specifically. They are not "food stamps" like in the U.S. in that workers with any income level can receive them.

wages are fully taxable, whereas Christmas bonuses are taxable only up to a certain amount. In collaboration with an accountant in Mexico, I kept track of the taxable shares of each labor income component recorded in the ENIGH. Lastly, I account for social security taxes withholding. These taxes are paid by private and public sector workers. Private sector workers are withheld an amount equivalent to around 2.4% of their salary. The withholding for public sector workers is around 8% of their salary.

To estimate the worker's pre-tax monthly income I follow an iterative process using the Mexican Treasury tax rate data for each year included in the period of analysis. I start by the lowest tax bracket in the RTT for the lowest ratio. I use the corresponding tax rate to estimate what would be a worker's pre-tax labor income given her recorded amounts in each labor income component. The estimate of the pre-tax labor income is then compared to the income bracket corresponding to the tax rate applied. If the estimate is between the lower and upper bounds of the bracket, the pre-tax labor income and tax rate is recorded. This calculation is then performed for the next tax bracket in the same RTT. Once estimates are calculated (and possibly recorded) for each tax bracket, the same process is repeated with the following RTT. Almost always only one pre-tax labor income is recorded for each RTT. The ENIGH does not provide information about the firms workers work for. Thus, the final estimate of the worker's monthly pre-tax labor income (tax rate) is the average of the recorded pre-tax labor income (tax rate) estimates.

The estimated tax rate represents the tax rate that would be applied to the marginal peso earned as wages, i.e. the marginal tax rate.

A.3 Sample Survey

This survey will take only a few minutes to complete. Please read the instructions for each question and mark your answer. If you would rather not answer a particular question, you can choose "Prefer not to answer". Remember that our goal is to learn your opinions about the Pension System in Mexico. There are no wrong answers. THANK YOU FOR PARTICIPATING!

1. Do you currently work? □ Yes □ No

2. Do you contribute to a social security pension system (IMSS/ISSSTE)?
   □ Yes □ No

3. Gender: □ Male □ Female

4. What is your age?
   I'm _____ years old. □ Prefer not to answer

5. Are you currently …?
   □ Single? □ Married?
   □ Other marital status? □ Prefer not to answer

Now, we would like to ask you about retirement savings

6. Which of the following statements describes you better?

□ I think about my retirement savings frequently
□ I think about my retirement savings every now and then
□ I seldom think about my retirement savings.
□ I have never thought about saving for my retirement
□ I prefer not to answer

7. For each statement, please mark the option that best describes your opinion.

	Disagree completely	Disagree	Neutral	Agree	Agree completely
(a) I have enough information about the retirement system.					
(b) I understand what the investment options are in the AFOREs					
(c) I prefer to save for my retirement in my AFORE rather than in other vehicles.					
(d) I think I'm saving enough for my retirement.					

8. Do you know which AFORE you are currently registered in?

□ Yes, my AFORE is: _____ □ No

9. Which are the main reasons you chose (or stayed with) your current AFORE? Please select up to three answers.

□ Friend or relative recommended
□ Co-worker recommendation
□ My employer offers this AFORE
□ Lower fees
□ My bank accounts are in the same bank
□ Highest returns
□ I believe it's the more stable AFORE
□ A large number of branches
□ It was assigned to me by CONSAR
□ Good service
□ Other: _____
□ Prefer not to answer

10. Have you ever switched AFOREs?

□ Yes □ No □ I don't know □ Prefer not to answer

11. How long have you been with your current AFORE?

□ Less than a year □ 1 – 2 years □ 3-5 years
□ More than 5 years □ I don't know □ Prefer not to answer

12. Have you ever received an AFORE statement?

□ Yes □ No □ I don't know □ Prefer not to answer

13. Approximately, in which of the following bins would you locate your monthly income?

□ $0 - $2000 pesos □ $6001 - $8000 pesos □ $15001 - $25000
□ $2001 - $4000 pesos □ $8001 - $10000 pesos □ More than $25000
□ $4001 - $6000 pesos □ $10001 - $15000 pesos □ Prefer not to answer

Now, we would like to ask you some questions about some situations commonly faced by people. Please answer them to the best of your knowledge. If you believe you do not know the answer, or if you prefer not to answer select the corresponding option.

