Institutional Design of Pension Systems and Individual Behavior: How do Households Respond?

Renata Herrerias and Guillermo Zamarripa[*]

December 10, 2019

Mexico adopted a Defined Contribution (DC) Pension System with private individual accounts in 1997. We use the pension reform as a natural experiment to compare the expectations of policy makers at that time with the actual behavior of workers participating in the system. Pension rules were intended to encourage workers to assume full ownership of their pension accounts, to participate in the formal labor market (tax paying firms), and to induce additional pension savings. Using a panel data of Mexican workers, we find that individuals participate much less than required, the alternative of voluntary savings have almost been ignored, and 30 percent of affiliated workers do not claim ownership of their pension accounts. We analyze the dynamic of workers' behaviors finding that men, higher income workers, workers with housing credit and individuals living in richer regions are the ones most likely to comply with the rules. Worker characteristics and local labor market rigidities prevailed over pension incentives. The consequence is that only one third of participants are expected to receive lifetime pension income under the reformed system. We conclude that pension policy design should consider as a restriction the structure of local labor markets and not the other way.

Keywords: Pensions, Pension Policy, Defined Contribution, Labor Markets

JEL G23, G28, H75, J31

---

1.   Introduction

Mexico introduced a Defined Contribution (DC) Pension System in 1997 for private sector workers replacing the unfunded Defined Benefit (DB) system that prevailed since 1973. The substitution of DB systems by fully funded DC systems with private individual accounts, is a process that started in 1981 in Chile and proved to be a global trend (Orenstein 2013). Many elements of the design of the Mexican system were taken from the Chilean model and from policy recommendations of multilateral organizations[1]. We use the institutional design of the new pension system in Mexico as a natural experiment to compare the expectations of policy makers at that time with the actual behavior of workers participating in the system. We center our analysis on the elements of the reform directly related to workers' behaviors and the structure of the local labor market. We study three aspects of the design: enrollment, minimum required participation to obtain pension benefits, and voluntary savings.

The pension system that Mexico adopted, implies that upon retirement the worker replaces labor income with an annuity purchased with the savings accumulated during working life. Savings are built from periodical compulsory contributions and additional voluntary savings. Future values of savings depend on workers' participation and on the rates of return of financial markets. The shape of new system was based on the widespread believe that the role of the state should decrease and individuals should become responsible for their old-age income, implying a risk transfer from the government and corporations to households. The design was based on principles of transparency and ownership. Policy makers at the time believed that this design was strong enough to incentivize

---

[1] Barr and Diamond (2016) assert that the arrangements in Chile were highly influential in Latin America and other emerging economies. Between 1981 and 2004, thirty countries fully or partially replaced DB systems with a DC scheme following the Chilean system (Perotti and Schwienbacher 2009). Aggarwal and Goodell (2013) argue that pension reforms accelerated because of fiscal burdens of retirement benefits.

workers to join the formal labor market, surpassing labor market rigidities related to informality, and to be more involved with their retirement savings.

As in many countries, the adoption of the pension reform and its implementation in Mexico succeeded in many aspects. For instance, in those aspects related to financial development and innovation, increase in national savings, and private capital formation towards old-age provision (Lindbeck and Persson 2003, Feldstein 2005, Aguila 2011, and Scharfstein 2018).

To disentangle the limits of the pension policy design, we analyze first who tends to complete the enrollment process. The system considers automatic enrollment when individuals join a tax-paying firm (formal labor market). However, during the first year of affiliation, the worker has to choose a pension fund manager to complete the enrollment process. The regulator allocates the workers that do not completed enrollment to a pension fund manager, and the worker is known as "assigned". Not completing the enrollment process implies that the worker is not taking ownership and control of her account and leaves the regulator as the decision maker. Choi, Laibson, Madrian and Metrick (2002) study automatic enrollment to 401(k) presenting evidence of individual procrastination and self-control biases. In this line, our results indicate that one third of affiliated workers in Mexican pension system do not complete the enrollment process. Among them, 56 percent join the system only once and participate less than 1 year which adds noise to the system and overestimate pension coverage rates. The key puzzle is why workers with higher participation rates do not complete the enrolment process? We find that lower income and lower number of employers explain this behavior.

Second, considering that the key objective of the system is to guarantee that pension savings will provide old-age income, we determine who is expected to receive pension benefits under the new

rules by analyzing in detail the dynamics of workers participation like Smith (2006). As part of the reform in Mexico, regulators increased the minimum required time of active participation from 10 to 24 years to transform accumulated savings into lifetime annuities with a minimum guaranteed pension. Forteza, Apella, Fajnzylber, Grushka, Rossi and Sanroman (2011) report low average density of contributions and frequent interruptions with short periods of contribution in Argentina, Chile and Uruguay. Alonso, Hoyo and Tuesta (2015) show that in Mexico obtaining adequate pensions will be restricted only to those with high income and long employment history. We report that the increase in the required time implies that only one-third of participants are expected to transform pension savings into lifetime annuities. Those not obtaining a pension will receive accumulated savings as a lump sum upon retirement. We find that characteristics such as gender, income, geographic location, number of employers and having a housing credit explain participation. Having a mortgage seems to be the most important determinant to predict participation in the formal labor market, and thus, in the pension system.

Finally, the third element that we study is related to voluntary savings. We provide some insights on who makes additional voluntary contributions to pension savings which is an element of the pension regulation that has been almost ignored. Van Rooij, Lusardi, and Alessie (2011) report a strong and positive relationship between financial knowledge and retirement planning. Similar to their results we find that the few individuals with voluntary contributions are high income workers.

Our analysis is based on a unique data set obtained from the regulator[2] that contains a sample of workers enrolled in Mexican Pension System after 1997 under the new pension regime. The data reports socioeconomic information together with contributions and income over time (panel data).

---

[2] CONSAR or National Commission for Retirement Savings

We explore the variations in behavior between workers who complete the enrollment process and those who do not, between men and women, by income, by geographic location and by whether or not the individual has a mortgage with National Housing Institute (INFONAVIT[3]).

There are studies analyzing the outcomes and the effects of pension reforms, and reporting low coverage and participation in DC systems. For example, Poterba, Rauh, Venti and Wise (2007) simulate potential outcomes of DC and DB systems in the United States finding that average accumulated retirement wealth under DC plans exceed average wealth in DB plans; however, DC plans are more likely to generate very low retirement wealth. Grech (2013) evaluates the sustainability of pension reforms in Europe asserting that pension generosity significantly decreased in some countries and in some others fiscal pressures did not disappear. He also points that linking benefits to contributions reinforced the need for longer labor careers. Crawford and Disney (2014) studied the impact of reforms of pension plans of the police force in England and Wales measuring the change in pension liabilities for polices and taxpayers. Ni and Podgursky (2016) use the case of pension reforms of public school's teachers in Missouri to calibrate a model to estimate the effects of transitioning to DC alternatives. Barr and Diamond have extensively analyzed pension reforms particularly focusing on Chile and China (see for instance Barr and Diamond 2008, 2010 and 2016). In Barr and Diamond (2010) they explain that Chile had to introduce noncontributory pensions in 2008 in response to the changing structure of the labor force. At that time, the Chilean government recognized that "the prevailing image in Chile in 1981, of a workforce composed mainly of male heads of household, with permanent jobs, contributing

---

[3] INFONAVIT is the National Housing Institute for workers in the private sector. As part of social security benefits, formal workers are entitled to obtain a mortgage from the Institute after three years of formal employment.

continuously throughout their active lives, became less representative of the real situation of the country[4]".

We add to the literature by explaining why local market conditions and rigidities in the labor market can prevail over the incentives of a DC pension system, preventing individuals to fully benefit from the social security system and to assume more responsibility on pension savings. We provide a detailed analysis of the actual structure of the labor force participating in the Mexican pension system and we identify which variables determine participation (density of contribution). We explain the dynamics of workers' behaviors over time and show the constant transit or workers between formal and informal jobs or unemployment, most of all among low income workers and women. We find that socioeconomic factors like income, gender, and geographic location are related to workers' behaviors regarding enrollment, participation and additional savings.

Ongena and Zalewska (2018) assert that the main challenge for the optimal design of a pension system is how to create the right incentives to induce adequate individual behavior toward savings for retirement, or to counter the individual life-cycle myopia (Feldstein and Liebman 2002). Our results support the view that the design of the Mexican pension system has not achieved those goals and have not met policy makers expectations as only one third workers are expected participate enough time to transform their savings into pension income. Therefore, the reform will not be successful at preventing poverty at old age because workers do not behave as policy makers predicted. Our results lay the ground for policy recommendations and changes to the institutional design of DC systems.

---

[4] Presidential Advisory Council on Pension Reform (2006) cited by Diamond and Barr (2010).

The rest of the paper is organized as follows. Section 2 presents a brief description of the Mexican Pension System. We describe the database and provide stylized facts of the System in section 3. Section 4 presents univariate analyses of groups of worker's behaviors. Section 5 contains regression analyses to corroborate the importance of variables explaining enrollment and participation. We analyze our findings in Section 6 and Section 7 concludes.

2.   The Mexican Pension System

The new pension system is part of the social security policy in México that also includes health services and the right to receive a mortgage loan with INFONAVIT. Every worker in the formal economy (tax paying firms) is entitled by law to social security. The design of the DC system consists of mandatory and voluntary contributions to individual pension accounts. Compulsory contributions are every two months. The reform did not modify the rate of contribution that is on average 6.5 percent of a worker's salary (5.15 percent paid by the employer, 0.225 percent by the government, and the rest by the worker). Contributions to the system occur while the individual is laboring in a formal company. Accumulated pension savings are invested in SIEFORES (Specialized retirement mutual funds), exclusively managed by AFORES (retirement-specialized fund managers).

The reform changed the minimum time of contribution to be eligible for the minimum guaranteed pension (MGP). The required time of participation increased from 10 years (500 weeks) to 24 years (1,250 weeks). Upon retirement individuals working in the formal market for at least 1,250 weeks will invest their savings in an annuity. The MGP secures that the lifetime monthly payment will be at least 1 minimum salary which is an important feature of the design of DC systems

because it provides a social protection base. Workers that do not meet the time requirement will claim all savings as a lump sum at age 65 or upon retirement and will not secure a lifetime annuity.

The system has an automatic enrollment process that takes place when a tax-paying firm registers their employees with the Social Security Institute (IMSS). Individual accounts are created for all workers entering the formal labor market for the first time. Each worker must select a pension manager during the first year of participation to complete the process. On average, two-thirds of workers affiliated to the system complete the enrollment process and take full ownership of their accounts becoming "registered workers". If the individual does no select a pension manager during the first year of affiliation, the government will "assign" her account to a manager and she becomes an "assigned worker". To fully enroll in the system, the worker needs to contact a sales representative of the selected pension fund manager. In large size companies it is common to have in place sales representatives of a pension manager who approaches newly hired workers. However, in small and medium size companies this is not the case and normally new workers do not receive any guidance on how to complete the process. In this sense, according to the 2018 Survey on Financial Inclusion (ENIF), 20 percent of workers who declared having a pension account do not know who is their pension manager. Among those who declared to be working but do not have −or do not know if they have− a pension account, 26 percent claim not knowing what is a pension account or how to obtain one. Under the old DB system, workers did not need to contact any institution before retirement because IMSS administered all accounts; upon retirement individuals would notify and claim pension benefits directly with IMSS. In general, it is not difficult to complete enrollment in the new system and the process is working reasonably well for most of the population. However, the design did not include a systematic procedure to contact and

inform individuals about pension benefits, so one third of affiliated workers do not complete the enrollment process.

There is an alternative to make additional voluntary contributions to pension savings. Workers can make tax deductible deposits in their individual accounts as an incentive to increase pension savings. During the period covered in our sample (1997-2012), voluntary contributions could only be made physically at the pension fund's branch or through an electronic transfer.

Finally, the pension system has a restrictive investment regime that defines permitted asset classes and limits in asset allocation. The investment regime has evolved over time allowing more asset classes and higher risk taking. However, workers have very limited power over their investment allocation: they can only select the pension fund manager and are permitted to change pension manager once a year. Pension savings are allocated to a specific pension fund according to worker's age and individuals can only opt for a less risky fund[5].

