Income inequality in an Individual Capitalization Pension System: The case of Chile

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Abstract

One of the main concerns with individual capitalization pension systems is the potential detrimental impact they may have on the distribution of income at retirement. In this paper we evaluate such impact for the Chilean case. Using individual-level administrative data for a representative sample of all the affiliates to the pension system between 1981 and 2002, we are able to forecast the individual pension payouts for members of each retirement cohort between 2005 and 2025. We then compare the distribution of this retirement income to the corresponding active life income distribution for each cohort. This comparison shows that in general the distribution of retirement income is much more unequal than the distribution of active life income for the same cohort. Results from simulation exercises suggest that the existence of a fixed commission is not important for explaining this difference. The same can be said for the level of the minimum pension guaranteed by the State. However, reducing the number of contributions required to access this benefit would have an important effect on retirement income distribution, diminishing inequality. A more thorough evaluation of the causes of old age income distribution in individual capitalization pension systems requires more of these type of simulations that evaluate the impact of other features that play a role in these systems.

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1. Introduction

Behind 7 African countries, and after Brazil and Colombia, Chile has one of the most unequal distributions of income in the world[3]. Although some policies have been implemented in order to improve this figure, the last available measures show that inequality seems to be very persistent. According to Mideplan (2004) the Gini index of per capita income was 0.57 in 2003 and has remained around this figure since 1987. In a longer-term analysis, Larrañaga (2001) shows that Chile has historically had large levels of inequality. Using data for Metropolitan Santiago, he shows that the Gini index has never been bellow 0.46.

On the other hand, Chile introduced a new pension system based on individual capitalization in 1981, replacing the unfunded PAYG system. It was assumed that this reform would be unbiased in distributive terms.[4] However, some critics have said that the new system has demonstrated a good performance for the richest workers, but not for the poorest ones, thus increasing income inequality at old age.

Given that the reformed pension system is based on individual capitalization it is relevant to ask what is the effect of income inequality during the accumulation stage on the dispersion of income during retirement. At the same time it is useful to judge the performance of the pension system for low income relative to high income workers based on individual data. This analysis may direct to policy implications that would make the system more neutral to the pervasive inequality problem faced by Chile.

Using an administrative data base sample, and the Social Security Survey (EPS 2002)[5], we forecast the pension payouts of active workers, and compare it to their lifetime income. We then analyze the impact on income distribution at retirement of the main features of the individual capitalization system that have a different effect on poor and rich workers (life expectancy, fixed commissions, minimum pension guarantee, etc.) and measure how much of the impact on the distribution of income can be attributed to each feature.

Our results show that retirement income is distributed significantly more unequally than active life income. Although our measure of active life income is somehow limited because it corresponds to the individual's income reported when contributing, the Gini Index for retirement income seems high even when compared to the distribution of actual wages in the economy.

Our preliminary results indicate that the existence of a Fixed Commission does not have an important impact on old-age income distribution. Given its current level, the elimination of this fee would only have a negligible effect on cohorts that retire very far in the future. Similarly, the level of the minimum pension benefit does not seem to affect retirement

[3] Human Development Report 2004 – UNDP

[4] Perhaps the reformers didn't take care of the distributive consequences considering that they were changing an unfair system in terms of the benefits. A big change was made in order to give the same benefit for unit of peso contributed, no matter of what kind of worker you were. Furthermore, the idea was to separate the pension system from any redistributive policy (see J. Piñera – El Cascabel al Gato, 1991).

[5] The data base is propriety of the Ministry of Labor, Chile. Available at www.proteccionsocial.cl.

income distribution in an important way. Whether it grows at 2% per year (as it has historically been the case), at 4% or it does not grow at all, old age income distribution remains very similar. More important than the minimum pension level are its requirements in this respect. Currently, to obtain the benefit, a worker must contribute for at lest 20 years in the pension system. Relaxing this requirement to 17 years has an important effect on diminishing inequality of pension payments.

The next section of the paper presents a brief description of the system, as it was shaped after the pension reform in 1981, including some basic figures about its performance through the years. Section 3 analyzes the main features that may potentially impact old age income distribution through an individual capitalization pension system. It serves as an analytical standpoint for the empirical exercises carried out later in the paper. The next section explains our methodology, including a description of the data we use, the estimations we carry out and the forecast methodology that allow as to build final balance at the time of retirement for all individuals currently active in the sample. Section 5 shows the results of our forecasts and simulation exercises, while section 6 concludes.

2. A Brief Description of the Chilean Pension System

In 1981, Chile reformed its pension system, adopting an individual capitalization system with private fund managers. At the same time, the old Pay-as-you-Go system was reorganized into a single pension institution, the INP (Instituto de Normalización Previsional). Existing workers were allowed to choose in which system they would remain; choice that they can make at any time before retirement. However, once they choose the new system, they cannot go back to the old system. In order to recognize contributions made into the old system, workers who transferred to the new system were issued "Recognition Bonds", which complement the individual's account balance and are liquidated at the time of retirement. On the other hand, workers that entered the labor market for the first time from 1981 on were mandated to participate in the new system. As of 2003, less than 5% of workers were still participating in the old pension system. This paper will focus on the performance of the individual capitalization system and thus will not consider the situation of those who remained in the old system.

The Chilean Pension System manages retirement, disability and survivorship benefits. Salaried workers are mandated to contribute 10% of their monthly salary up to a ceiling fixed by law to an individual retirement account managed by a private manger of her choice. Self-employed individuals can participate voluntarily. As a result, while 25% of workers are self-employed in any given month, only 2% of monthly contributions into the pension funds come from self-employed individuals.

Pension Fund Managers (or AFPs according to their acronym in Spanish) charge a monthly fee defined as a percentage of the salary that currently corresponds to an average of 2.5%. Additionally, they charge a fixed fee each time a contribution is made. Fund Managers are not allowed to charge fees or give benefits that have not been previously specified by law. Approximately, 1 percentage point of monthly fees is destined to cover the disability and

survivorship insurance. Since this paper will focus on income at retirement we will not specifically address the disability and survivorship insurance component of the system[6].

All contributions go into a pension fund that AFPs invest in the financial market. The return on these investments is accrued in each contributor's individual account. Currently, each AFP offers five funds from which contributors can choose. They vary in their degree of exposure to fixed and variable income instruments.

The legal retirement age is 65 for men and 60 for women. However, contributors who comply with certain requirements about their accumulated funds can retire earlier. Upon retirement, contributors can choose between buying an annuity or having a programmed withdrawal. In the first case, the individual transfers the whole balance in her account to an insurance company in order to buy an annuity and access a fixed monthly income. In the second case, the balance remains in the AFP, which each year calculates the amount to be withdrawn. This amount takes into account the life expectancy that corresponds with the updated survival probability.

The government guarantees a minimum level of pension that currently is equivalent to Chilean $77,077 per month, which corresponds approximately to 27% of the average salary in the economy and 65% of the minimum monthly wage. The access to this benefit requires a minimum of 20 years of contributions into the system. Workers whose balance at the time of retirement is not enough to finance this minimum pension cannot choose to buy an annuity and must opt for a programmed withdrawal. The amount of the withdrawal can be adjusted up to the level of the minimum pension and only after the individual account balance is exhausted the benefit is paid out fully financed by the state.