14. In a supermarket, product A typically costs $700 and product B typically costs $1000. If today product B is being offered with a 30% discount, which of the two products is cheaper?

□ Product A
□ Product B
□ They cost the same
□ I don't know
□ Prefer not to answer

15. Say that you have a savings account with $1000 pesos. The bank in which you have your account gives you an annual rate of return of 10%. If you don't make any deposits or withdrawals for five years, how much would you say the balance in your account be at the end of these 5 years?

□ Exactly $1500 pesos □ More than $1500 pesos
□ Less than $1500 pesos □ I don't know
□ Prefer not to answer

16. Say that you have a credit card from which you owe $2000 pesos. The bank charges you a monthly interest rate of 1%. If you decide to pay the minimum payment of $20 every month, how many years will it take to get rid of your debt?

□ Less than 5 years □ Between 5 and 10 years
□ Between 10 and 15 years □ Never, I will always be in debt
□ I don't know □ Prefer not to answer

[PRESENT HYPOTHETICAL CASE]

17. In scenario 1, I would recommend:

□ He stays in his current AFORE □ He switches AFORE to: _____

18. In scenario 2, I would recommend:

□ He stays in his current AFORE □ He switches AFORE to: _____

19. In scenario 3, I would recommend:

□ He stays in his current AFORE □ He switches AFORE to: _____

20. Would you be willing to be re-contacted by our team regarding this research project?

□ Yes □ No

SAMPLE SURVEY – SPANISH VERSION

La encuesta le quitará unos pocos minutos de su tiempo. Si prefiere no contestar alguna pregunta en particular, puede indicar “Prefiero no contestar”. Recuerde que nuestro objetivo es conocer más sobre su opinión del sistema de ahorro para el retiro en México. No hay respuestas incorrectas. ¡GRACIAS POR SU PARTICIPACIÓN!

1. ¿Trabaja actualmente? □ Sí □ No

2. ¿Contribuye actualmente a algún sistema de seguro social (IMSS/ISSSTE)?
□ Sí □ No

3. Género: □ Masculino □ Femenino

4. ¿Cuántos años cumplidos tiene?
_____ años. □ Prefiero no contestar

5. ¿Actualmente.…?
□ es soltero? □ es casado?
□ tiene otro estado civil? □ Prefiero no contestar

Ahora, nos gustaría hacerle algunas preguntas sobre el ahorro para el retiro.

6. ¿Cuál de las siguientes oraciones diría usted que lo describe mejor? *Lea las opciones y marque la indicada*

□ Pienso en mi ahorro para el retiro frecuentemente
□ Pienso en mi ahorro para el retiro a veces
□ Muy de vez en cuando pienso en mi ahorro para el retiro
□ Nunca he pensado en mi ahorro para el retiro
□ Prefiero no contestar

7. Para cada oración, por favor indíqueme que postura describe mejor su opinión

	Totalmente de acuerdo	De acuerdo	Neutral	En desacuerdo	Totalmente en desacuerdo
(a) Tengo suficiente información sobre el sistema del ahorro para el retiro.					
(b) Entiendo bien cuáles son las opciones de inversion de las AFOREs.					
(c) Prefiero ahorra para mi retiro en mi AFORE que fuera de ella.					
(d) Considero que estoy ahorrando lo suficiente para mi retiro.					

8. ¿Conoce usted en qué AFORE está registrado?

□ Sí, mi AFORE es: _____ □ No

9. ¿Cuáles fueron las principales razones por la que usted eligió (o se mantuo en) su AFORE actual? Puede seleccionar hasta **tres opciones**.

□ Recomendado por familiar/amigo
□ Recomendado por compañero de trabajo
□ Mi empleador ofrece esa AFORE
□ Las comisiones son bajas
□ Tengo otras cuentas en el mismo banco
□ Me da el mayor rendimiento
□ Confío en la estabilidad de la AFORE
□ Mayor accesibilidad a sucursales
□ Me la asignó la CONSAR
□ Buen servicio
□ Otra: _____
□ Prefiero no contestar

10. ¿Ha cambiado usted alguna vez de AFORE?