3. The data and stylized facts on the Mexican pension system

We use a data set containing a stratified random sample of 40,000 workers that is representative of the population affiliated to the Pension System provided by the regulator (CONSAR). Workers in our sample entered the system between 1997 and 2007 and all of them will retire under the new DC scheme. This implies that time of participation and savings accumulated during their working life will determine retirement income. For each bimester between the third of 1997 to the sixth of 2011 the data set contains salaries (daily wage) and the amount contributed to retirement and housing accounts if the individual is participating in the pension system by working in a tax-paying

---

[5] A detailed and comprehensive review of the structure of the reformed pension system in Mexico can be found at Grandolini and Cerda (1998).

company. Variables include year of birth and number of employers. For registered workers we also know place of birth (state), current address (state), gender, and number of changes of pension manager. Retirement and housing accounts' outstanding balances and all socio-demographic information are as of December 2011. Cumulative indicators are calculated since date of affiliation.

Table 1 shows the composition of the sample in terms of number of workers and accumulated savings in individual accounts. By type of affiliation, 33 percent of workers do not complete the enrollment process (assigned) and the majority of registered new workers are men (55 percent). The numbers are in line with the makeup of the whole system[6]. Accumulated savings of assigned workers represent 6.8 percent of total savings, and among registered workers women own 40 percent of total pension savings.

From the dynamics of contributions, we know exactly how many times workers exit the system and return (number of entrances) and for how long the worker participates each time she is active in the system. We estimate density of contribution, our key variable to analyze participation, with equation (1):

$$(1) \qquad Density \text{ of } Contribution \text{ (\%)} = \frac{Number \text{ of periods contributed}}{Number \text{ of periods in the system}} \times 100$$

To calculate the number of periods in the system we use the year and the bimester of the first contribution and the number of subsequent contributions. Time of active participation defines whether or not accumulated savings will be transformed into a lifetime pension payment upon retirement and if the worker is entitled to the MGP. The requirement is to contribute for at least

---

1,250 weeks (24 years), or 60 percent of the time over 40 years[7]. We further define a dummy

variable that takes value of 1 if the worker is expected to reach 24 years of active participation.

To estimate the expected time of active participacion, we assume that the individual will continue

participating by a rate similar to her historic density of contribution. Expected time of active

participation (Equation 2) is the expected time enrolled in the system multiplied by density of

contribution. Total time of enrollement is the number of years from the year of first contribution

($Year_{enroll}$) until worker's 65th birthday ($Year_{65th}$).

(2) $$E(Time_i) = (Year_{65th} - Year_{enroll}) \times Density\ of\ Contribution$$

The database contains the daily salary reported by employers in all bimesters in which the worker

contributed. Daily salary is the reference to estimate the amount of pension contributions. To make

the data comparable over time we obtain standardized measures of income dividing the reported

salary by the minimum wage effective in each period[8]. We create three measures of income: initial

salary (salary reported when the worker first appeared in the database), average salary across time,

and the slope (trend) of the salaries over the period of analysis as a proxy for the growth rate of

income.

Table 2 contains descriptive statistics by type of affiliation (registered and assigned). All numbers

show significant differences between groups. Registered workers have 55 percent average density

of contribution (56.1 percent median), 50 percent are expected to receive the MGP, enter and exit

the system 2.8 times on average and have mean length of stay of 2.6 years on each entry. Mean

---

[7] 40 years x 52 weeks = 2,080 weeks. Minimum density of contribution = 1,250/2,080 x 100 = 60%

[8] The Mexican Federal Labor Law contemplates a national minimum wage. The National Minimum Wage Commission defines every year daily minimum salary.

age of affiliation is close to 22 years old, but the median registered worker enters the system for the first time at age 19. Among registered workers, 19 percent have a mortgage and half of them has changed pension manager at least one time. In contrast, average density of contribution of assigned workers is 16 percent, half of them have a density below 6.4 percent, and only 7 percent are expected to obtain the pension benefit. Assigned workers enter the system on average 1.6 times and 75 percent of them stay in the system less than one year on each entrance. The median assigned worker affiliates for the first time at age 22 and average age of affiliation is 25.5 years old. Only 0.7 percent of them has a mortgage. Mean outstanding balance in retirement accounts of registered workers is 7 times larger than those of assigned workers. Turning to voluntary savings, a negligible number of workers in our sample made additional contributions: 172 out of 40,000 workers[9]. The median amount of voluntary savings represents 2 percent of the median balance of the pension account.

There are large differences in income between registered and assigned workers (Table 2). The distribution of assigned workers' initial salary is right skewed and more disperse than the distribution of registered workers. Median initial income is higher for registered workers. Average salary of registered workers is 2.2 times the minimum salary and 1.5 times for assigned workers. Also, the slope of salary history is larger for registered workers. In general, labor trajectories of registered workers are better and more stable than those of assigned workers.

We have data on gender, place of birth, current location, and number of pension manager changes for registered workers. Descriptive statistics of the sample divided by women (Panel A) and men (Panel B) are in Table 3. Density of contribution is slightly lower for women (52 vs. 58 percent)

---

[9] At the end of 2011, when our data sample ends, voluntary savings balance represented only 0.3 percent of total resources in the pension system.

but the difference is larger using median values (51 vs. 60 percent). In general women have lower salary indicators, lower savings balances, and fewer employers. The probability of receiving the MGP is larger for men (54 vs. 45 percent).

Table 4 reports the distribution of workers across states using their current address[10]. Individuals working in Mexico City, the State of Mexico, Jalisco, and Nuevo Leon represent 41 percent of workers and they own 48.2 percent of total savings in the sample. The remaining 59 percent of the workers are distributed in the 28 other states. The 10 states with the smallest participation represent only 8.2 percent of workers and 5.8 percent of accumulated savings. The poorest states in the country (Tlaxcala, Oaxaca, Guerrero, Tabasco, and Chiapas) are the ones with the lowest accumulated savings per capita, which on average is less than half the savings in the richest states. These poor regions have the lowest percent of workers entitled to the MGP. The differences are consequence of the heterogeneous nature of regional economic activity and the structure of the local labor markets in Mexico[11].

In sum, descriptive statistics show heterogeneity in worker's behavior under the same institutional framework. The most pronounced differences in behavior are between assigned and registered workers, although the data also shows that gender, income and geography are relevant in explaining behavior in the pension system.

4. Univariate analysis of workers behavior

In this section we provide evidence on the behavior and characteristics of individuals affiliated to the pension system. Haverstick, Munnell, Sanzenbacher, and Soto (2010) show that tenured

---

[10] The geographic distribution of our sample closely replicates the makeup of the whole population in the SAR.
[11] For example, the four riches states (Mexico City, State of Mexico, Jalisco and Nuevo Leon) produce 42 percent of GDP.

workers are more likely to leave jobs with DC plans than with DB plans implying more labor mobility in jobs with DC plans. By analyzing the dynamics of participation of different groups of workers we are able to provide a profile of workers more likely to complete the enrollment process and to estimate the proportion of workers that comply with the rules (participation of at least 24 years or around 60 percent density of contribution) and are expected to obtain the MGP. We also discuss in more detail the profile of workers with voluntary contributions to pension accounts.

4.1. Behavior by type of enrollment (Assigned vs. registered workers)

We analyze differences in behavior between fully enrolled workers or registered workers and those who has not chosen pension manager identified as "assigned" workers. Registered workers have full ownership of their accounts, are entitled to voluntary contributions, and to claim the accumulated savings upon retirement. Assigned workers have not yet claimed ownership of their savings and the government cannot identify them.

We analyze participation over the whole period covered in our sample. In Figure 1 we show the distribution of workers by deciles of density of contribution and by type of affiliation. More than 60 percent of assigned workers have a density of 10 percent or less and 91 percent of them are below the fifth decile. In contrast, only 45 percent of registered workers correspond to the bottom five deciles indicating that they participate more time in formal jobs.

Our data indicates that 91 percent of individuals stop contributions at least once during their working life. In Figure 2 we report the distribution of workers by number on entrances to the system. While 67 percent of assigned workers enter the pension system once, 70 percent of registered workers tend to come back to the system re-entering more than once. Given this dynamic, the rate of participation changes with tenure in the system. When a worker is affiliated

for the first time, the density is 100 percent, but it declines over time because of the entry-exit dynamics. Figure 3 presents the relation between participation and tenure. We estimate mean, median, and 75th (registered) and 95th (assigned) percentiles of density for each group by the years in the system calculated since the bimester of first contribution until the end of 2011. There is a common pattern: average density declines over time because many workers leave the formal labor market. Five years after affiliation the average density is 30 percent for assigned workers (median of 19 percent) and by year 13 mean density is below 10 percent (median close to 4 percent). For registered workers, mean and median density drop to 50 percent in the long run, and 25 percent of workers have a density above 80 percent. The decline in density of contribution is the consequence of interruptions in participation in the formal labor market. The pronounced difference in density between assigned and registered workers is because registered workers tend to return to the formal market and stay more time. While 56 percent of assigned workers enter once, stay one year or less and never come back, only 8 percent of registered workers behave like that.

Regarding the group of assigned workers that enter the system once and participate less than 1 year, we hypothesized that many of them belong to the informal labor market and randomly entered a formal job with social security because. They may not finish the enrollment process because they do not know about their pension accounts or because they are aware of their short stay and do not perceive any benefit in completing the process. Low financial literacy or a small stakes hypothesis can explain this behavior. In contrast, registered workers' behavior is more consistent with the institutional design of the pension system. They participate more regularly in the formal sector but are more likely to underestimate the importance of retirement savings.

We find evidence of the existence of a segmented labor market in Mexico, with rigidities that prevent certain groups of workers from being part of the formal market and to comply with pension

regulation. Our data reveals that registered workers are more able to have jobs in the formal market, whereas assigned workers have no mobility within the formal market. Apparently, the objective of generating pension savings has not been achieved for assigned workers.

4.2. Behavior by gender

James, Cox Edwards, and Wong (2003) and Dion (2006) show that under DC pension systems women tend to have less favorable conditions. In Table 3 we show that density of contribution, accumulated savings, and salary measures are lower for women. To further understand differences, we analyze the distribution of participation for men and women. Figure 4 reports the fraction of workers across density of contribution deciles grouped by gender. The distribution of both groups is similar: both are U-shaped and evenly distributed in middle deciles with the highest concentration of workers in the tenth decile (around 20 percent). However, women's distribution is slightly tilted toward the bottom deciles compared to that of men. For instance, 50 percent of women correspond to the first five deciles of density of contribution vs. 42 percent of men.

The differences in participation by gender are explained by the dynamics of interruptions. Time of participation is not significantly different, however women re-enter on average less than men and spend longer periods of time without contributing to the system. Figure 5 reports the fraction of workers by the number of times they enter the system. 60 percent of women enter only once or twice and do not return compared to 50 percent of men, implying that it is more likely for women to not return to a formal job once they leave. In Figure I in the online appendix[12] we also estimate the average time without pension contributions every time workers leave the system. The data shows that women stop participating over longer periods than men. For example, during the first

---

[12] https://bit.ly/2rnQD4X

exit, women stay out of the pension system 1.6 years on average, compared to 1.4 years for men. This is why women have a lower density of contribution.

The analysis of density of contribution over time also confirms that women participate less. Figure 6 presents mean, median, and 75th percentile of density by time in the system. Participation declines over time for both men and women. However, women's mean density drops to 44 percent after 15 years compared to 55 percent for men in the same period. Furthermore, one half of women present density below 40 percent after 15 years. In the case of men median density stays above 58 percent in the long run. In sum, gender explains differences in participation and their variations in time. Our results are in line with Dion (2006).

The main difference between men and women is in the exit-reentry process. There are two possible explanations: women choosing to stay longer outside the formal labor force, or potential rigidities of the formal market not allowing them to reenter as much as they would like. Our data does not allow to distinguish between them.