2.1 Basic Figures Regarding the Evolution of the System

The data used in this paper corresponds to the history of contributions of a representative sample of all the contributors into the system from its creation in 1981 until 2002. For this reason it is necessary to have in mind the evolution of the system in terms of participants, contributions and also of the general context in which it developed.

As of December 2002 there were over 6.7 million of participants in the system with 3.4 million of them actively contributing during that month, which represented 63% of the employed population in the same period. Five percentage points can be attributed to contributions that actually correspond to previous working months and are made with delay. The remaining figure can be decomposed into 80% of coverage for salaried workers (who are mandated to contribute) and only 4.5% for self-employed, whose contribution is voluntary. Coverage in the system increased from a level of 45% in 1986 to the 58% observed in 2003. Chart 1 shows the evolution by type of worker.

As mentioned before, contributions into the pension fund are equivalent to 10% of monthly salaries up to a limit of 60 UF (a monetary unit indexed to the level of prices). Currently this limit is roughly equivalent to 8.6 times the minimum wage (which is not inflation

[6] For more information about the Disability and Survivorship Insurance see Castro (2005)

indexed) and 3.8 times the average wage in the economy. Consequently, the data captured by AFPs only contains information on wages up to the contribution limit, which we will call "reported wage"[7]. As shown in Chart 2, the average reported wage increased approximately 4% per year between 1989 and 2003, while the average level of wages in the economy increased by 3.3% during the same period[8]. Average reported wages are generally higher than the average wage in the economy, a fact that indicates that despite the contribution limit and under-reporting, contributors to the system have higher income than the rest of the economy.

Although it is the distribution of contributors' reported wages which will have a direct impact on the distribution of retirement income, given the limitations of this measure mentioned above, we will use the distribution of general wages in the economy in order to analyze income distribution during the period. Distribution of income has historically been highly unequal in Chile compared to international standards. However the evolution of inequality as measured by the Gini Index, has experimented some fluctuations. As can be observed in Chart 3, the introduction of the Individual Capitalization Pension System in 1981 coincides with an upward trend in income inequality. The period of time in which the new system has been in place has witnessed the highest levels of inequality ever observed since it can be reliably measured. Only after 1990, inequality returned to the level observed immediately prior pension reform.

Which is the effect of this inequality of wages during the accumulation period on the inequality of retirement income in an individual capitalization pension system? This paper attempts to provide an answer to this question identifying the different sources through which retirement income can be affected differently for high wage and low-wage workers. The next section provides an analytical view of these features.

3. Features that Impact Old-Age Inequality through the Pension System

One of the main concerns raised against proposals of privatizing at least part of the current Pay-as-you-Go Social Security systems in the world relate to the distributional impact of such reform. It is commonly viewed that since retirement income would depend more heavily on active life income, inequality of retirement income would increase under a private pension system based on individual capitalization. However, Coronado et al (1999) show that redistribution in the PAYG system is lower than generally thought mainly because people of higher lifetime income live longer and draw benefits for a longer period of time. Using microsimulations Feldstein and Leibman (2000) show that the impact of an investment based pension system on the distribution of retirement income in the United States would be minimal.

[7] This name seems suitable since it captures the fact that wages according to which contributions are made differ from actual wages because of the contribution limit, but also because of under-reporting, especially from self-employed and domestic service workers.
[8] According to the Employment Survey of the National Statistics Institution (INE).

Likewise, the literature that has analyzed the Chilean experience with Pension reform has identified several channels through which the individual capitalization system performs differently for low income and high income workers. Williamson (1999) points to the existence of a flat rate transaction fee (Fixed Commission) and less regular work histories (lower contribution density) as reasons why returns on retirement savings tend to be lower for low-wage workers than for high-wage workers. Gill et al (2004) mention informality as a factor that limits the equity that can be attained by multipillar pension systems based on individual capitalization.

However, there has not been at this point any systematic analysis of all the aspects that may affect old age income distribution and much less a quantification of their separate effects. The use of individual data in this paper allows us to do so. But first, we need to identify which aspects have a relevant impact on retirement income distribution in an individual capitalization system, focusing in the Chilean case. In order to organize the analysis, we classify these features in the following four categories:

1. Labor Market features:
    - Density of Contributions: A higher density of contributions (the proportion of time that a worker actually contributes to the pension system) will imply higher accumulation and therefore higher pensions, all else equal. Furthermore, there is a significant and positive correlation between income and the density of contributions. This correlation would have the effect of further increasing income inequality at retirement.
    - Informal jobs: 43% of the first decile workers don't have a job contract, and therefore, are not mandated to contribute to the pension system. This is another channel through which low income workers can accumulate less into the system and as a result amplify income inequality after retirement.

2. Pension System Structure features:
    - Fixed Commission: The fixed commission is collected from the worker's balance each time a contribution is made. Thus, the higher the fixed commission is, the lower the net contribution the worker makes, affecting low wage workers in a greater proportion.
    - Early Retirement: Contributors that comply with certain rules are allowed to retire and obtain old-age pensions prior to the legal retirement age. Since these rules are based on accumulated funds, they will be fulfilled by higher income workers with greater probability. Since early retirement reduces the pension payout, this channel would shrink income inequality at old age.
    - Contribution Limit: Contributions to the pension fund are determined as a proportion of wages (10%) up to a limit fixed by law[9]. Thus, in practice, higher income individuals contribute less than 10% of their income to their individual pension fund, which in turn could negatively affect the replacement rate they obtain at old age.

[9] The rationale for this limit is twofold: The mandate is supposed to determine a minimum amount of savings and individual pension funds are State guaranteed in the event of a Pension Manager bankruptcy.

3. Subsidies and taxes features:
    - Minimum Pension: The government guarantees a minimum pension level for all retirees who having contributed for at least 20 years in the pension system do not accumulate the necessary funds to self-finance this minimum level. This subsidy partly reduces income inequality at retirement.
    - Tax Exemption: Contributions into the system are tax exempt, while income that comes from pensions pays taxes. Since the tax code is progressive, the tax exemption has a greater value for high income workers than for low wage earners. Furthermore, since pension income is generally different than active life income, retirees may fall in tax brackets that differ from the ones they faced during active life, thus affecting net income distribution at old age.

4. Demographic features:
    - Life Expectancy: It is very likely that life expectancy is positively correlated with lifetime income. However, pensions are paid according to standard sex-specific life tables. This implies that in practice, payouts are calculated for a "longer than necessary" period of time for low wage workers, thus decreasing the per-period payout and worsening income distribution[10].

In terms of how much can be done to the design of the pension system to mitigate its impact on income inequality it is clear that the potential impact of the design of the system on Labor Market features is limited. For this reason the estimated effects of the features that are part of the design of the pension system are the most interesting ones in terms of policy proposals. We separately analyze the features that imply some fiscal cost, such as taxes and subsidies, because the political viability of any policy proposal that affects these features may be lower than those that do no have budget implications. Finally, demographic factors are treated as exogenous and there is practically no room for policy to affect their impact on income distribution.

Using the methodology explained in the next section, applied on micro-data, we estimate the effect that each of these features have on income distribution at old age. This exercise can shed some light on the possible effects that implementing an individual capitalization pension system may have on old-age income distribution for countries that currently run a PAYG system and on the design features that must be taken into account in order to maintain inequality neutrality.