□ Sí □ No □ No se □ Prefiero no contestar

11. ¿Por cuánto tiempo ha permanecido con su AFORE actual?

□ Menos de 1 año □ 1 – 2 años □ 3-5 años
□ Más de 5 años □ No se □ Prefiero no contestar

12. ¿Ha recibido alguna vez un estado de cuenta de su AFORE?

□ Sí □ No □ No se □ Prefiero no contestar

13. Aproximadamente, ¿en cuáles de las siguientes catergorías ubicaría su salario mensual?

□ $0 - $2000 pesos □ $6001 - $8000 pesos □ $15001 - $25000
□ $2001 - $4000 pesos □ $8001 - $10000 pesos □ Más de $25000
□ $4001 - $6000 pesos □ $10001 - $15000 pesos □ Prefiero no contestar

Ahora quisiéramos hacerle unas preguntas basadas en algunas situaciones a las que las personas se enfrentan en la vida cotidiana. Por favor respóndalas de acuerdo a lo que considere correcto, no es necesario consultar otras fuentes. Si considera que no conoce la respuesta, o prefiere no contestar escoja la opción que corresponde.

14. En un supermercado el producto A vale $700 y el producto B vale $1000. Si al producto B le hacen un descuento del 30%, ¿cuál de los dos productos es más barato?

□ Producto A □ Producto B □ Cuestan lo mismo
□ No se □ Prefiero no contestar

15. Imagine que usted tiene una cuenta de ahorros con $1000 pesos y que la tasa de interés anual es del 10%. Si usted dejara crecer su dinero y no realizara ningún retiro, ¿cuánto cree usted que tendrá en su cuenta al cabo de 5 años?

□ Exactamente $1500 pesos
□ Más de $1500 pesos
□ Menos de $1500 pesos
□ No se
□ Prefiero no contestar

16. Suponga que usted debe $2000 pesos en su tarjeta de crédito. El banco calcula los intereses mensualmente y su tasa de interés es de 1% mensual. Si usted paga el pago mínimo de $20 cada mes y no le carga más a su tarjeta de crédito, ¿en cuántos años calcula usted que terminará de pagar su deuda?

□ Menos de 5 años
□ Entre 5 y 10 años
□ Entre 10 y 15 años
□ Nunca, siempre estaré en deuda
□ No se
□ Prefiero no contestar

[PRESENTE LOS CASOS HIPOTÉTICOS]

17. Yo le recomendaría en el caso 1 que:

□ Se quede en su AFORE □ Cambie su AFORE a: _____

18. Yo le recomendaría en el caso 2 que:

□ Se quede en su AFORE □ Cambie su AFORE a: _____

19. Yo le recomendaría en el caso 1 que:

□ Se quede en su AFORE □ Cambie su AFORE a: _____

20. Finalmente, nos gustaría contactarlo de nuevo para comentarle sobre los resultados del proyecto. ¿Estaría de acuerdo en que lo contactáramos de nuevo?

□ Sí E-mail:_____ Teléfono:_____
□ No

A.4 Hypothetical scenario with six AFORE options and loss framing

HYPOTHETICAL CASE
This is Mari's case:

Mari is a worker who has saved $10,000 in her AFORE. As of today, Mari is 56 years old and is currently affiliated to AFORE XXI. With information from her last AFORE statement, Mari put together the following table:

SB 1 for people 56 years old or more

NET RETURN INDEX

AFORE	RETURN	FEES	NET RETURN
Azteca	9.49%	1.81%	7.68%
Profuturo GNP	8.14%	1.81%	6.33%
Invercap	7.96%	1.78%	6.18%
Banorte Generali	7.56%	1.38%	6.18%
ING	7.78%	1.62%	6.16%
XXI	7.80%	1.80%	6.00%

RETURN - FEES = NET RETURN

It seems like Mari lost money in the previous period since she accumulated less than what she could have obtained for her retirement savings. If you could give Mari some advice, what would you recommend?

□ I would recommend that she stays in her current AFORE
□ I would recommend that she switched to AFORE: _____

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