4.3. Income and participation

In this section we analyze whether pension participation is also related to income. Dushi and Iams (2015) is an example of how income shocks affect participation on DC plans. Numbers in Tables 2 and 3 show that mean salary is higher for registered workers and among them, men have on average higher income than women. Given that different groups of workers have different levels of income, we analyze the information controlling by type of affiliation and gender. Figure 7 reports data on mean salaries and salary growth by decile of density of contribution by type of affiliation (Panels A and C) and by gender (Panels B and D). All panels show that salaries are correlated to participation in the pension system. Panels A and C show that mean salaries increase

monotonically with density of contribution and workers with higher densities are those with higher average salaries. Because of lower levels of income, growth rates of salaries are higher for workers in the bottom deciles of density (Panels B and D). Considering the evidence that participation is related to income we question the effectiveness of the pension system rules as an incentive to increase labor in the formal sector.

Turning to type of enrollment, mean salaries do not show pronounced differences between assigned and registered except in the top three deciles where the registered workers present higher numbers (Figure 7 Panel A). This indicates that those who tend not to finish the enrollment process are the ones with lower incomes. Since salary growth rates are higher for registered workers, we conclude that income differences arise over time (Figure 7 Panel B). In general, registered workers will have better labor trajectories in terms of income and outperform the assigned.

For gender the relation of salaries and density of contribution remains, but in general women have lower levels of income (Figure 7 Panel C). The key difference is that salary growth rates of women do not change significantly across density deciles and they are much lower than those of men (Figure 7 Panel D). Our data shows that over time men have better income paths in their careers.

The results above provide evidence that higher participation is related to higher wages, and that women and assigned workers have lower average salaries compared to men. Workers that earn more tend to have a higher probability of compliance with the rules. The positive relation between participation and income can be explained by the fact that high income workers belong naturally to the formal labor segment of the market, while less income workers spend more time either in the informal market or unemployed. The reform did not change this structure.

4.4. Other factors: housing credit, change of portfolio manager and change of location

The data allows us to explore some of the decisions that workers affiliated to the system make such as to obtain a mortgage, to change pension fund manager and to work in a location different from the place of birth[13]. We analyze if there is a relation between participation and workers making different decisions regarding the three variables.

As part of the design of the pension system in Mexico workers are eligible to obtain a mortgage from the INFONAVIT[14] after 1 year of affiliation to SAR. The relevant perspective for our analysis is from the point of view of INFONAVIT as a financial institution. To be entitled to a mortgage, a worker must reach a minimum score which is based on age, income, time in the system, and outstanding balance in their housing savings account. Workers between 21 and 49 years old with higher incomes and 3 years in a formal job are more likely to qualify for the credit. Financial soundness of INFONAVIT depends on the capacity to separate good debtors from bad, since credit collection is dependent on worker participation in the formal market. Therefore, INFONAVIT's risk model should be a very good predictor of steady participation in the labor market and having a mortgage is an exogenous variable that can predict formality. We analyze participation dividing the sample by whether the worker has a mortgage or not. Out of the 40,000 workers in our sample, 5,171 have a mortgage, of which 2 percent are assigned and 38 percent are women. Panel A in Figure 8 indicates that 87 percent of individuals with a mortgage have a density above 60 percent compared to 26 percent of workers without a mortgage. There is a positive and significant relation between a stable labor trajectory and housing credit. In fact, the credit analysis of INFONAVIT

---

[13] Data on changes of location and fund manager are only available for registered workers.
[14] INFONAVIT is a government agency granting mortgage credits to workers in the formal market.

predicts more stable labor trajectories and workers with characteristics consistent with job stability are the ones who obtain the credit.

We revise differences in participation between workers that changed fund manager and those who did not. Almost 75 percent of registered workers in our sample changed fund manager at least once. These workers have a higher density of contribution than workers who did not change manager. Panel B in Figure 8 shows that the majority of workers that opted to change fund manager (54 percent) have a density above 60 percent. Changing pension manager is positively related to participation.

Finally, we review if working in a state different from the place of birth is related to a more steady pension participation which could be a proxy for social and economic mobility. Panel C of Figure 8 shows density of contribution of registered workers divided by whether or not they work outside their state of birth (29 percent of the sample). Density distribution of those that changed location is just slightly tilted towards top deciles. We find no evidence of a relation between geographic mobility and participation.

4.5. Voluntary savings

Literature on individual behavior with respect to savings has explained that individuals may invest less than required (Ongena and Zalewska 2018), and people have not good heuristics to determine adequate savings rate (Thaler and Benartzi 2004). Contributions and participation in DC pension plans are related to attitudes towards planning for the future and saving for retirement (Munnell, Sunden, and Taylor 2002). In the case of the DC pension system in Mexico, the evidence shows that the system did not create the right incentives to increase pension savings with additional contributions.

Despite the low number of workers with voluntary contributions (172 out of 40,000 in our sample) we present summary statistics to understand this segment in Table I in the online appendix[15]. Mean density of contribution is 72 percent, 71 percent will obtain the MGP and median average salary is 4 times minimum salary. Participation, income, amount of savings and the probability of obtaining the MGP are all higher compared to those without voluntary contributions. Workers with additional contributions are in the extreme of the distribution of participation and income. These results show that the individuals who need to save more because of low participation are not making additional contributions.

The behavior of workers in Mexico related to voluntary contributions is a counterfactual to "Opt out" schemes. The "Opt in" scheme is not adequate because individuals do not have a good heuristic rule for voluntary savings. For example, Choi, Laibson, Madrian, and Metrick (2002) study automatic enrollment in 401(k) plans that proved to be an effective tool for supporting employees to start saving for retirement. They show evidence of procrastination and self-control biases, as the majority of individuals in their sample made no changes in their 401(k) plans despite recognizing having a "too low" savings rate and mentioning the intention of increasing it.

Our results are in line with Landerretche and Martinez (2013) that show that Chileans with greater knowledge about the pension system are more likely to have additional financial savings, but not within the voluntary pension saving plans. We conclude that the alternative of voluntary savings of the institutional design has not been considered by workers.

---

[15] https://bit.ly/2rnQD4X

4.6. Who complies with pension rules?

We consider all the variables analyzed above to determine the proportion of affiliated workers that are more likely to comply with the rules and are expected to transform savings into lifetime annuity regardless the amount of savings. For this analysis we use as threshold for receiving the MGP a projection of density of contribution of 60 percent or higher. Considering the evolution of participation in time, aproximately 42 percent of registered and 1 percent of assigned workers could be entitled to the MGP. This represents 32 percent of all the workers in the system. The rest of workers will receive their accumulated savings as a lump sum payment upon retirement. Among registered workers, the trend considering tenure shows that 48 percent of men can be entitled to the MGP but the fraction of women declines to 34 percent. This last figure confirms that women are at a disadvantage under the rules of the system.

We also use income as a variable to predict compliance with minimum requirements. For both assigned and registered workers the average standardized salary in the 6th decile of density of contribution is approximately 3 times the minimum salary (Panel A in Figure 7). Considering the distribution of income this level of salary corresponds to the 71th percentile of registered and 90th percentile of assigned workers. Adjusting by income, 29 percent of registered and 10 percent of assigned workers could receive the MGP resulting in a combined result of 23 percent.

Regarding other factors, among those individuals that changed pension manager, 54 percent of them are likely to receive the MGP. Finally, 87 percent of workers with a mortgage and 75 percent of workers with voluntary savings have density above 60 percent making them the groups with the highest probability to obtain the MGP.

We conclude that worker's behavior in the pension system is related to income, gender and geography. There are three key findings in this section. First, there is a group of "temporary" low income workers that tend to not complete the enrollment process. Second, in the long run, because of constant interruptions and short length of stay, most workers in the system will not participate enough time to be eligible for the MGP upon retirement. More steady labor trajectories with higher probability of obtaining the MGP are linked to higher income groups. Lastly the alternative of voluntary savings has almost being ignored by pension participants.

5. Regression models of workers behavior

In the previous section we find that completing the enrollment process, gender, income, housing credit and changing pension manager have an apparent relation with participation. We also find that workers that do not complete the enrollment process are those participating very short periods of time and with lower income. In this section we perform regression analyses to confirm our findings and to assess the relative importance of each element explaining worker's behavior. First, we estimate the probability of not completing the enrollment process and then we evaluate the variables that explain participation. As a robustness test we use Probit models to find the probability of obtaining the MGP. All models are a cross-section analysis.

5.1. Probability of not completing the enrolment process

In this section we explore which variables explain the probability of not completing the enrollment process. From the analysis in Section 4 we learned that assigned workers tend to affiliate to the system at an older age, have lower income, and the majority stay less than 1 year and once leaving the system normally do not come back. The dependent variable is a dummy that takes the value of one if the worker is assigned.

In the first model we select as independent variables the ones that describe the characteristics of a worker's behavior at the time of affiliation and the following year, and whether they return for a second time. Independent variables are age of affiliation, initial salary, length of stay during the first entrance (dummy equal to 1 if worker stays less than 1 year), and whether or not the worker returns to the system (dummy equal to 1 if worker does not return). We report the results of the Probit regression and its marginal effects in Table 5, Panel A. Workers entering at an older age, staying less than 1 year and not returning are more likely to not complete the enrollment process. Using the value of the Probit coefficients we calculate the marginal effects on the probability of staying as an assigned worker. Staying less than 1 year after joining the system increases the probability of being an assigned worker by 36 percent, and not returning to the system adds another 32 percent to the probability. In relative terms age of affiliation has a very low effect and initial salary has no effect on enrolment status at all.

We now compare assigned and registered workers that stay more than 1 year, return for a second time or both. 20 percent of assigned workers contributed more than 1 year and join the pension system for a second time. The purpose is to disentangle who is more likely to not complete the enrollment process among individuals that participate more and seem to belong to the formal labor market. Given longer labor trajectories, we include as independent variables average income and number of employers. We report results in Panel B of Table 5. In Model 1 that includes only workers staying more than 1 year, the probability of not completing the enrollment process increases for individuals with lower income, entering at an older age, and not returning for a second time. Estimations for the subsamples with workers returning to the system (Model 2) or the combination of the two conditions (Model 3) confirm that lower income or entering at older age explain staying as assigned worker. The number of employers is negatively related to the

probability of not completing the enrollment process. For each additional employer the probability of full enrollment increases by 64 percent for workers staying more than 1 year and entering for a second time.

In general, what explains the result of not completing the enrollment process is the behavior of entering once and staying very short periods of time. However, among workers with longer trajectories in the formal market, the level of income and the number of employers explain the choice of not completing the enrollment process. Most assigned workers have the profile of an individual who belongs to the informal labor market, taking a one-time formal job. Our findings made us conclude that the small stakes hypothesis together with less financial knowledge are the most likely explanations for why assigned workers do not claim ownership of their savings.

5.2. Models of workers participation

In this section we implement several models to test which variables better explain workers' participation and the probability to obtain the MGP. We evaluate the following relation using standard OLS, Tobit, and Probit models:

(3) $$D_i = \alpha + \beta X_i + \gamma T_i + \lambda S_i + u_i$$

where, D_i is either the percentage of density of contribution of worker i measured from the bimester of the first contribution to the last bimester of 2011 and takes values between 0 and 100 (OLS and Tobit); or it is the probability to obtain the MGP and it takes the value of 1 if the worker is expected to reach 24 years of participation (Probit); X_i is a vector of variables attributed to individual i. Variables are average income, age of affiliation, number of employers, gender (dummy equal to 1 if male), number of changes of pension manager, change of residence, mortgage (dummy equal to

1 for having a mortgage), and working in one of the richer states (dummy equal to 1 if working in Mexico City, State of Mexico, Jalisco, or Nuevo Leon); T_i is a vector of dummy variables capturing the year when individual i entered the system (between 1998 and 2007); and S_i is a vector of dummy variables capturing the state where individual i works available only for registered workers (31 dummy variables). Considering the very unequal labor trajectories between assigned and registered workers and the fact that we have more variables for registered workers we estimated two separate sets of models.

i. Assigned workers

From our findings in previous sections we select as independent variables average salary, age of affiliation, number of entrances, number of employers, and whether the worker has a mortgage. We estimate first OLS regressions and then Tobit models as the values of the dependent variable are between 0 and 100. In some of the estimations we include dummies of the year of incorporation to the system as a control for tenure considering that participation declines over time. Results reported in Table 6 show that higher income, entering at an older age, returning workers (number of employers), and having a mortgage are positively related to density of contribution.