4. Methodology

4.1 Data Set and Sample

In 2002, the Ministry of Labor, through its Under-Secretariat of Social Security, requested the realization of a Social Security Survey ("Encuesta de Protección Social" or EPS in Spanish) in order to analyze the status of Social Protection in Chile with a special emphasis

[10] However, if the retiree chooses a programmed withdrawal, any unused funds at the time of death are left as bequests.

on old age protection. The Survey was developed by experts at University of Chile and an international team of consultants and counted with technical support from the Superintendence of Pension Fund Administrators and the Budget Division at the Treasury Department. This Survey collected information on a representative sample of members in both the old pension system (members of INP) and the new pension system (who save in personal accounts at AFPs)[11].

At the same time, the Superintendence of AFPs elaborated a database of the complete history of contributions for all the members of the individual capitalization pension system in the EPS sample, based on administrative data maintained by the AFPs[12]. The models in this chapter use this database, which we call the History of Contributions Data Base (HCDB). We also use some information from the Social Security Survey (EPS 2002), but only to complete our diagnosis or to create alternative scenarios in the simulations.[13] This survey includes self reported information on income during the survey year and about employment situation for the previous twenty one years.

Berstein and Tokman (2005) show that this sample is not representative of the whole Chilean population, because the sample only covers workers that are affiliated to a pension system. They found higher levels of participation of the individuals interviewed in EPS 2002 in the labor market and in the formal sector than the ones in the CASEN 2000 survey, which is made using a sample that is representative for the whole population.

Nonetheless, as we can see in table 1, the number of affiliates as a proportion of the population given by the Civil Identification Agency is near 90% for men of 35 – 49 year old. Then, if we made 20-year forecasts for this group, we would be able to predict pension levels for nearly the whole population.

The HCDB is the premier data set with administrative information of contributions, commissions, accounts balances, recognition bonds and pension withdrawals for a sample of affiliates. It provides 22 years of monthly data (1981 to 2003) on a sample of 24,859 individuals. We do not observe the whole sample the 22 years, because there are some affiliates that die before 2003, and others that begin their contributions after 1981. As a result, we have an unbalanced panel data set.

4.2 Forecast Methodology

From the HCDB we can obtain the saving account's current balance for active contributors in the system, but in order to calculate their pension payouts we need to forecast the workers' contributions until they retire. Following Berstein, Larrain and Pino (2005), using the historical information contained in the same data set, we estimate a Mincer equation with a panel regression and individual random effects. The model takes the form,

[11] For more information about this survey visit www.proteccionsocial.cl

[12] This data base is propriety of the Superintendence of AFP, and is still under construction, due to de complexity to recover all the workers' data requested by the authority.

[13] We would like to combine both data sources in order to have more information on the marital status, the number of children or the educational attainment of each individual sampled in the HCDB, but that merged data base is still under construction.

$$\log y_{it} = \alpha + \beta_1 \cdot age_{it} + \beta_2 \cdot age_{it}^{\ 2} + \beta_3 \cdot age_{it}^{\ 3} + \beta_4 \cdot dcohort2529 + \ldots + \beta_{15} \cdot dcohort8589 + \\ + \beta_{16} \cdot dcohort2529 \cdot age_{it} + \ldots + \beta_{25} \cdot dcohort8589 \cdot age_{it} + \beta_{26} \exp_{it} + \beta_{27} u_t + \upsilon_i + e_{it} \quad (1)$$

where y_{it} is the earnings of individual *i* in period *t*, age_{it} is the age of individual *i* in period *t*, while age_{it}^2 and age_{it}^3 captures non linearities in age. *dcohortwxyz* is a dummy for the individuals born between 19wx and 19yz, u_t is the unemployment rate in period *t*, measured by the National Institute of Statistics of Chile (INE). exp_{it} is the cumulated experience for individual *i* in period *t*, measured by the number of contributions in the old and new system. υ_i is the error component for individual *i*, fixed for all time periods. e_{it} is the random disturbance for individual *i* in period *t*. Note that we also included the interaction between the age and cohort dummies.

We only use mandatory contributions, since voluntary contributions should be estimated with other model. We also use contributions made after 1987, due to significant changes made in AFP regulations.[14] Contributions made after retirement are not considered. We restrict our model to ages starting at 15. Although it is not possible for a worker to contribute if she is 15, the data set contains some abnormal cases that we do not consider. We also restrict our model to contributions made before the affiliates reach the legal retirement age (60 for women and 65 for men).

We estimate equation (1) for men and women, separately. Table 2 shows coefficient estimates and their standard error.

Once we have an estimate for the contribution amount subject to contributing to the pension system, the next step is to estimate the probability of contributing. To achieve this, we estimate the participation equation using a probit regression that takes the form:

$$\Pr_{it} = \alpha + \beta_1 \cdot age_{it} + \beta_2 \cdot age_{it}^{\ 2} + \beta_3 \cdot dcohort2529 + \ldots + \beta_{14} \cdot dcohort8589 + \\ + \beta_{15} \cdot dafp1 + \ldots + \beta_{26} \cdot dafp12 + \beta_{17} \cdot \exp_{it} + \beta_{18} \cdot balance_{it} + \beta_{19} \cdot mp_t + \beta_{20} \cdot fc_{it} + \quad (2) \\ + \beta_{21} \cdot vc_{it} + \beta_{22} \cdot ymean_i + \beta_{23} \cdot u_t + \beta_{24} \cdot balance_{it} \cdot (240 - \exp_{it} - \cos_i) + e_{it}$$

where Pr_{it} is the probability of contributing to the pension system for individual *i* in period *t*, age_{it} is the age of individual *i* in period *t*, while age_{it}^2 captures non linearities in age. *dcohortwxyz* is a dummy for the individuals born between 19wx and 19yz, *dafpr* is a dummy for the AFP *r*, exp_{it} is the cumulated experience for individual *i* in period *t*, measured by the number of contributions in the new system. $balance_{it}$ is the account balance of individual *i* in period *t*, mp_t is the amount of the minimum pension in period *t*, fc_{it} is the fixed commission for individual *i* in period *t*, vc_{it} is the variable commission for individual *i* in period *t*, $ymean_i$ is the average income of individual *i*, fixed for all time periods, u_t is the unemployment rate in period *t*, measured by the National Institute of Statistics of Chile (INE). Finally, we have added the interaction between the account

[14] The main changes were the elimination of the administrative fees charged as a percentage of the balance and changes in retirement rules.

balance and the constraint of 240 contributions to achieve the minimum pension guarantee. Therefore, we have to add the contributions done in the old system (cos_i) and the contributions in the new system (exp_{it}). e_{it} is the random disturbance for individual *i* in period *t*.

As done with the income equation, we estimate equation (2) for men and women, separately. Table 3 shows coefficient estimates and their standard error.

The results of these estimations give us the necessary inputs to forecast both the probability of contributing and the amount of the contributions. These forecasts allow us to estimate the final balance that each member of the individual capitalization pension system will have at the time of retirement, which we set at the legal retirement age. The projection supposes a 5% annual return on savings and a growth rate of wages of 2% per year in order to construct the final balance. This balance is transformed into an equivalent annuity for each individual using the standard methodology based on sex-specific life-tables[15].

