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## REVEALED AND CONCEALED PREFERENCES IN THE CHILEAN PENSION SYSTEM: AN EXPERIMENTAL INVESTIGATION

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# Revealed and Concealed Preferences in the Chilean Pension System: An Experimental Analysis

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*Using survey data and a field experiment to measure agents' risk and time preferences, we identify the agent-type that is free to reveal its preferences through decisions about pension system participation. Thus, we show that in Chile the appropriate focus for policy makers interested in the welfare-enhancing effects of such participation are the self employed. They are indistinguishable from other economically active agents with respect to time and risk preferences and sort into participants and non-participants in the pension system with reference to those preferences. In contrast, employees are rationed. The more patient and less risk averse self employed participate.*

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# Revealed and Concealed Preferences in the Chilean Pension System: An Experimental Analysis

## I. Introduction

Imagine that a government is planning to bring about a change in the characteristics of a good with the aim of raising aggregate utility and that it wishes to monitor the effects of this intervention. Imagine also that there are two types of consumer, one rationed to consume the good at a certain level, the other unrationed. The economist in charge of monitoring would most likely focus her attention on the second type of consumer as it is they who are free to reveal their preferences through changes in their consumption patterns. *Ceteris paribus*, such a study would yield findings that could be generalized to the full population of consumers. But what if the consumers sort into type with reference to preference parameters that are also salient to their decisions about the good? Then, it would be inappropriate to generalize and the economist would have to find some other way to quantify the effects of the intervention on the rationed consumers.

This is the conundrum facing the many governments considering or undertaking reforms of their public social security systems. Many require waged and salaried employees to contribute a certain percentage of their income to a pension system by law, while the self employed are either not covered by or can easily evade the mandate. This renders the self employed of considerable interest to policy makers. Unlike employees, they are free to reveal their preferences through their decisions about whether to participate in the pension system or not. However, drawing inferences about the welfare-enhancing effects of reforms on the economically active population

as a whole from an analysis focused exclusively on the self employed could be misleading - the preferences relating to time and risk that are of direct relevance to choices about pensions may also play a role in the sorting of the economically active into employees on the one hand and the self employed on the other.

Much of the theoretical and empirical literature suggests that when self employment is a matter of choice, agents with a lower aversion to risk are likely to self-select into that group (Knight, 1921, Kihlstrom and Laffont, 1979). Empirical evidence from both developed (Taylor, 1996, Uusitalo, 1999, Guiso and Paiella, 2000) and middle income developing countries (Yamada, 1996, Maloney, 1999) supports this view, although none of these studies make use of direct measures of risk aversion. On the other hand, an extensive literature, primarily focused on poorer developing countries, characterizes self employment not as a choice, but as part of a residual sector where workers who have either lost their jobs or recently migrated from rural areas, bide their time and queue for waged employment in modern firms (Lewis, 1954, Harris and Todaro, 1970). Within this literature it is implicitly assumed that the self employed are no less risk averse than employees. While the role of time preferences on the decision to save for retirement is well established (Samwick, 1997), to our knowledge, the link between peoples' subjective discount rates and labor market choices has not been made. We, nevertheless, include time preferences in our study as they help us distinguish rationed from unrationed consumers.

Although relevant, the literature on sector choice does not currently offer our imaginary economist the guidance she needs. Ideally, such guidance would take the form of answers to three questions. First, are employees and the self employed distinct in terms of preferences and, in particular, are the self employed predominantly a self-selected group displaying relatively low risk aversion? Second, are employees truly

rationed in the sense that whether they contribute to a pension system is determined not by their preferences but by or simultaneously with the type of job they have? Third, are the self employed truly unrationed in the sense that whether they contribute to a pension system or not is determined by their preferences? If the answers to these questions are 'no', 'yes', and 'yes' respectively, then a study of the self employed only would serve our economist's purpose. If, however, some other combination of answers emerges, then this relatively straightforward approach would not suffice.

In this paper we provide answers to these three questions for Chile, the middle-income developing country that pioneered social security reform with a transition to individual retirement accounts in 1981. Under both the old and the new Chilean systems, employees are required to save a fixed portion of their income every month, while the self employed can choose whether to contribute to the pension system.

The paper has four sections. Following this introduction, Section II briefly describes the reform of social security in Chile, and the salient features of the new pension system. Section III outlines our methodological framework. Section IV presents our results and Section V concludes.

## II. The Reform of Social Security in Chile

In 1981, fiscal pressures, brought about by shifting demographic trends that rapidly increased the share of elderly in the population, forced Chile to dismantle its defined-benefit, pay-as-you-go (PAYGO) pension system, similar to those currently administered across Europe, the United States, and other developing countries (SAFP, 1999). Chile chose to adopt a system in which old age pensions are financed primarily out of publicly mandated, but privately managed, individual retirement accounts

(World Bank, 1994).[1] The reform lowered the rate of pay-roll taxation and reduced the pure-tax element of mandated salary deductions by tightening the link between contributions and retirement benefits (Grubber, 1995). However, just as under the PAYGO regime, the self employed were exempted from the mandate to save for retirement.