We find a potential contradiction regarding age of affiliation between the results of the previous section and the ones in Table 6. Age has a positive relation with both the probability of staying as assigned and density of contribution. To address this issue, we include an interaction term of age of affiliation and the number of employers. We expect that higher participation is related to returning workers and not to all assigned workers. In fact, the interaction term delivers a positive and significant coefficient and age coefficient becomes negative or insignificant. We conclude that the relation between age and participation is related to a small group of assigned workers taking a job in the formal market more than once.

The housing credit dummy reports a large positive and significant coefficient. Compared to other variables in the models, having a mortgage is the strongest determinant of density of contribution, but having a mortgage may be a proxy for income and may not add new information. To address this issue, we include an interaction term of average standardized salary and housing credit dummy. The variable delivers a negative coefficient but it does not alter the magnitude and significance of housing credit dummy. We interpret these results as having a mortgage and income do not provide the same information and both are relevant determinants of participation.

Results do not change qualitatively when we include year of entry dummies (results not reported here but available in the online appendix[16]) but the magnitude of all coefficients decreases. For example, the value of the standardize salary coefficient declines to 0.47 from 0.86. We confirm the importance of controlling for tenure as density declines over time. The magnitude of the coefficients of year dummies progressively increases towards the most recent years of incorporation. All results are consistent using Tobit estimations.

ii.   *Registered workers*

We have additional information for workers that complete the enrollment process such as gender (dummy variable that takes the value of 1 if worker is male), location (dummy variable that takes the value of 1 if the individual works in Mexico City, State of Mexico, Jalisco or Nuevo Leon, which are the states with the highest income), the number of times the worker changes pension manager, and voluntary savings (dummy equal to 1 if the worker made additional contributions). We include these variables in models of registered workers on top of the variables used for assigned workers. Results in Table 7 show a positive relation between density of contribution and

---

[16] Table II, online appendix (https://bit.ly/2rnQD4X)

income, age of entrance, number of employers, working in a richer state, having a mortgage, making additional contributions and whether the individual is male. The number of times a worker in the sample changed AFORE may be an indication of the sense of ownership of pension savings. The results show that sense of ownership is also related to higher density of contribution. One caveat is that we cannot assess whether the change of AFORE is a rational decision. Considering the magnitude of the coefficients, having a mortgage, making additional contributions and changing pension manager are the most relevant determinants of participation.

In line with previous results, having a mortgage is a very strong determinant of density of contribution. Workers with housing credit are expected to have density of contribution 35 percent higher than workers without a mortgage. This result confirms that INFONAVIT has a good model of credit origination, accurately predicting stable labor trajectories. We also include the interaction term to assess the combined effect of income and housing credit. The interaction term delivers negative and significant coefficients so there is not additional effect for higher income workers.

In general, the effect of gender in participation is not as large as other factors, but given that women have lower income than men, we test if lower participation is attributed to lower income and not to gender. We create another interaction term multiplying the gender dummy (1 if male) by average standardized salary. The dummy reports negative and significant coefficients and the coefficients for gender remain positive and significant. This implies that regardless the level of income, men participate more than women.

Controlling for year of incorporation (tenure) and location do not significantly change the results. The coefficients of year dummy variables are negative for earlier years confirming that tenured

workers tend to present lower density (Table III, online appendix)[17]. On the other hand, we remove the dummy for richer states and include all state dummies except one. Few state dummies are statistically significant, but notably some of the poorest states like Chiapas, Tabasco, and Tlaxcala deliver negative and significant coefficients (Table IV, online appendix) [18].

Finally, we analyze the exit-entry dynamics using either the number of employers or the number of entries. We do not include both of them in the same regression given the high positive correlation between them (0.68). The models in Table 7 show a positive relation between number of employers and density of contribution. Changing jobs without leaving the system indicates more participation. We repeat all estimations replacing number of employers with number of entries in the Table V in the online appendix[19]. The coefficients of number of entries are either insignificant, or negative and significant. Workers entering and leaving the system are the ones that will have lower density of contribution. Longer tenures per entry with fewer exits determine high density of contribution. Coefficients of other variables remain qualitatively unchanged when we substitute number of employers by number of entries.

iii. *Probability of receiving the minimum guaranteed pension (MGP)*

As a robustness test we analyze if the same factors explain the probability of obtaining the MGP using as dependent variable a dummy that takes value of 1 if the worker is expected to reach 24 years of active participation.

We use the same independent variables as in previous models and report results in Table 8. The first column contains results for all the sample and columns 2 to 5 for registered workers only. In

---

[17] https://bit.ly/2rnQD4X
[18] https://bit.ly/2rnQD4X
[19] https://bit.ly/2rnQD4X

all cases we control for tenure including year of affiliation. All results are in line with those

reported on estimations of density of contribution in Tables 6 and 7. We confirm that fully enrolled

workers, males, workers with higher income, changing pension managers, with a mortgage, and

making additional contributions are the ones with higher probability to receive the MGP. For

instance, completing the enrollment process increases the probability of receiving a pension by 23

percent. Also, males are 5 percent more likely to receive pension upon retirement; workers making

voluntary contributions 11 percent; and having a mortgage increases the probability by 40 percent.

Considering geographic location, for example, individuals who work in Tlaxcala have 8 percent

less probability of receiving the MGP [20]. Mortgage is the more predictive variable.

In sum, similar factors explain participation of assigned and registered workers. For the latter case,

the additional information shows that being a man, living in a rich region and changing pension

manager are also positively related to participation. Registered workers eligible for the MGP are

also the ones with higher wages. If higher income reflects higher human capital, then stable labor

trajectories are related to human capital too.

6. Results analysis and labor market rigidities

Results above lead us to conclude that the institutional design of the pension system in terms of

automatic enrollment, eligibility and retirement savings is not entirely compatible with the

behavior of workers in Mexico. Considering the great variance of labor trajectories of individuals,

we can argue that there are three well defined groups that are visible in our data. The behavior of

each group points to potential restrictions to increase participation in the formal labor market.

Despite the reform those restrictions prevailed.

---

[20] Online appendix Table VI (https://bit.ly/2rnQD4X)

The first group arises from the automatic enrollment process and includes 56 percent of assigned workers who enter the system once and stay less than 1 year. It is the group with no real incentives to claim ownership. The group seems to be intrinsically formed of informal workers who entered the formal market by accident and employers enrolled them in the pension system because of the regulation. These workers have little mobility between the formal and the informal labor market. The results suggest that they do not claim ownership because of i) the very short time in the formal labor market and ii) "small stakes" given the insignificant amount of savings (75 percent of them have accumulated savings of $700 USD or less). The perceived benefits of completing the enrollment process are very small. In general, the behavior of the "one time assigned worker" seems to add noise to the analysis of the institutional design of the system, overstating measures of pension coverage. Most of them may never claim their pension savings because they are not part of the formal labor market and do not expect to receive pension benefits.

The second group represents one-third of the sample and includes registered and assigned workers with a density of contribution above 60 percent. They are the average formal worker who does not migrate to the informal market or stay much time outside the system. They will certainly transform accumulated savings into a lifetime annuity of at least one minimum salary because they will comply with the rules. It is very likely for these workers to accumulate enough savings to reach the 60 percent replacement rate implicit by the rates of contributions of the system. The behavior of this group is the most compatible with the design of the pension system, but seems to be driven by the labor market structure rather than by the institutional design of the system. Higher participation is related to higher salaries that are correlated with skills.

The behavior of the group of assigned workers in this second group with high density of contribution puzzles us: why they do not claim ownership of their savings? 20 percent of assigned

workers return to the formal market and present higher participation. Among them 19 percent could be eligible for the MGP. These workers have higher salaries than the rest of assigned workers and some of them have a mortgage. We argue that this behavior is not related to "small stakes" because they have the largest amount of savings in the group. We rather assert that the answer is related to procrastination, lack of information or low financial education.

The third group is the rest of the sample. These workers have a dynamic behavior of entering and exiting the system. It reveals that the labor market is not dualistic for this group (Maloney 1998). This segment of the market represents almost one half of workers in the system and is characterized by individuals who, despite interruptions, in some way belong to the formal labor market because they normally return. Apparently, the new rules are too strict for this segment and the probability of obtaining pension benefits is low. This segment could be the most vulnerable group if they heavily rely on accumulated savings in the pension system as income for old age. At first, it seems rational for them to try to participate more in the formal market because of the possibility of lifetime pension benefits. Their behavior reveals that despite the reform they were not able to join the formal labor market more time. It may be the case that the rigidities of the labor market are stronger than the incentives of the reform. Our data does not allow us to explain why they behave that way. This remains as a question for further research. In any case, the institutional design is not adequate for them and the problem is reinforced by their unsound financial decisions. Workers do not compensate for low participation with higher voluntary savings. Furthermore, the evidence from the Financial Inclusion Survey (2018) does not support the hypothesis that people save much outside the pension system.

An important implication of our findings is that the institutional design of the pension system in Mexico is working well for a small privileged group of individuals: male workers, with stable

labor conditions, living in richer regions, and eligible for housing credit. We conclude that the behavior of the majority of workers in the pension system is not driven by maximizing income at retirement and long-term planning, but it is defined by the structure of the labor market. These results are contrary to the ones expected by policy makers.

7. Conclusions

The change from DB to a fully funded DC pension scheme posed challenges for policy makers. In DC systems the worker most take full responsibility and faces all the risks related to pension and ageing. The design of the new system in Mexico was based on principles of transparency and ownership. Policy makers at the time believed that this design was strong enough to give the right incentives: complete registration, more formal labor market participation and high voluntary savings. The expectation was that individuals would understand their risks and would adapt favorably to the new rules.

In this study we present evidence of what is working and what is not in the Mexican DC pension system. We analyze the behavior of workers within the new institutional design and evaluate individual compliance with the requirements of the system. We conclude that the design and rules of the system are not compatible with the structure of the labor market in Mexico. Our results show that Mexican workers are not behaving as policy makers expected. The majority of workers do not participate sufficiently in the formal labor market to reach pension benefits and will not transform savings into lifetime annuities. Also, the alternative of voluntary savings has been almost ignored.

One-third of workers do not complete the enrollment process. Most of them will not obtain pension benefits. We conclude that low savings and low probability of receiving pension income explain their behavior (small stakes). Assigned workers that enter more than once are similar to registered

workers. Despite this resemblance, we find that low income workers are more likely to not complete the enrollment process and to not claim ownership.

Results for registered workers show a positive relation of participation with income, age of affiliation, changes of pension managers, mortgage, living in richer states, and whether the individual is male. All results confirm that higher participation and more stable labor trajectories correspond to more privileged groups. Higher participation related to workers' characteristics reveals that the labor market naturally imposes restrictions on the potential design of pension systems. We speculate that the existence of labor market rigidities, rather than willingly not working in the formal sector, explain individual behavior and why many workers will not comply with required participation. Finally, for all registered workers and returning assigned workers our evidence is consistent with other results in the literature regarding low voluntary savings for retirement: procrastination, no adequate heuristics and low financial education.

Distinct behaviors may have different explanations. Some are related to rational behavior (small stakes), others to imperfect information (returning assigned workers) and possible biases (negligible voluntary retirement savings). The implications of our findings are that the new institutional design is not fulfilling its purpose and is not addressing the problem of reducing government involvement and poverty at old age.

To further improve the system we make the following policy recommendations:

−   Do not try to fix labor market rigidities with the pension system. Restrictions to the former are more powerful that the incentives of the latter.

−   There is a need to adapt the parameters of the system. Eligibility criteria for MGP and its amount should consider individual's behavior in the labor market.

- To compensate for the low voluntary savings there is a need to increase the rate of contribution.