With this method we can calculate the effect on income distribution at old age of changing several features of the capitalization system, contrasting the distribution of annuities in the base scenario with the distribution of annuities in the alternative scenario. It is worth noticing that since our forecasts are based on a panel that contains different cohorts, the output of our exercise consists on the distribution of **new** annuities each year (those that are starting to be paid the corresponding period). Therefore it is the distribution of new annuities per year, the one that we are able to characterize with the analysis we present next.

5. Results

5.1 Income Distribution in the Base Scenario

The projections made with our estimations and variables that capture the current structure of the pension system give as a base-line scenario with which we can compare the distribution of retirement income that arise from our simulations. The results of this exercise are shown in Chart 4. This graph plots the Gini Index of our projected Retirement Income Distribution and Active Life Income Distribution by Retirement Cohort. Our projections show a downward trend for retirement income inequality in the future. However this trend may be due to the fact that the further in the future the retirement cohort is, the projected saving account balances at time of retirement depend more heavily on projected rather than on observed income history. Since projections are usually smoother than actual income, this also smoothes the distribution of final balances and hence of pensions. For this reason it is more useful to compare the behavior of retirement income distribution with the one that active life income distribution will have in the future.

[15] These life-tables were updated in 2004 and include dynamic adjustment factors that take into account future improvements on life expectancy levels.

It can be seen in the same graph that active life income distribution is not as steady as retirement income distribution, but consistently better. This situation could be magnified due to diverse aspects:

- We only observe the formal-employed income of each worker. We can not observe the self employed income if she does not contribute, and of course we can not observe the informal job income. On the other hand, we observe her "full pension". Then, this is not a totally fair comparison.

- As we have discussed above, there is a contribution limit and a minimum wage to contribute to the pension system. Thus, there would be part of the workers income that we do not observe, even if the worker has a formal employer.

Both these features collapse the distribution of observed life-time income with respect to the distribution of actual lifetime income. However if we consider that the Gini index for the distribution of wages in the economy is around the level of 0.55, as seen in Chart 3, and the projected distribution of pensions never shows a Gini index below 0.60 for the retirement cohorts that we observe, it is safe to conclude that income distribution at retirement is worse than income distribution during active life. Furthermore, recall that it is the distribution of reported lifetime income the one that directly affects the distribution of retirement income. Since we project retirement income to be less equally distributed than active life income, there must be some feature implicit in the design of the pension system that worsens income distribution for a given cohort when we compare income in their retirement stage with the one they had during their accumulation stage.

5.2 Effect of each Feature on Old Age Income Distribution

Now that we have discussed our base scenario, we are going to make some exercises to measure the impact of each feature mentioned in chapter 3.

5.2.1 Pension System Structure

a) Fixed Commission.

As explained above, since fixed commissions are charged from the account balance they deplete a worker's saving for retirement. Since this commission is flat and charged each time a contribution is made, its impact on final balances is higher for lo income workers. But, how much does it affect the distribution of retirement income? In this exercise we depart from the baseline scenario by supposing that there is no fixed commission in the system and everything else remains constant[16].

Chart 5 shows our results. It can be seen that fixed fees don't have an important effect on retirement income distribution. This may be product of the low level of fixed commissions in the system, which currently represent less than 12% of an AFP income. Even the cohorts that are not exposed to a fixed fee during 25 years of their accumulation period only show a

[16] Of course AFP may change the variable commission they charge in response, but this will not have a direct effect on retirement income distribution because variable fees come from the worker's salary.

small impact, with the Gini Index of retirement income decreasing at most in 2% for the cohort that retires in year 2030.

5.2.2 Subsidies and taxes features

a) Minimum Pension:

The minimum pension is a state guarantee for retirees who contributed at least for 20 years. Today the minimum pension is around US$ 133, but it has been increased about 60% in real terms since 1990[17]. Thus, we can carry out 2 types of exercises: change the minimum pension requirements or change its amount.

From the participation equation estimates (Table 3) we see that the amount of the minimum pension has a negative impact in the probability to contribute, but the interaction of the balance with the requirements to obtain a minimum pension has a positive impact. Then, the final result is a bit uncertain.

- Changing the minimum pension amount: The results are presented in Chart 6. The base scenario considers a minimum pension annual growth of 2% in real terms, which corresponds to the average wage growth in the last years. We have considered two other scenarios of politics: minimum pension growing at 4% in real terms and 0% in real terms.
  We see that the impact of minimum pension growth in income distribution is negligible.

- Changing the minimum pension requirements: The base scenario is the current requirement of 20 years of contributions. We have added two scenarios: 17 and 23 years of contributions, maintaining the same benefit level. The results are presented in Chart 7. We see that this measure has an important impact in income distribution: For the final 10 years in our forecast, the Gini Index rises around 1% in average when the access requirement is increased to 23 years of contributions and decreases by 2.25% if requirements are relaxed to 17 years of contributions.
  This result implies that if conditions to obtain the minimum pension subsidy were relaxed just a little bit, an important number of additional people would access this benefit and this would improve income distribution at old age, by complementing low-level pensions for more retirees. In other words, the number of people who obtain the benefit is more important than its level for the distribution of retirement income.

5.2.3. Other Features

At this point we have no results for simulations that measure the effect of all the other features discussed in section 2. The study of the effect of periods of informality requires use of the History of Contributions Database matched with information from the EPS survey, match that is not yet available. The effect of early retirement requires a more complex model than the one used here. In order to predict retirement behavior we would

[17] The minimum pension is legally adjusted in real terms. Other increases are due to political reasons.

need to incorporate a third equation into our econometric model. We leave this task for future work.

The remaining exercises are relatively easier to do and are part of work in progress that will be incorporated to future versions of this paper in order to give a more complete picture of the features that impact income distribution at old age through the Chilean Individual capitalization pension system.

6. Conclusions

One of the main concerns with individual capitalization pension systems is the potential detrimental impact they may have on the distribution of retirement income. The Chilean experience has served as a model for the implementation of pension reform in other countries and has been closely looked by analysts around the world in order to extract as many lessons as possible from its experience with this system. However there has not been until today a thorough study of the impact of the individual capitalization system on old age income distribution in the Chilean case. This paper is the first step to fill that gap.

Using a representative sample of all the affiliates to the pension system between 1981 and 2002, we are able to forecast the individual pension payouts for members in each retirement cohort between 2005 and 2025. In order to do this we first estimate income and participation equations for the same sample of individuals with their historical and observed information collected in the database. With the estimates form these equations we predict future income and contribution probabilities for each individual. This information is used to build the final balance at time of retirement (taken as the corresponding legal retirement age). This balance is then converted into an equivalent annuity, which we take to be the individual's retirement income. This allows us to compare the distribution of retirement income with the distribution of active life income for each retirement cohort.

Our results show that retirement income is distributed significantly more unequally than active life income. Although our measure of active life income is somehow limited because it corresponds to the individual's income reported when contributing, the Gini Index for retirement income seems high even when compared with the distribution of actual wages in the economy.

Our preliminary results indicate that the existence of a Fixed Commission does not have an important impact on old-age income distribution. Given its current level, the elimination of this fee would only have a negligible effect on cohorts that retire very far in the future. Similarly, the level of the minimum pension benefit does not seem to affect retirement income distribution in an important way. Whether it grows at 2% per year (as it has historically been the case), at 4% or it does not grow at all, old age income distribution remains very similar. More important than the minimum pension level are its requirements. Currently, to obtain the benefit, a worker must contribute for at lest 20 years in the pension system. Relaxing this requirement to 17 years has an important effect on diminishing inequality of pension payments.

These results are part of an ongoing effort that uses this methodology to evaluate the impact of several features that affect old-age income inequality through the pension system. This evidence may be useful for countries that are currently evaluating to implement a pension system based on individual capitalization. It may serve as a reference point for the design features that must be taken into account when adopting such a system in order to limit its impact on old age income inequality.

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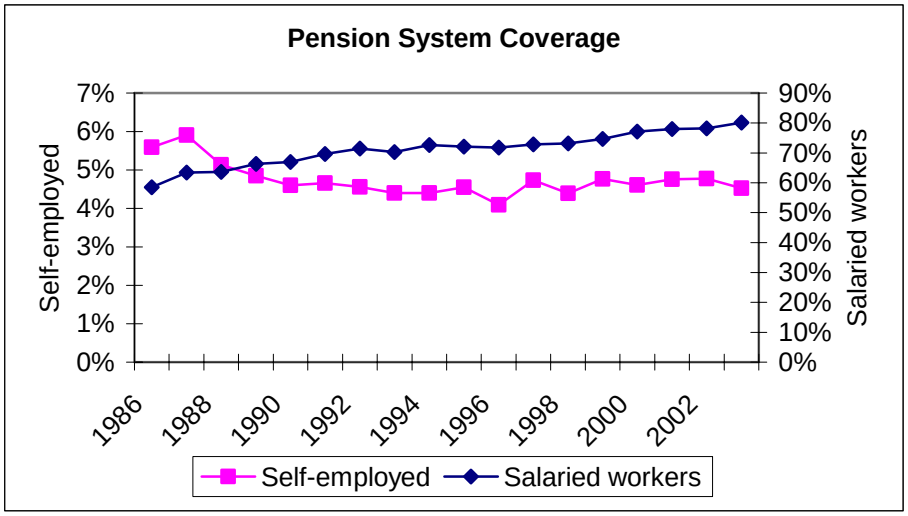
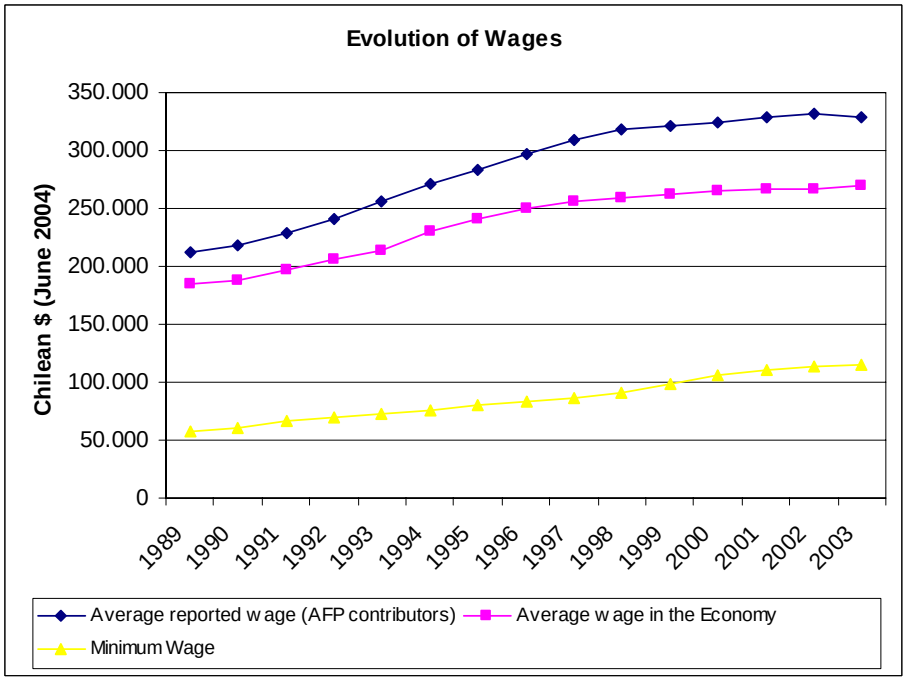
Chart 1



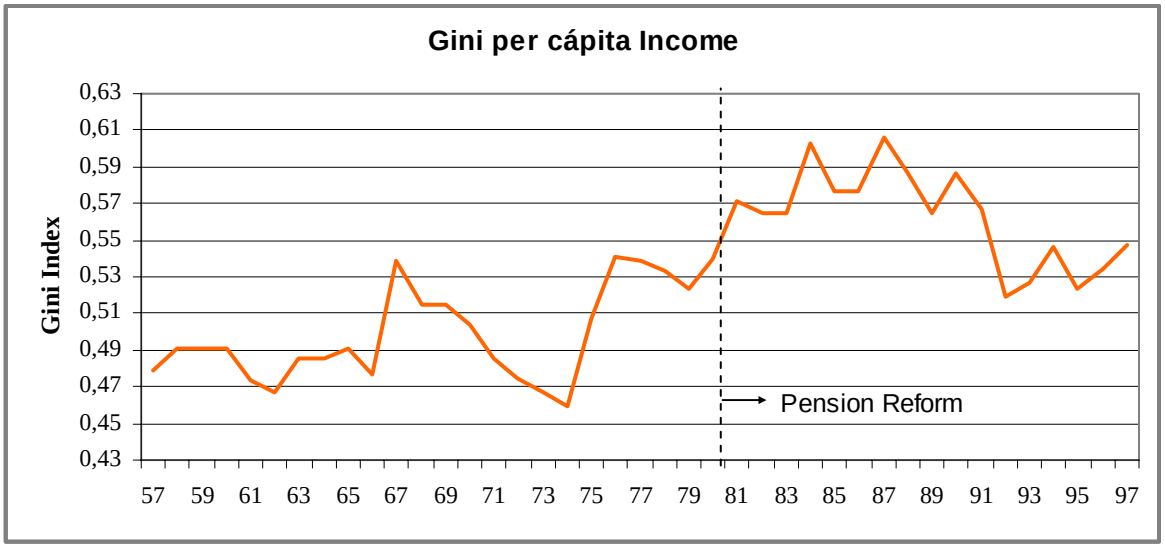
Source: SAFP and INE

Chart 2.