- Voluntary savings can be part of the system but with opt-out schemes as in other countries.

- There is a need to promote financial education for retirement savings.

One caveat is that our database does not contain variables to explain why the specific behaviors happen. For instance, further data and research are needed to explain if workers' behaviors are by choice or due to frictions of the labor market and why they do not save enough for retirement.

References

Aggarwal, R., and Goodell, J. W. (2013). Political-Economy of Pension Plans: Impact of Institutions, Gender, and Culture. Journal of Banking and Finance, 37(6), 1860-1879.

Aguila, E. (2011). Personal Retirement Accounts and Savings. American Economic Journal: Economic Policy, 3(4).

Alonso, J., Hoyo, C., and Tuesta, D. (2015). A Model for the Pension System in Mexico: Diagnosis and Recommendations. Journal of Pension Economics, 14(1).

Barr, N., and Diamond, P. (2008). Reforming pensions: Principles and policy choices. Oxford University Press.

Barr, N., and Diamond, P. (2010). Reforming Pensions: Lessons from Economic Theory and Some Policy Directions. Economia, 11(1), 1-23.

Barr, N., and Diamond, P. (2016). Reforming Pensions in Chile. Polityka Społeczna, 1(12), 4-8.

Choi, J. J., Laibson, D., Madrian, B. C., and Metrick, A. (2002). Defined Contribution Pensions: Plan Rules, Participant Choices, and the Path of Least Resistance. In *James Poterba, ed., Tax policy and the economy*, 16, 67-113.

Crawford, R. and Disney, R. (2014). Reform of police pensions in England and Wales. Journal of Public Economics, 116, 62-72.

Dion, M. (2006), Women's Welfare and Social Security Privatization in Mexico, Social Politics: International Studies in Gender, State and Society, 13(3), January.

Dushi, I., and Iams, H. M. (2015). The Impact of Employment and Earnings Shocks on Contribution Behavior in Defined Contribution Plans: 2005–2009. The Journal of Retirement, 2(4), 86-104.

Feldstein, M. (2005). Structural Reform of Social Security. The Journal of Economic Perspectives. 19(2).

Feldstein, M., and Liebman, J. B. (2002). Social Security. Handbook of Public Economics, 4, 2245-2324.

Forteza, A., Apella, I., Fajnzylber, E., Grushka, C., Rossi, I., and Sanroman, G. (2011). Contributions to Social Security in Argentina, Chile and Uruguay: Densities, Transitions and Duration. Economica, La Plata. LVII (Jan-Dec).

Grandolini, G., and Cerda, L. (1998). The Pension Reform in Mexico. The World Bank, Policy Research Working Paper 1993, June.

Grech, A. G. (2013). Assessing the sustainability of pension reforms in Europe. Journal of International and Comparative Social Policy, 29(2), 143-162.

Haverstick, K., Munnell, A. H., Sanzenbacher, G., and Soto, M. (2010). Pension Type, Tenure, and Job Mobility. Journal of Pension Economics and Finance, 9(4), 609-625.

James, E., Cox Edwards, A., and Wong, R. (2003). The Gender Impact of Pension Reform. Journal of Pension Economics and Finance, 2(2).

Landerretche, O. M., and Martinez, C. (2013). Voluntary Savings, Financial Behavior, and Pension Finance Literacy: Evidence from Chile. Journal of Pension Economics and Finance, 12(3), 251-297.

Lindbeck, A., and Persson, M. (2003). The Gains from Pension Reform. Journal of Economic Literature, 41(1), 74-112.

Lusardi, A., and Mitchell, O. S. (2011). Financial Literacy around the World: An Overview. Journal of Pension Economics and Finance, 10(4).

Maloney, William F. (1998). Are Labor Markets in Developing Countries Dualistic?. World Bank Policy Research WPS 1941.

Munnell, A. H., Sunden, A., and Taylor, C., (2002). What Determines 401(k) Participation and Contributions? Social Security Bulletin, 64-3.

National Banking and Securities Commission CNBV and National Institute of Statistics and Geography (2018). National Survey for Financial Inclusion. Mexico. Available at http://en.www.inegi.org.mx/programas/enif/2018/default.html.

Ni, S., and Podgursky, M. (2016). How teachers respond to pension system incentives: New estimates and policy applications. Journal of Labor Economics, 34(4), 1075-1104.

Ongena, S., and Zalewska, A. A. (2018). Institutional and Individual Investors: Saving for Old Age. Journal of Banking and Finance, 92, 257-268.

Orenstein, M. (2013). Pension Privatization: Evolution of a Paradigm. Governance: An International Journal of Policy, Administration, and Institutions, 26-2.

Perotti, E., and Schwienbacher, A. (2009). The Political Origin of Pension Funding. Journal of Financial Intermediation, 18(3), 384-404.

Poterba, J., Rauh, J., Venti, S., and Wise, D. (2007). Defined Contribution Plans, Defined Benefit Plans, and the Accumulation of Retirement Wealth. Journal of public economics, 91(10), 2062-2086.

Poterba, J., Venti, S., and Wise, D. A. (2018). Longitudinal Determinants of End-of-Life Wealth Inequality. Journal of Public Economics. 162, 78-88.

Scharfstein, D. S. (2018). Pension Policy and the Financial System. Journal of Finance, 73(4).

Smith, S. (2006). Persistency of Pension Contributions in the UK: Evidence from the British Household Panel Survey. Journal of Pension Economics and Finance, 5(3), 257-274.

Thaler, R. H., and Benartzi, S. (2004). Save More Tomorrow™: Using Behavioral Economics to Increase Employee Saving. Journal of political Economy, 112(S1), S164-S187.

Tobin, J. (1958). Estimation of Relationships for Limited Dependent Variables. Econometrica: journal of the Econometric Society, 24-36.

Van Rooij, M. C., Lusardi, A., and Alessie, R. J. (2011). Financial literacy and retirement planning in the Netherlands. Journal of economic psychology, 32(4), 593-608.

Figure 1
Density of contribution by type of affiliation

Panel A. Assigned workers

Panel B. Registered workers
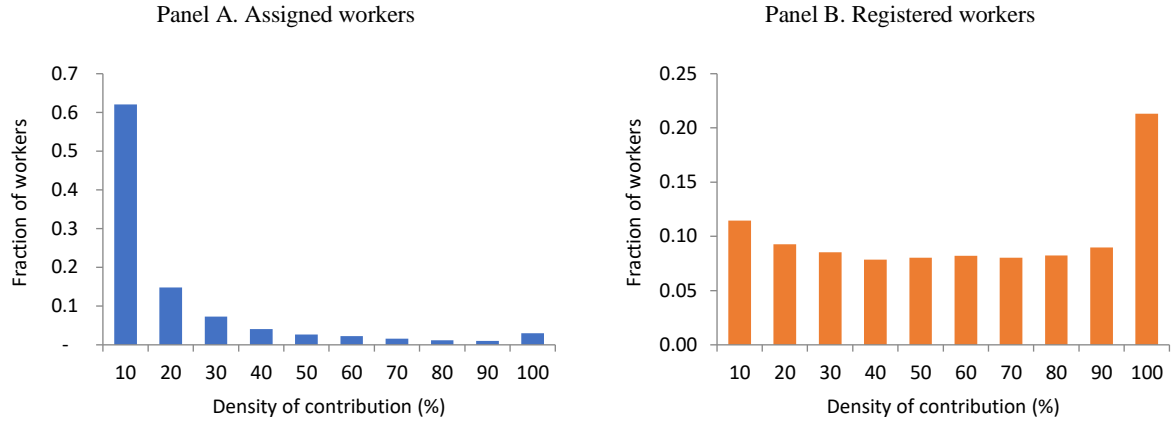
Notes: The figures report the distribution of workers by density of contribution deciles, grouped by type of affiliation that refers to registered and assigned (incomplete enrollment process) workers. Density of contribution refers to the time of active participation as percentage of the total time since enrollment.

Figure 2
Number of entrances by type of affiliation
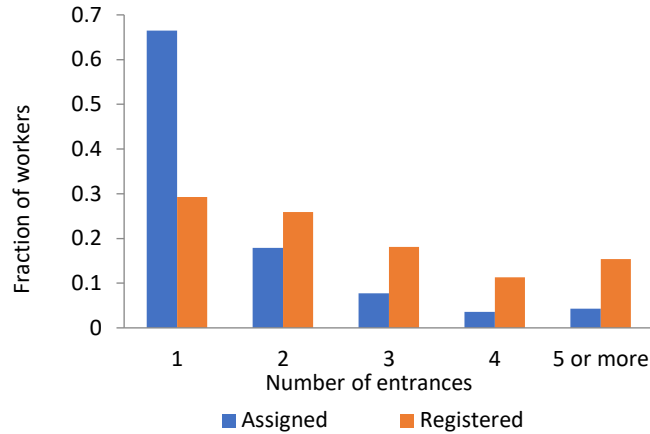
Notes: The figure reports the distribution of workers by the number of times they enter and exit the pension system grouped by type of affiliation that refers to registered and assigned (incomplete enrollment process) workers.

Figure 3
Density of contribution and time in the system by type of affiliation

Panel A. Assigned workers   Panel B. Registered workers
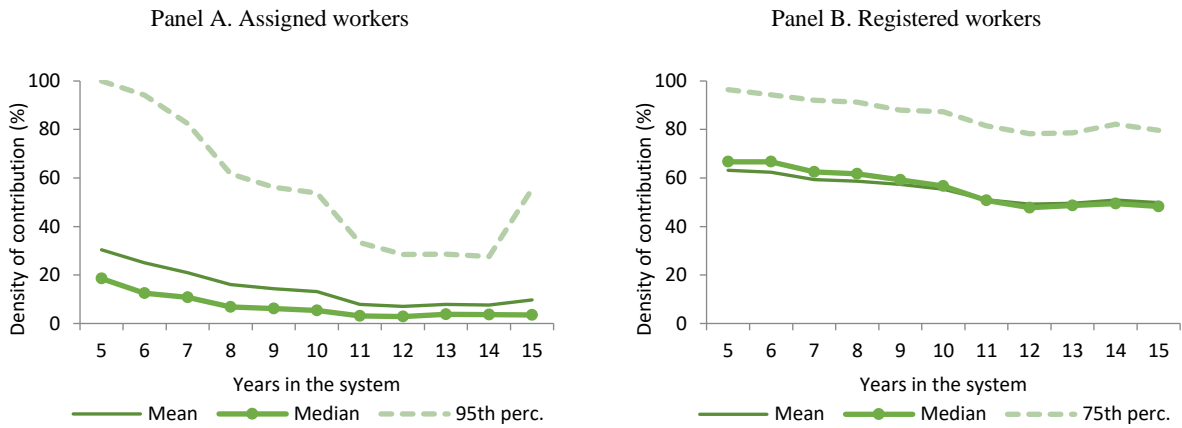
Notes: The figures report mean, median, and 95th (assigned) or 75th (registered) percentiles of density of contribution in percentage by workers' number of years in the system. Years are measured from the date of the first contribution to the pension account until the last bimester of 2011. Density of contribution refers to the time of active participation as percentage of the total time since enrollment. Type of affiliation refers to registered and assigned (incomplete enrollment process) workers.

Figure 4
Density of contribution deciles by gender

Panel A. Women   Panel B. Men

Notes: The figures report the fraction of workers by decile of density of contribution in percentage grouped by gender. The information corresponds only to registered workers. Density of contribution refers to the time of active participation as percentage of the total time since enrollment.

Figure 5
Number of entrances by gender
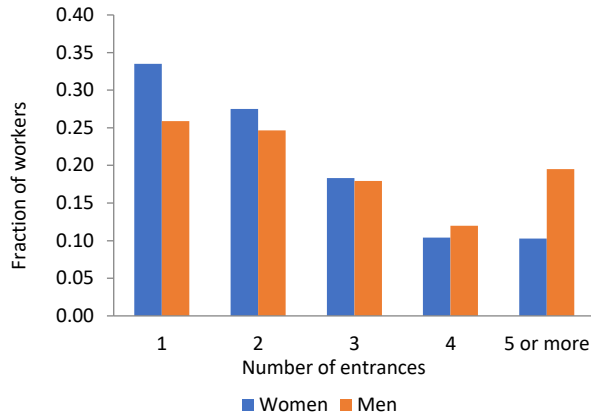
Notes: The figure reports the number of times an individual enters the system grouped by gender. The information corresponds only to registered workers.