Source: SAFP and INE

Chart 3



Source: Ruiz-Tagle V. (1998)

Chart 4

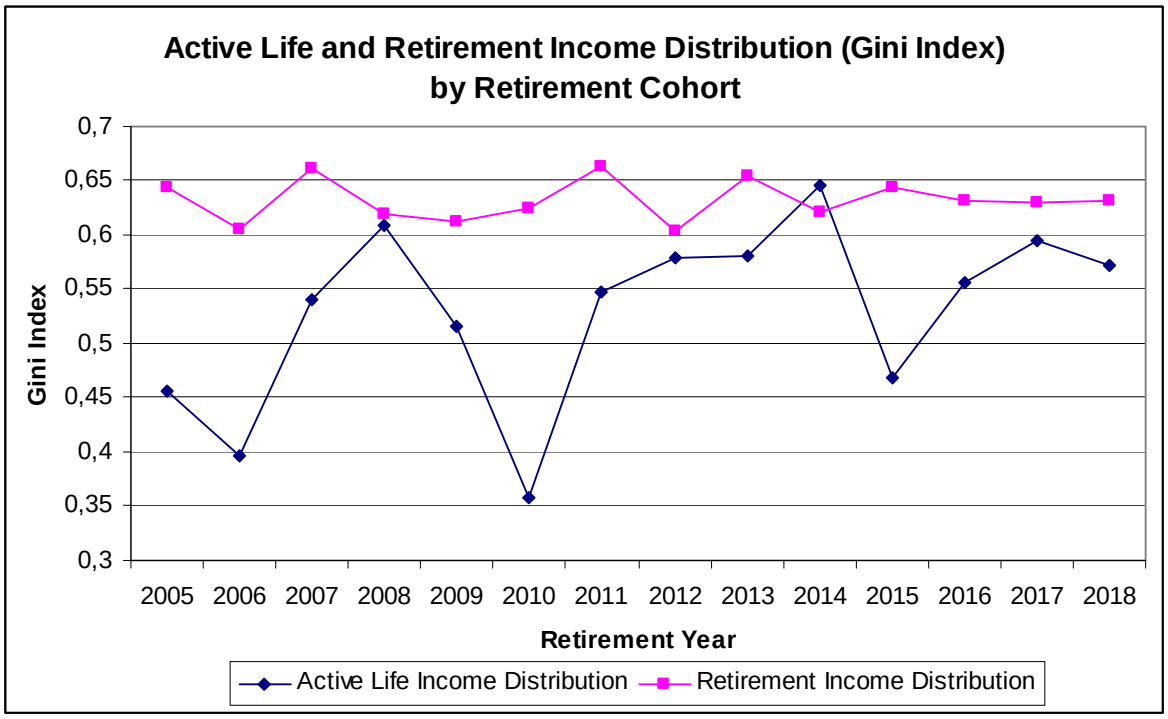
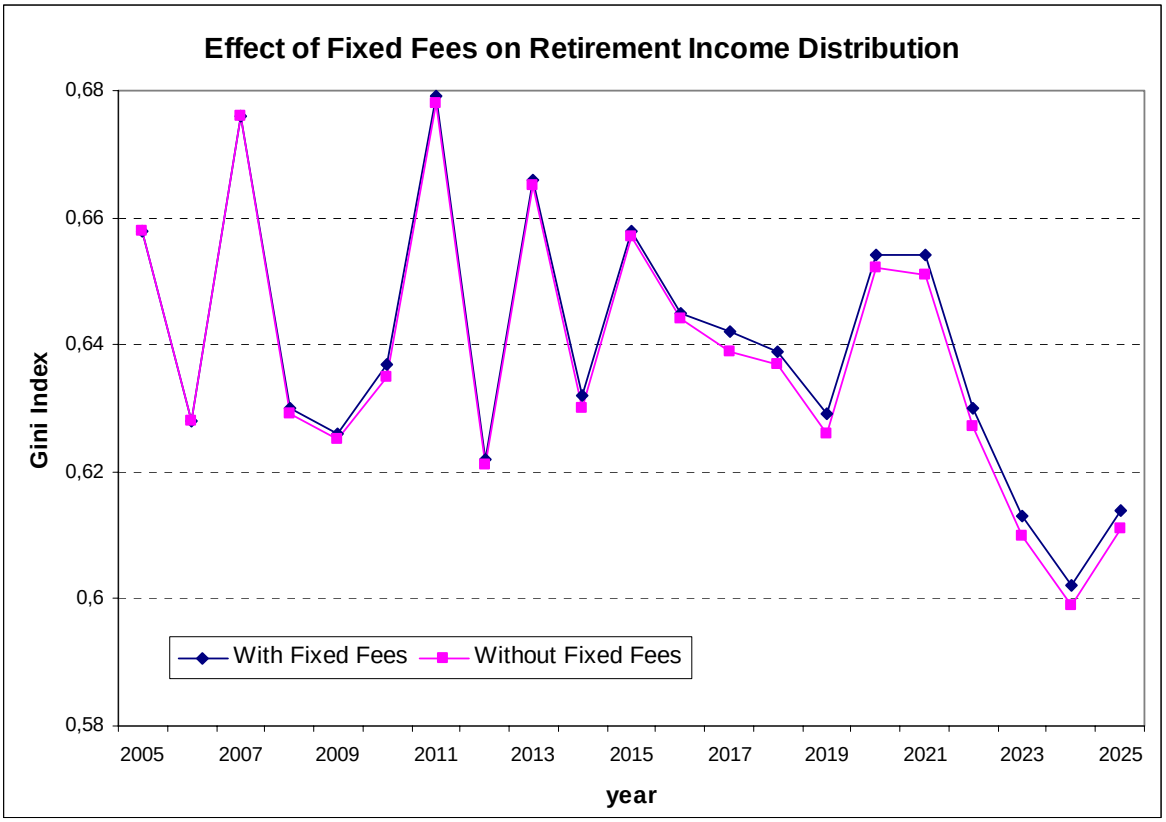


Chart 5



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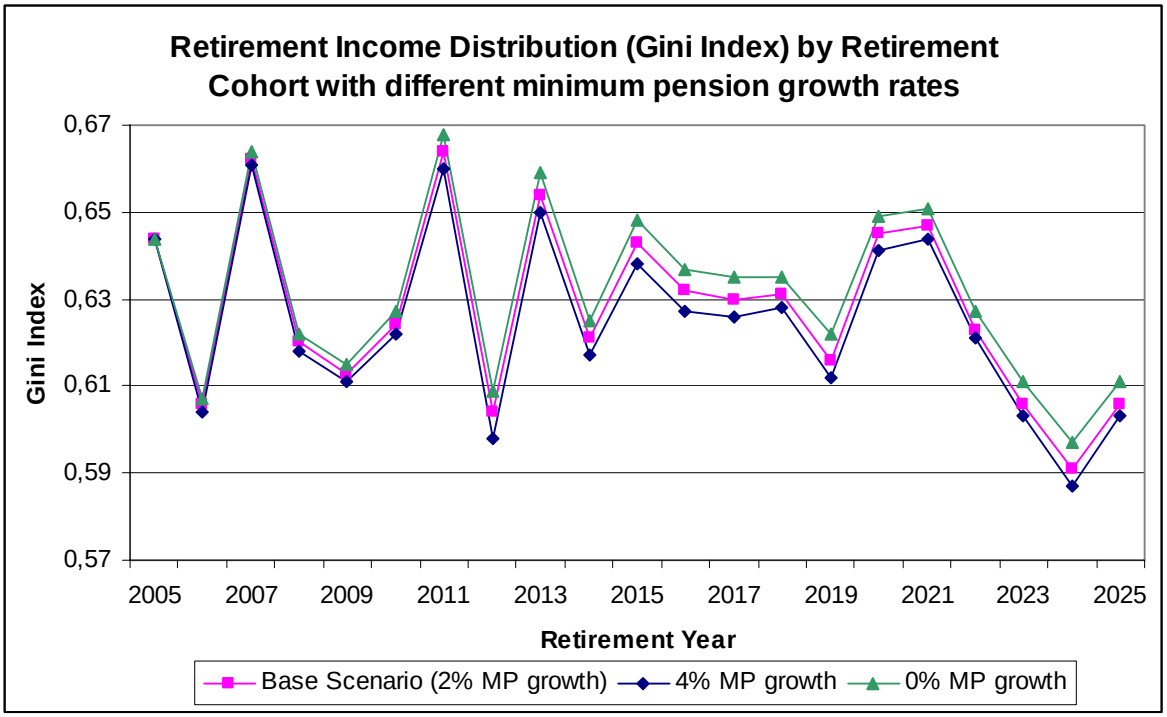


Chart 7

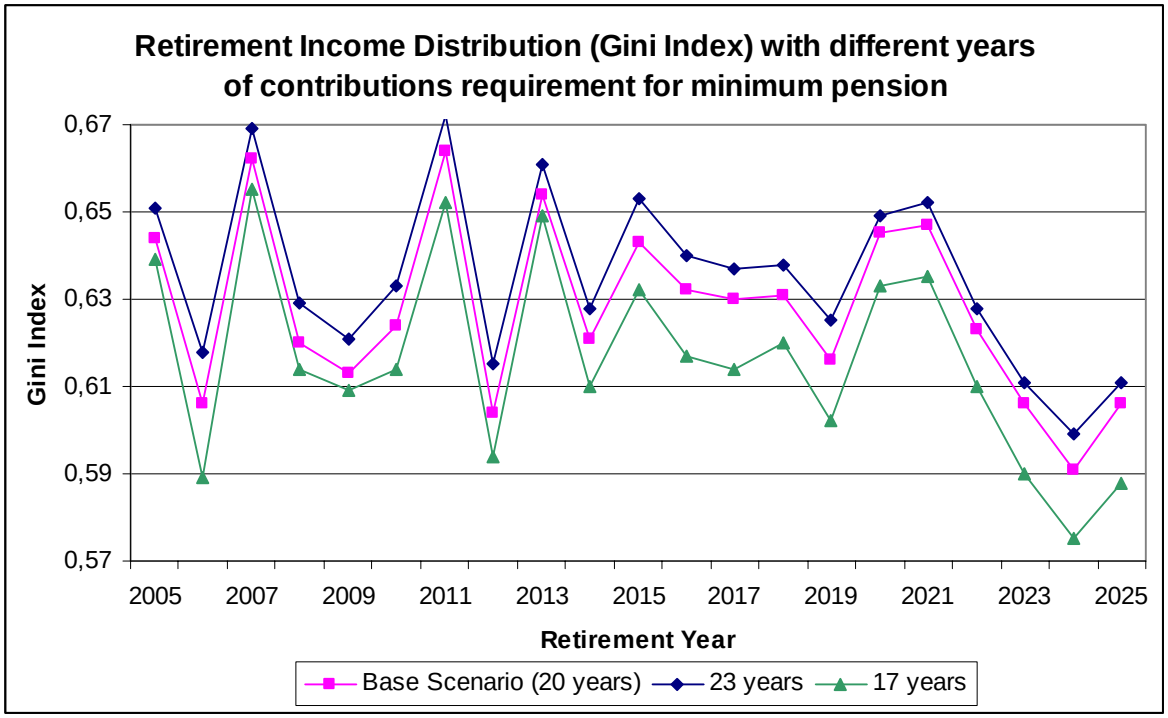
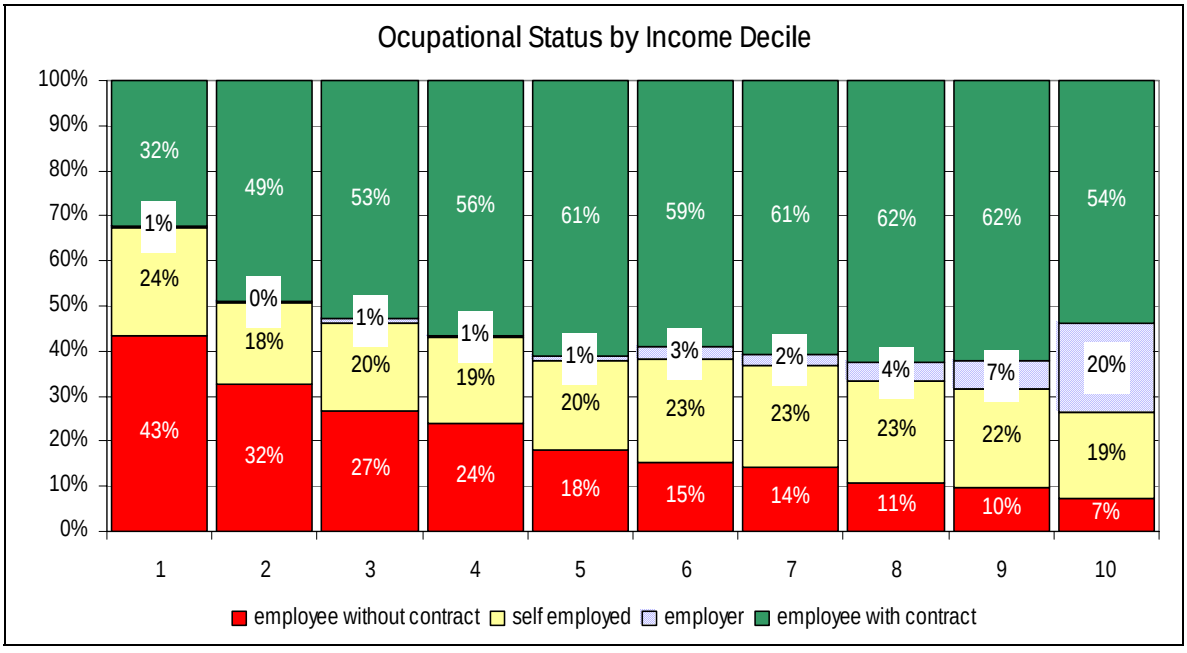


Chart 8



Source: CASEN Survey (2000)

Table 1: Affiliates and Population

Age	AFP Affiliates - Dec 2003		Population - Jan 2004		Affiliates/Population	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
15 - 19	126.423	83.579	702.450	675.782	18,00%	12,37%
20 - 24	464.229	345.684	670.472	653.403	69,24%	52,91%
25 - 29	579.912	479.760	650.195	642.406	89,19%	74,68%
30 - 34	603.007	507.524	682.420	678.235	88,36%	74,83%
35 - 39	617.005	512.775	682.353	686.568	90,42%	74,69%
40 - 44	556.963	438.915	631.865	644.498	88,15%	68,10%
45 - 49	409.761	307.079	533.205	548.822	76,85%	55,95%
50 - 54	272.537	196.013	433.905	449.576	62,81%	43,60%
55 - 59	170.179	115.039	367.889	385.199	46,26%	29,86%
60 - 64	86.027	29.273	298.309	319.768	28,84%	9,15%
65 - 69	20.976	11.245	231.042	253.613	9,08%	4,43%