Figure 6
Density of contribution and time in the system by gender

Panel A. Women

Panel B. Men
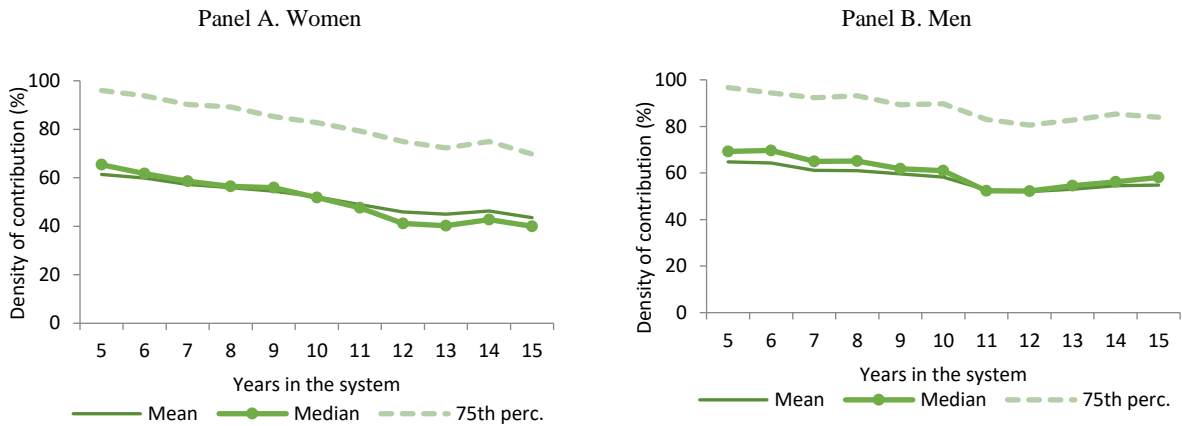
Notes: The figures report mean, median, and 75th percentile of density of contribution in percentage by workers' number of years in the system. Years are measured from the date of the first contribution to the pension account until the last bimester of 2011. Density of contribution is the time of active participation as percentage of the total time since enrollment.

Figure 7
Standardized salaries by density of contribution deciles

Panel A. Mean salary by type of affiliation

Panel B. Salary slope by type of affiliation

Panel C. Mean salary by gender

Panel D. Salary slope by gender

Notes: Numbers are averages of income measures for workers in the corresponding density of contribution decile. Income measures are mean salary over time and the slope of salary history as proxy for growth, standardized in terms of minimum salary. Indicators are estimated using the salary of each worker reported by the employer in every bimester and the national minimum salary reported by the Mexican government for the corresponding period. The sample is divided by registered and assigned workers (not completing enrollment process) and by gender in the case of registered workers. Density of contribution refers to the time of active participation as a percentage of the total time since enrollment.
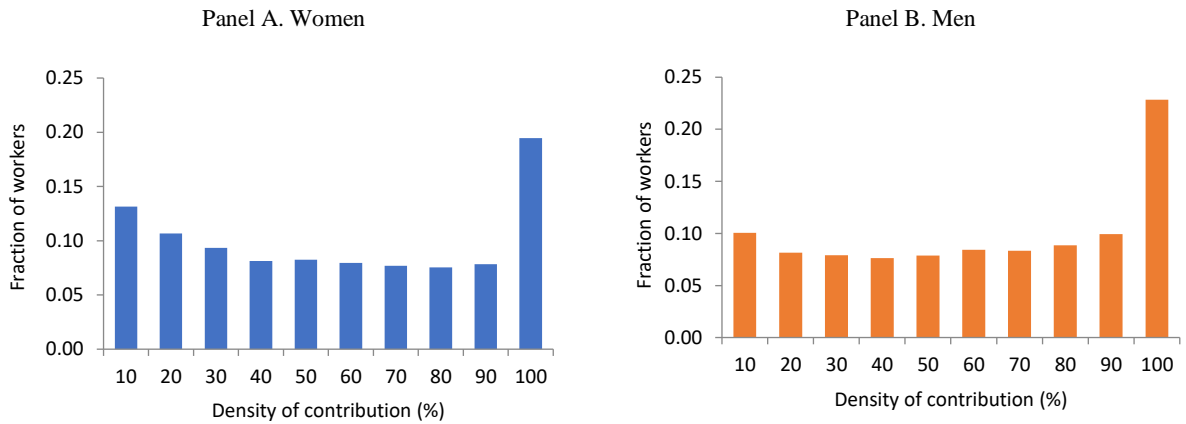
Figure 8
Density of contribution by housing credit, change of pension manager and change of residence
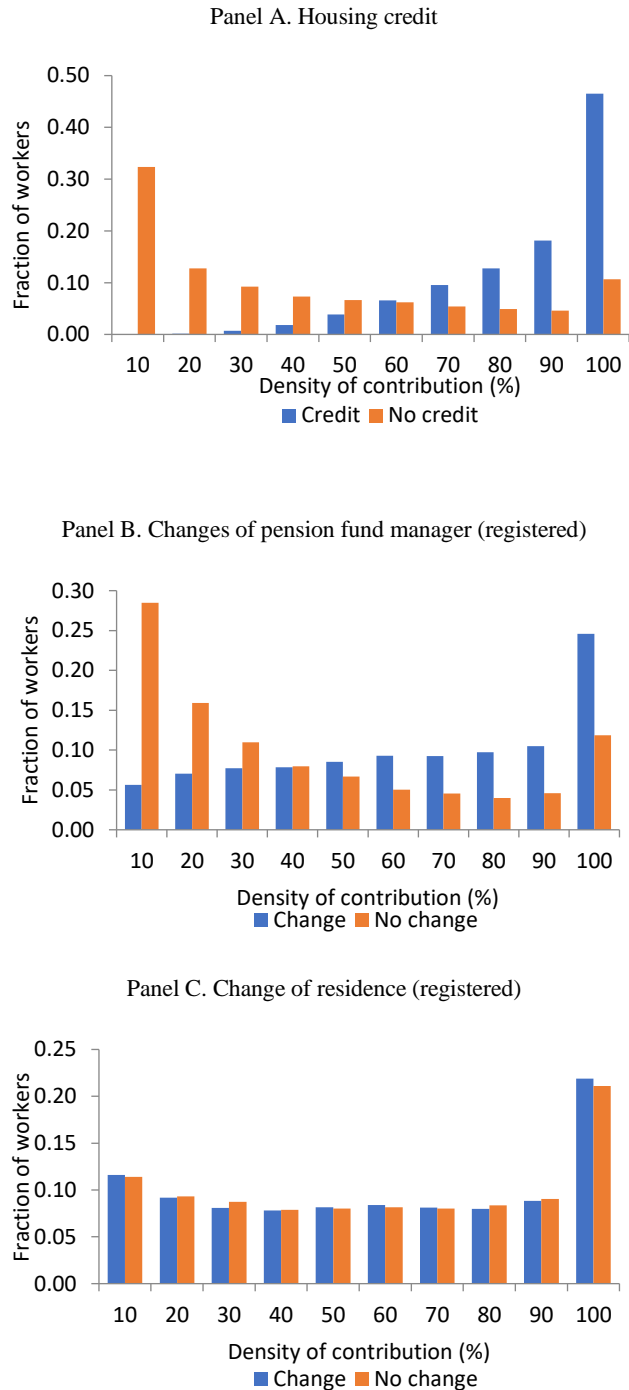
Panel A. Housing credit

Panel B. Changes of pension fund manager (registered)

Panel C. Change of residence (registered)

Notes: The figures report the fraction of workers by decile of density of contribution in percentage by the corresponding control variable. Housing credit refers to workers with credit from the National Housing Institute (INFONAVIT). The information on changes of pension managers and change of location corresponds only to registered workers. Change of residence occurs when the state of the current address is different from the state of birth. Density of contribution refers to the time of active participation as a percentage of the total time since enrollment.

Table 1
Sample composition

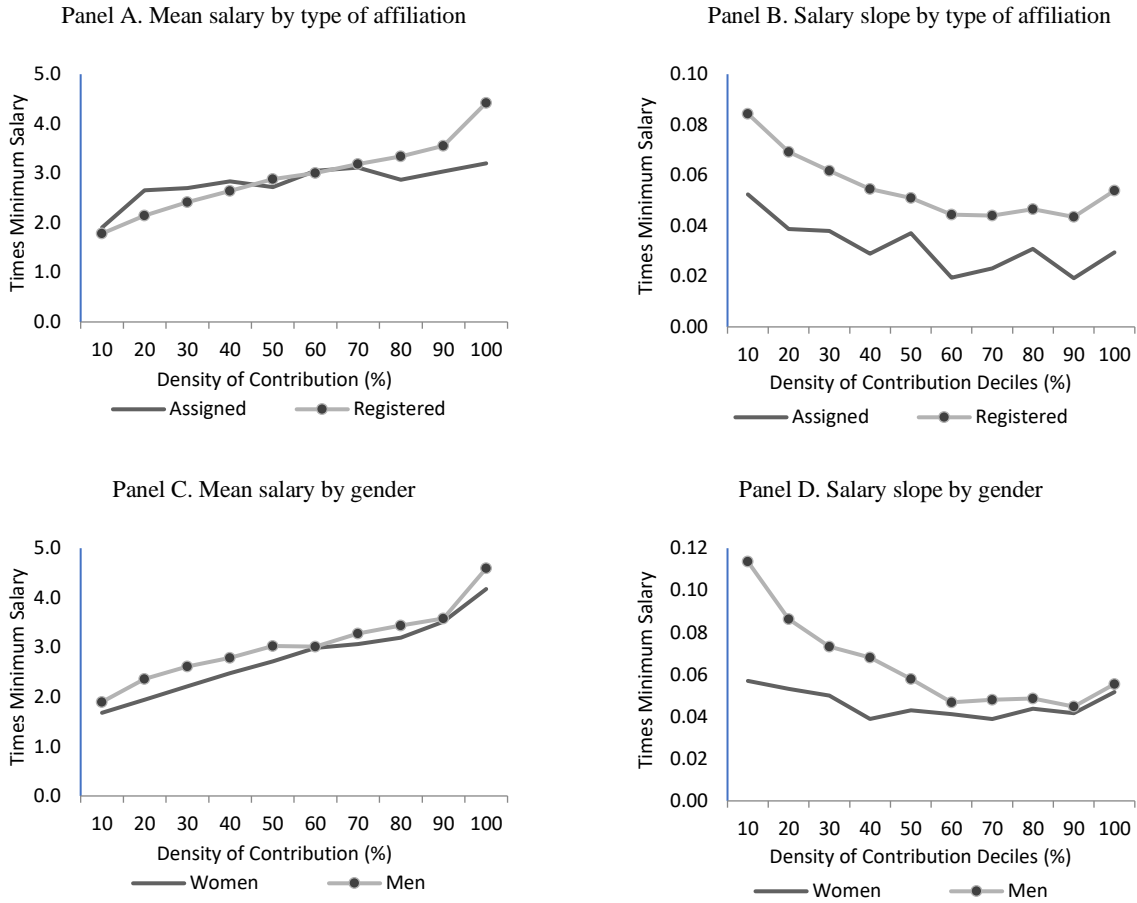|	Workers		Pension savings, outstanding balance		Average balance per worker
	Number	Percentage	Millions (MXN)	Percentage	MXN
Assigned	13,190	33	$79.10	6.8	$5,994.85
Registered	26,810	67	$1,090.30	93.2	$40,669.21
Men	14,736	55	$659.30	60.5	$44,743.40
Women	12,074	45	$431.00	39.5	$35,696.77
Total	40,000		$1,169.41		$29,235.34

Notes: The table reports composition of the sample, number and percentage of workers, by type of affiliation (registered and assigned workers). Registered workers are those who completed the enrollment to the pension system by choosing a pension manager, and assigned workers are those who did not complete the enrollment. For registered workers we report the composition of the sample by gender. The second columns report outstanding balance of accumulated saving sand the distribution in percentage as of December 2011. Average balance per worker in the third column is the average of pension savings outstanding balance per group.