Data Source: AFP Affiliates from the Superintendence of AFP; Population form the Civil Identification Agency (Servicio de Registro Civil e Identificación)

Table 2: Mincer Equation Estimates

	men		women	
	(1)	(2)	(3)	(4)
age	0.38	0.377	0.173	0.258
	(6.44)**	(92.45)**	(3.65)**	(49.15)**
age2	-0.007	-0.007	-0.005	-0.005
	(61.64)**	(61.64)**	(27.81)**	(27.94)**
age3	0	0	0	0
	(37.17)**	(37.16)**	(12.79)**	(12.81)**
dcohort2529	-10.978	-10.746		
	(2.98)**	(3.02)**		
dcohort3034	-8.493	-8.261	-6.293	-5.174
	(8.19)**	(24.83)**	(3.33)**	(3.02)**
dcohort3539	-6.706	-6.474	-10.98	-9.86
	(6.76)**	(45.06)**	(13.17)**	(38.37)**
dcohort4044	-6.052	-5.819	-8.262	-7.141
	(6.14)**	(68.99)**	(10.31)**	(62.73)**
dcohort4549	-4.95	-4.717	-6.85	-5.728
	(5.03)**	(76.54)**	(8.58)**	(69.42)**
dcohort5054	-3.713	-3.48	-5.622	-4.499
	(3.77)**	(73.56)**	(7.06)**	(68.18)**
dcohort5559	-2.639	-2.406	-4.353	-3.229
	(2.68)**	(63.76)**	(5.47)**	(58.76)**
dcohort6064	-1.853	-1.62	-3.421	-2.297
	(1,89)	(53.18)**	(4.30)**	(50.39)**
dcohort6569	-0.924	-0.692	-2.49	-1.367
	(0,94)	(26.85)**	(3.13)**	(35.56)**
dcohort7074	-0.234		-1.586	-0.464
	(0,24)		(2.00)*	(13.22)**
dcohort7579	0.308	0.54	-1.141	
	(0,31)	(17.98)**	(1,44)	
dcohort8084	0.741	0.973	-1.07	
	(0,75)	(16.21)**	(1,34)	
dcohort2529*age	0.171	0.174		
	(2.08)*	(3.03)**		
dcohort3034*age	0.149	0.152	0.186	0.1
	(2.52)*	(27.89)**	(3.35)**	(3.42)**
dcohort3539*age	0.124	0.126	0.264	0.178
	(2.10)*	(49.03)**	(5.56)**	(37.84)**
dcohort4044*age	0.116	0.118	0.225	0.14
	(1.96)*	(64.98)**	(4.77)**	(53.10)**
dcohort4549*age	0.1	0.103	0.204	0.118
	(1,7)	(70.81)**	(4.32)**	(52.76)**
dcohort5054*age	0.078	0.081	0.184	0.098
	(1,33)	(67.61)**	(3.90)**	(49.24)**
dcohort5559*age	0.055	0.057	0.158	0.072
	(0,93)	(58.16)**	(3.35)**	(40.15)**
dcohort6064*age	0.038	0.041	0.141	0.055
	(0,65)	(52.42)**	(2.98)**	(34.99)**
dcohort6569*age	0.016	0.019	0.121	0.035
	(0,27)	(31.83)**	(2.56)*	(26.22)**
dcohort7074*age	-0.003		0.1	0.014
	(0,05)		(2.11)*	(11.53)**
dcohort7579*age	-0.023	-0.02	0.086	
	(0,38)	(22.04)**	(1,82)	
dcohort8084*age	-0.043	-0.04	0.086	
	(0,72)	(15.28)**	(1,81)	
experience	0	0	0	0
	(1,72)	(1,72)	(3.52)**	(3.51)**
unemployment	-0.019	-0.019	-0.013	-0.013
	(46.44)**	(46.44)**	(25.16)**	(25.13)**
Constant	6.905	6.674	9.21	8.09
	(7.03)**	(144.64)**	(11.60)**	(143.93)**
Observations	1048719	1048719	586961	586961
Number of rut	12515	12515	9309	9309

Absolute value of z statistics in parentheses

* significant at 5%; ** significant at 1%

Table 3: Participation Equation Estimates

	men		women	
	(1)	(2)	(3)	(4)
age	0.038	0.038	0.057	0.057
	(13.85)**	(13.86)**	(10.83)**	(10.85)**
age2	-0.001	-0.001	-0.001	-0.001
	(25.20)**	(25.22)**	(11.92)**	(11.93)**
dcohort2529	0.02		-4.768	-4.768
	(0,26)		(23.49)**	(28.62)**
dcohort3034	-0.265	-0.284	-5.248	-5.248
	(3.40)**	(13.11)**	(28.08)**	(35.84)**
dcohort3539	-0.383	-0.402	-5.192	-5.192
	(4.88)**	(17.97)**	(28.34)**	(36.64)**
dcohort4044	-0.585	-0.604	-5.378	-5.378
	(7.35)**	(24.17)**	(29.71)**	(38.75)**
dcohort4549	-0.79	-0.809	-5.35	-5.35
	(9.75)**	(28.25)**	(29.80)**	(39.10)**
dcohort5054	-0.86	-0.88	-5.499	-5.499
	(10.39)**	(27.06)**	(31.07)**	(41.15)**
dcohort5559	-0.981	-1.001	-5.657	-5.657
	(11.60)**	(27.51)**	(32.60)**	(43.93)**
dcohort6064	-0.962	-0.982	-5.68	-5.68
	(11.10)**	(24.25)**	(33.47)**	(45.98)**
dcohort6569	-0.884	-0.904	-5.725	-5.724
	(9.64)**	(18.02)**	(32.87)**	(44.22)**
dcohort7074	-0.778	-0.799		
	(6.24)**	(8.14)**		
dcohort7579	-1.208	-1.228		
	(7.89)**	(9.29)**		
experience	0.008	0.008	0.009	0.009
	(233.44)**	(233.45)**	(151.64)**	(151.71)**
balance	1.75e-08	1.75e-08	3.13e-08	3.13e-08
	(78.73)**	(78.79)**	(57.23)**	(57.23)**
mp	-1.21e-05	-1.21e-05	-2.08e-05	-2.08e-05
	(22.16)**	(22.16)**	(23.07)**	(23.07)**
fc	1.89e-05	1.89e-05	5.02e-05	4.99e-05
	(4.15)**	(4.15)**	(6.71)**	(6.68)**
vc	-0.818	-0.819	0.497	0.495
	(6.11)**	(6.13)**	(2.21)*	(2.20)*
balance*(240-exp-cos)	2.01e-11	2.01e-11	2.47e-11	2.47e-11
	(29.54)**	(29.54)**	(17.41)**	(17.43)**
unemployment	-0.04	-0.04	-0.042	-0.042
	(21.55)**	(21.55)**	(13.52)**	(13.53)**
ymean	-4.51e-08	-4.51e-08	-8.83e-08	-8.83e-08
	(28.67)**	(28.76)**	(26.25)**	(26.26)**
Constant	1.41	1.419	4.507	4.712
	(10.74)**	(17.22)**	(.)	(.)
Observations	562805	562805	211799	211827

Absolute value of z statistics in parentheses

* significant at 5%; ** significant at 1%

Includes AFP fixed effects