Table 2
Descriptive statistics by type of affiliation

	Mean	25th perc.	Median	75th perc.	95th perc.	Std. Dev.	Obs.
Panel A. Registered							
Density of contribution (percentage)	55.10	24.69	56.06	87.04	100.00	32.86	26,810
Minimum guaranteed pension	0.50	0.00	1.00	1.00	1.00	0.50	26,810
Entrances to the system (times)	2.66	1.00	2.00	4.00	6.00	1.58	26,810
Average length of stay (bimesters)	15.77	4.33	9.50	20.67	54.00	16.84	26,810
Age of first enrollment	21.69	18.00	19.00	23.00	36.00	6.78	26,810
Outstanding balance (required contributions account)	57,223	13,319	35,378	69,849	185,406	78,635	26,693
Outstanding balance (voluntary contributions account)	8,646	120	720	3,820	87,214	20,641	169
Initial standardized salary	1.99	1.14	1.49	2.06	4.47	2.02	26,805
Average standardized salary	3.09	1.62	2.19	3.26	8.19	2.99	26,805
Standardized salary slope (growth)	0.06	0.00	0.02	0.07	0.29	0.37	26,810
Total number of employers	5.08	3.00	4.00	7.00	12.00	3.19	26,810
House credit	0.19	0.00	0.00	0.00	1.00	0.39	26,810
Changes of residence	0.29	0.00	0.00	1.00	1.00	0.45	26,810
Changes of pension managers (times)	1.36	0.00	1.00	2.00	4.00	1.28	26,810
Panel B. Assigned							
Density of contribution (percentage)	15.84	2.74	6.41	17.86	71.43	22.38	13,190
Minimum guaranteed pension	0.07	0.00	0.00	0.00	1.00	0.25	13,190
Entrances to the system (times)	1.64	1.00	1.00	2.00	4.00	1.14	13,190
Average length of stay (bimesters)	4.40	1.00	2.00	4.33	16.00	6.57	13,190
Age of first enrollment	25.46	18.00	22.00	30.00	50.00	12.16	13,190
Outstanding balance (required contributions account)	9,302	456	2,025	8,217	40,451	23,326	13,133
Outstanding balance (voluntary contributions account)	582	15	273	1,458	1,458	770	3
Initial standardized salary	2.09	1.06	1.38	1.96	4.93	2.95	13,180
Average standardized salary	2.24	1.11	1.52	2.11	5.23	3.09	13,180
Standardized salary slope (growth)	0.05	0.00	0.00	0.02	0.35	0.50	13,190
Total number of employers	2.15	1.00	1.50	3.00	6.00	1.79	13,190
House credit	0.01	0.00	0.00	0.00	0.00	0.09	13,190

Notes: The table reports summary statistics for workers grouped by type of affiliation (registered and assigned workers). Panel A reports registered workers, who completed the enrollment to the pension system by choosing a pension manager, and Panel B reports assigned workers, who did not complete the enrollment. Density of contribution is the ratio of the number of periods that the worker contributes to the pension system over the total number of periods enrolled in it. Minimum guaranteed pension (MPG) is a dummy that takes the value of 1 if the expected time of participation is 24 years or more and the worker would be entitled to the MPG. We report entrances to the system that refer to the number of times that the worker returns to the system, average time of stay during each entrance, and age of first enrollment. Outstanding balances of savings are reported in Mexican pesos as of 2011. We estimate salary metrics using the nominal daily salary reported by employers. Initial salary is the salary reported when the worker first appeared in the system. We obtain average salary and the slope of the salary using all available salaries of each worker. We standardize initial salary, average salary, and salary growth dividing by the oficial minimum national salary effective in the corresponding period. House credit is a dummy that takes the value of 1 when workers obtain a mortgage from the National Housing Institute. Change of residence is a dummy that takes the value of 1 if the reported state of birth is different from the current address state (only for registered).

Table 3
Descriptive statistics by gender (registered workers)

	Mean	25th perc.	Median	75th perc.	95th perc.	Std. De.	Obs.
Panel A. Women							
Density of contribution (percentage)	52.05	21.15	50.65	83.95	100.00	33.10	12,074
Minimum guaranteed pension	0.45	0.00	0.00	1.00	1.00	0.50	12,074
Entrances to the system (times)	2.42	1.00	2.00	3.00	6.00	1.43	12,074
Average length of stay (bimesters)	15.60	4.50	9.67	20.50	53.00	16.36	12,074
Age of first enrollment	22.44	18.00	20.00	24.00	38.00	7.21	12,074
Outstanding balance (required contributions account)	51,286	11,019	30,060	62,753	171,717	72,823	12,026
Outstanding balance (voluntary contributions account)	8,539	114	611	3,820	42,111	20,097	82
Initial standardized salary	1.93	1.14	1.45	1.99	4.38	1.77	12,072
Average standardized salary	2.86	1.51	2.02	3.00	7.69	2.69	12,072
Standardized salary slope (growth)	0.05	0.00	0.02	0.07	0.26	0.17	12,074
Total number of employers	4.43	2.00	4.00	6.00	11.00	2.82	12,074
House credit	0.16	0.00	0.00	0.00	1.00	0.37	12,074
Changes of residence	0.28	0.00	0.00	1.00	1.00	0.45	12,074
Changes of pension managers (times)	1.25	0.00	1.00	2.00	3.00	1.19	12,074
Panel B. Men							
Density of contribution (percentage)	57.60	28.57	60.34	88.89	100.00	32.44	14,736
Minimum guaranteed pension	0.54	0.00	1.00	1.00	1.00	0.50	14,736
Entrances to the system (times)	2.87	1.00	2.00	4.00	6.00	1.66	14,736
Average length of stay (bimesters)	15.92	4.17	9.40	21.00	55.00	17.23	14,736
Age of first enrollment	21.07	17.00	19.00	22.00	34.00	6.34	14,736
Outstanding balance (required contributions account)	62,091	15,830	39,855	75,414	194,234	82,783	14,667
Outstanding balance (voluntary contributions account)	8,747	125	860	4,621	87,214	21,256	87
Initial standardized salary	2.05	1.15	1.52	2.10	4.53	2.20	14,733
Average standardized salary	3.27	1.74	2.35	3.42	8.55	3.20	14,733
Standardized salary slope (growth)	0.06	0.00	0.02	0.08	0.31	0.47	14,736
Total number of employers	5.62	3.00	5.00	8.00	12.00	3.36	14,736
House credit	0.21	0.00	0.00	0.00	1.00	0.41	14,736
Changes of residence	0.29	0.00	0.00	1.00	1.00	0.45	14,736
Changes of pension managers (times)	1.44	1.00	1.00	2.00	4.00	1.34	14,736

Notes: The table reports summary statistics for registered workers grouped by gender. Registered workers are those that completed the enrollment to the pension system by choosing a pension manager. Panel A reports numbers of women and Panel B of men. Density of contribution is the ratio of the number of periods that the worker contributes to the pension system over the total number of periods enrolled in it. Minimum guaranteed pension (MPG) is a dummy that takes the value of 1 if the expected time of participation is 24 years or more and the worker would be entitled to the MPG. We report entrances to the system that refer to the number of times that the worker returns to the system, average time of stay during each entrance, and age of first enrollment. Outstanding balances of savings are reported in Mexican pesos as of 2011. We estimate salary metrics using the nominal daily salary reported by employers. Initial salary is the salary reported when the worker first appeared in the system. We obtain average salary and the slope of the salary using all available salaries of each worker. We standardize initial salary, average salary, and salary growth dividing by the official minimum national salary effective in the corresponding period. House credit is a dummy that takes the value of 1 when workers obtain a mortgage from the National Housing Institute. Change of residence is a dummy that takes the value of 1 if the reported state of birth is different from the current address state.

Table 4
Composition by state and average savings (registered workers)

State	Workers (%)	Accumulated savings (%)	Average savings (000 pesos)	Fraction of workers entitled to MGP	State	Workers (%)	Accumulated savings (%)	Average savings (000 pesos)	Fraction of workers entitled to MGP
Mexico City	10.6	15.4	$59	0.49	Durango	1.3	1.1	$35	0.43
Nuevo León	8.1	10.1	$51	0.56	Sonora	3.4	2.9	$35	0.45
Querétaro	2.1	2.6	$50	0.53	Puebla	3.5	2.8	$33	0.40
México	12.7	13.8	$44	0.46	Veracruz	3.7	2.9	$32	0.40
Yucatán	2.0	2.0	$42	0.56	Colima	0.6	0.5	$31	0.48
San Luis Potosí	2.1	2.1	$41	0.51	Aguascalientes	1.4	1.0	$31	0.45
Coahuila	3.2	3.2	$41	0.49	Michoacán	2.3	1.7	$31	0.43
Morelos	1.2	1.2	$40	0.48	Sinaloa	3.3	2.4	$30	0.44
Baja California Sur	0.6	0.6	$40	0.45	Nayarit	0.7	0.5	$30	0.46
Baja California	3.8	3.7	$40	0.46	Hidalgo	1.2	0.9	$29	0.37
Chihuahua	4.5	4.3	$39	0.48	Zacatecas	0.6	0.4	$28	0.41
Jalisco	9.3	8.9	$39	0.48	Tlaxcala	0.6	0.4	$27	0.28
Tamaulipas	4.4	4.1	$38	0.49	Oaxaca	1.0	0.7	$26	0.35
Guanajuato	6.0	5.5	$37	0.50	Guerrero	1.1	0.7	$26	0.34
Quintana Roo	1.6	1.4	$37	0.55	Tabasco	1.1	0.7	$25	0.38
Campeche	0.5	0.5	$36	0.46	Chiapas	1.6	0.8	$22	0.31

Notes: The table reports the distribution of registered workers in percentage by the state where they are employed, the distribution in percentage of total savings in pension accounts as of the end of 2011, average savings per worker in thousand MXN pesos, and the fraction of workers in each state that may be entitled to the MGP (24 years of expected time of active participation or more). Data is sorted by the amount of average savings. Registered workers are those that completed the enrollment to the pension system by choosing a pension manager.

Table 5

Probability of not completing the enrollment process (assigned worker)

Dependent variable: Probability of being assigned worker

Panel A. All sample

	Probit	Marginal Effects
Age of affiliation	0.0230***	0.00658***
	(0.000841)	(0.000233)
Initial Salary (std.)	0.00128	0.000366
	(0.00308)	(0.000879)
Length of stay 1st entry	1.134***	0.324***
	(0.0157)	(0.00354)
Dummy 2nd entry	1.253***	0.358***
	(0.0178)	(0.00420)
Constant	-2.325***	
	(0.0274)	
Observations	37,583	37,583
Pseudo R-squared	0.228	
Log Likelihood	-18,799	

Panel B. Workers with 2nd entrance or contributing 1 year or more

	(1)		(2)		(3)	
	Probit	Marginal Effects	Probit	Marginal Effects	Probit	Marginal Effects
Age of affiliation	0.0273***	0.00603***	0.0201***	0.00494***	0.0220***	0.00453***
	(0.00119)	(0.000256)	(0.00132)	(0.000319)	(0.00157)	(0.000319)
Average Salary (std.)	-0.0369***	-0.00814***	-0.137***	-0.0336***	-0.115***	-0.0237***
	(0.00321)	(0.000706)	(0.00664)	(0.00161)	(0.00717)	(0.00148)
Employers	-0.124***	-0.0274***	-0.170***	-0.0417***	-0.115***	-0.0237***
	(0.00432)	(0.000940)	(0.00432)	(0.000990)	(0.00462)	(0.000941)
Dummy 2nd entry	-0.155***	-0.0342***				
	(0.0246)	(0.00542)				
Constant	-0.906***		-0.124***		-0.638***	
	(0.0386)		(0.0406)		(0.0493)	
Observations	24,983		21,534	21,534	18,416	18,416
Pseudo R-squared	0.0897		0.144		0.0919	
Log Likelihood	-9952		-9357		-6872	

Notes: The table contains the results of cross-section Probit models and their marginal effects. The dependent variable is a dummy that takes the value of 1 if the worker is assigned. Assigned workers are those that did not complete the enrollment process and did not select a pension manager. Panel A considers all workers in the sample, and Panel B workers that stay more than 1 year on any entrance (1), workers with 2 entrances or more (2), or both (3). Independent variables are age of first enrollment; initial salary, that is the salary reported by the employer in the first bimester of contribution and it is standardized by dividing them by the official national minimum salary on the corresponding bimester; standardized average salary, which is the mean of all standardized salaries reported by employers across the bimesters that a worker contributed; length of stay in the first entry, which is a dummy that takes the value of 1 if the worker stayed less than 1 year; and second entry dummy, which takes the value of 1 if the worker does not enter the system for a second time; number of employers; and house credit that is a dummy that takes the value of 1 when workers obtain a mortgage from the National Housing Institute. Marginal effects are estimated using the coefficients of the corresponding Probit model and show the impact of 1 unit change in the independent variable on the probability of being an assigned worker. Robust standard errors are in parentheses and ***, ** and * denote significance at the 0.01, 0.05 and 0.10 level.

Table 6
Density of contribution assigned workers

Dependent variable: percentage of density of contribution (assigned)								
	OLS				Tobit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Average Salary (std.)	0.830***	0.859***	0.447***	0.469***	0.840***	0.871***	0.452***	0.475***
	(0.0737)	(0.0733)	(0.0645)	(0.0641)	(0.0758)	(0.0754)	(0.0663)	(0.0658)
Age of affiliation	0.112***	-0.00114	0.0815***	-0.0668***	0.114***	-0.00156	0.0836***	-0.0679***
	(0.0148)	(0.0247)	(0.0137)	(0.0231)	(0.0152)	(0.0253)	(0.0141)	(0.0236)
Employers	5.623***	4.201***	5.552***	3.691***	5.632***	4.170***	5.559***	3.656***
	(0.116)	(0.331)	(0.105)	(0.308)	(0.118)	(0.338)	(0.107)	(0.314)
House credit	50.88***	58.57***	48.01***	53.36***	53.43***	61.48***	50.55***	56.22***
	(3.141)	(3.570)	(2.667)	(3.103)	(3.579)	(4.062)	(3.081)	(3.566)
Age of affil. x Employ		0.0630***		0.0826***		0.0647***		0.0844***
		(0.0146)		(0.0139)		(0.0149)		(0.0141)
House credit x avg. Salary (std.)		-2.390***		-1.630***		-2.488***		-1.717***
		(0.566)		(0.504)		(0.605)		(0.541)
Constant	-1.304***	1.201**	-6.971***	-3.830***	-1.334***	1.239**	-7.047***	-3.837***
	(0.431)	(0.589)	(0.418)	(0.563)	(0.440)	(0.601)	(0.427)	(0.573)
Sigma					19.51***	19.46***	18.02***	17.96***
					(0.283)	(0.283)	(0.257)	(0.257)
Observations	13,180	13,180	13,180	13,180	13,180	13,180	13,180	13,180
Adjusted R-squared	0.270	0.273	0.377	0.381				
Pseudo R-squared					0.0343	0.0348	0.0517	0.0525
Log Likelihood					-57,157	-57,127	-56,128	-56,083
Time effects (year of entrance)	No	No	Yes	Yes	No	No	Yes	Yes

Notes: The table shows the results of cross-section OLS and Tobit models (Tobin, 1958) of the percentage of density of contribution of assigned workers, who are those that did not complete the enrollment process and did not select a pension manager. The dependent variable is density of contribution, which is the ratio of the number of periods that the worker contributes to the pension system over the total number of periods enrolled in it. Independent variables are average salary, which is the mean of all salaries reported by employers across the bimesters that a worker contributed standardized by dividing by the official national minimum salary on each bimester; age of first enrollment; the number of employers; and house credit, which is a dummy variable that takes the value of 1 if the worker has a mortgage with the National Housing Institute. Sigma is the estimated standard error of Tobit regressions. Robust standard errors are in parentheses and ***, ** and * denote significance at the 0.01, 0.05 and 0.10 level.

Table 7
Density of contribution registered workers

Dependent variable: percentage of density of contribution

	OLS				Tobit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Average Salary (std.)	2.894***	2.738***	2.887***	2.725***	3.323***	3.145***	3.317***	3.135***
	(0.134)	(0.126)	(0.135)	(0.127)	(0.174)	(0.163)	(0.174)	(0.164)
Gender	3.686***	2.710**	3.777***	2.792**	4.459***	3.380***	4.558***	3.472***
	(0.612)	(0.585)	(0.612)	(0.585)	(0.742)	(0.709)	(0.741)	(0.709)
Age of affiliation	0.240***	0.279***	0.244***	0.282***	0.286***	0.329***	0.291***	0.332***
	(0.0288)	(0.0278)	(0.0289)	(0.0279)	(0.0324)	(0.0313)	(0.0325)	(0.0314)
Employers	1.715***	2.477***	1.722***	2.493***	1.333***	2.177***	1.342***	2.197***
	(0.0521)	(0.0500)	(0.0524)	(0.0504)	(0.0600)	(0.0568)	(0.0603)	(0.0572)
Pension managers	5.828***	5.956***	5.831***	5.957***	6.529***	6.578***	6.534***	6.580***
	(0.141)	(0.138)	(0.141)	(0.138)	(0.173)	(0.167)	(0.173)	(0.168)
House credit	34.40***	34.73***	34.17***	34.59***	37.05***	37.43***	36.76***	37.24***
	(0.603)	(0.583)	(0.609)	(0.589)	(0.804)	(0.773)	(0.809)	(0.777)
Voluntary savings	7.234***	7.105***	6.806***	6.540***	8.763***	8.408***	8.316***	7.825***
	(2.083)	(2.088)	(2.067)	(2.072)	(2.612)	(2.594)	(2.594)	(2.575)
Gender x avg. Salary(std.)	-0.952***	-0.829***	-0.961***	-0.837***	-1.088***	-0.950***	-1.100***	-0.961***
	(0.170)	(0.162)	(0.169)	(0.162)	(0.224)	(0.214)	(0.224)	(0.214)
House credit x avg. Salary(std.)	-2.086***	-1.873***	-2.074***	-1.862***	-1.877***	-1.644***	-1.863***	-1.631***
	(0.142)	(0.137)	(0.142)	(0.136)	(0.203)	(0.195)	(0.202)	(0.194)
Richer States Dummy	1.603***	1.914***			1.836***	2.170***		
	(0.345)	(0.329)			(0.389)	(0.370)		
Constant	18.40***	8.355***	18.56***	9.364***	18.13***	7.074***	18.37***	8.288***
	(0.840)	(0.930)	(1.616)	(1.557)	(0.954)	(1.049)	(1.809)	(1.748)
Sigma					29.99***	28.48***	29.90***	28.40***
					(0.144)	(0.141)	(0.144)	(0.141)
Observations	26,805	26,805	26,805	26,805	26,805	26,805	26,805	26,805
Adjusted R-squared	0.325	0.389	0.329	0.393				
Pseudo R-squared					0.0402	0.0507	0.0408	0.0514
Log Likelihood					-116,912	-115,625	-116,836	-115,548
Time effects (year of entrance)	No	Yes	No	Yes	No	Yes	No	Yes
Regional effects (State)	No	No	Yes	Yes	No	No	Yes	Yes

Notes: The table shows the results of cross-section OLS and Tobit models (Tobin, 1958) of the percentage of density of contribution of registered workers, who are those that completed the enrollment process and selected a pension manager. The dependent variable is density of contribution, which is the ratio of the number of periods that the worker contributed to the pension system over the total number of periods enrolled in it. Independent variables are average salary, which is the mean of all salaries reported by employers across the bimesters that a worker contributed standardized by dividing by the national minimum salary on each bimester; gender, which is a dummy variable that takes the value of 1 if male; age of first enrollment; the number of employers; the number of pension managers, which refers to the number of times a worker changed AFORE; house credit, which is a dummy variable that takes the value of 1 if the worker has a mortgage with the National Housing Institute; voluntary savings, dummy that takes the value of 1 if the worker made additional contributions; and a richer states dummy that takes the value of 1 if the worker labors in Mexico City, the State of Mexico, Nuevo Leon, or Jalisco. Sigma is the estimated standard error of Tobit regressions. Robust standard errors are in parentheses and ***, ** and * denote significance at the 0.01, 0.05 and 0.10 level.

Table 8
Probability to obtain minimum guaranteed pension

Dependent variable: MGP dummy

	(1)		(2)		(3)	
	Probit	Marginal Effects	Probit	Marginal Effects	Probit	Marginal Effects
Average Salary (std.)	0.0793***	0.0178***	0.109***	0.0302***	0.108***	0.03004***
	(0.00265)	(0.001)	(0.00542)	(0.001)	(0.00545)	(0.001)
Gender			0.144***	0.0402***	0.145***	0.0403***
			(0.0265)	(0.007)	(0.0267)	(0.007)
Age of affiliation	-0.0376***	-0.0084***	-0.0399***	-0.0111***	-0.0401***	-0.0111***
	(0.00138)	(0.0003)	(0.00159)	(0.00043)	(0.00161)	(0.00043)
Employers	0.145***	0.0324***	0.104***	0.0291***	0.106***	0.0294***
	(0.00300)	(0.001)	(0.00319)	(0.001)	(0.00323)	(0.001)
Pension managers			0.304***	0.0845***	0.305***	0.0847***
			(0.00871)	(0.002)	(0.00875)	(0.002)
House credit	1.730***	0.388***	1.648***	0.4587***	1.650***	0.4576***
	(0.0471)	(0.01)	(0.0458)	(0.012)	(0.0461)	(0.012)
Voluntary savings	0.567***	0.1271***	0.424***	0.1181***	0.406***	0.1125***
	(0.124)	(0.028)	(0.119)	(0.033)	(0.119)	(0.033)
Gender x avg. Salary(std.)			-0.0364***	-0.0101***	-0.0363***	-0.0101***
			(0.00654)	(0.002)	(0.00655)	(0.002)
House credit x avg. Salary(std.)	-0.0358***	-0.008***	-0.0647***	-0.018***	-0.0648***	-0.018***
	(0.0101)	(0.002)	(0.00990)	(0.003)	(0.00991)	(0.003)
Richer States Dummy			0.106***	0.0295***		
			(0.0184)	(0.005)		
Assigned worker	-1.051***	-0.2357***				
	(0.0227)	(0.005)				
Constant	-0.825***		-0.904***		-0.887***	
	(0.0433)		(0.0530)		(0.0929)	
Observations	37,583		26,805		26,805	
Pseudo R-squared	0.379		0.290		0.292	
Log Likelihood	-15067		-13200		-13151	
Time effects (year of entrance)	Yes		Yes		Yes	
Regional effects (State)	No		No		Yes	

Notes: The table shows the results of cross-section Probit of the probability to obtain the MGP. Model (1) includes all workers in the sample and Models (2) and (3) include only registered workers, who are those that completed the enrollment process and selected a pension manager. The dependent variable is a dummy that takes the value of 1 if the individual is expected to participate in the system 24 years or more. Independent variables are average salary, which is the mean of all salaries reported by employers across the bimesters that the worker contributed standardized by dividing by the national minimum salary on each bimester; gender, which is a dummy variable that takes the value of 1 if male; age of first enrollment; the number of employers; the number of pension managers, which refers to the number of times a worker changed AFORE; house credit, which is a dummy variable that takes the value of 1 if the worker has a mortgage with the National Housing Institute; and the richer states dummy, which takes the value of 1 if the worker is located in Mexico City, the State of Mexico, Nuevo Leon, or Jalisco. Robust standard errors are in parentheses and ***, ** and * denote significance at the 0.01, 0.05 and 0.10 level.