Under the reformed system, participating workers contribute 13 percent of their income to institutional investors who specialize in managing and investing retirement savings. Only 10 percent of workers' contributions accumulate in their individual retirement accounts. The remaining 3 percent pays the fund managers' fees and the premiums on group level disability and life insurance policies that the fund managers are required by law to purchase for their contributors. Workers who contribute into an individual retirement account for at least 20 years are guaranteed a minimum annuity benefit from the government should their accumulated savings fall short of a determined amount. Thus, contributors are not only saving for their retirement, but also accumulating rights toward a publicly-provided minimum benefit and securing coverage against risks to household income from disability and sudden death.[2]

Recall that we do not simply assume that the mandate requiring employees to participate in the pension system acts like a ration. Rather, we present it as a hypothesis to be tested. Enterprises in the growing, unregulated sectors in developing economies, almost by definition, do not contribute to pension systems on behalf of

[1] Most countries that have undertaken structural reform of public social security systems, have retained or restructured a public "first pillar" with some sort of distributive, safety-net function, and added a private "second pillar" of individual retirement savings accounts, funded with mandatory, defined contributions. Finally, most have establishing the rules of a voluntary "third pillar" of regulated tax incentives and pension plans established between employers and employees.

[2] For a detailed account of social security reform in Chile, the structure of the new pension system and the impact of reforms, see Holzmann (1997), Edwards and Edwards (2000). For a discussion of the incentive effects expected from a transition to individual retirement accounts, see World Bank (1994).

their employees (ILO, 1997). Thus, job type and pension system participation may be co-determined, making it necessary to establish whether employees sort between formal and informal jobs knowing that this will determine whether they will accumulate rights to a pension and, thus, with reference to their risk and time preferences. Similarly, we do not assume that the self employed are truly unrationed. In this case, we are less concerned with the operations of the labour market than with credit market imperfections. These might prevent some self employed from accumulating rights to a pension even though their lifetime budget constraint and preferences indicate that they should.

## III. Methodological Framework

### *A. Hypotheses*

Let **t** be an agent's rate of time preference and **r** his rate of risk aversion. Further, let the self employed be identified by the subscript **s** and employees by the subscript **e**. Finally, let contributors to pension funds be identified by the subscript **c** and non-contributors by the subscript **n**. Now, our set of three questions can be translated into the series of testable hypotheses presented below.

| | Question | Time preferences | | Risk aversion | |
|---|---|---|---|---|---|
| | | Null | Alternative | Null | Alternative |
| **1.** | Are salaried/waged employees and the self employed distinct? | $H_0$: $\mathbf{t_s = t_e}$ | $H_1$: $\mathbf{t_s \neq t_e}$ | $H_0$: $\mathbf{r_s = r_e}$ | $H_1$: $\mathbf{r_s \neq r_e}$<br>$H_1$: $\mathbf{r_s < r_e}$ |
| **2.** | Are salaried/waged employees rationed? | $H_0$: $\mathbf{t_{ec} = t_{en}}$ | $H_1$: $\mathbf{t_{ec} \neq t_{en}}$<br>$H_1$: $\mathbf{t_{ec} < t_{en}}$ | $H_0$: $\mathbf{r_{ec} = r_{en}}$ | $H_1$: $\mathbf{r_{ec} \neq r_{en}}$<br>$H_1$: $\mathbf{r_{ec} > r_{en}}$ |
| **3.** | Are the self employed unrationed? | $H_0$: $\mathbf{t_{sc} = t_{sn}}$ | $H_1$: $\mathbf{t_{sc} \neq t_{sn}}$<br>$H_1$: $\mathbf{t_{sc} < t_{sn}}$ | $H_0$: $\mathbf{r_{sc} = r_{sn}}$ | $H_1$: $\mathbf{r_{sc} \neq r_{sn}}$<br>$H_1$: $\mathbf{r_{sc} > r_{sn}}$ |
| **4.** | Are salaried/waged employees and self employed contributors distinct? | $H_0$: $\mathbf{t_{sc} = t_{ec}}$ | $H_1$: $\mathbf{t_{sc} \neq t_{ec}}$<br>$H_1$: $\mathbf{t_{sc} < t_{ec}}$ | $H_0$: $\mathbf{r_{sc} = r_{ec}}$ | $H_1$: $\mathbf{r_{sc} \neq r_{ec}}$<br>$H_1$: $\mathbf{r_{sc} > r_{ec}}$ |

Our two null hypotheses relating to the first question state that employees on the one hand and the self employed on the other are the same. One alternative hypothesis, that they are not the same, is presented for time preferences and two alternative hypotheses, that they are not the same and that the self employed are less risk averse, are presented for risk preferences.

To check that employees are rationed and the self employed unrationed, as we expect under the partial mandate, we look at whether each agent type sorts into contributors and non-contributors with respect to preferences. In each of the four resulting sets of hypotheses the null is that contributors and non-contributors are the same. Then, for the hypotheses relating to time preferences two alternatives are presented. One states that contributors and non-contributors are different and the other that the former are more patient.

For the hypotheses relating to risk preferences the two alternatives are that contributors and non-contributors are different and that the former are more risk averse. Unrationed contributors will be more risk averse than non-contributors if the formal pension system is the only available insurance against poverty in old age. In the case of Chile this is probably a simplification, but the hypothesis provides us with a basis for further discussion below.

Finally, we add a fourth question and corresponding set of hypotheses. If employees are rationed and the self employed are unrationed, we would expect the contributors from the two groups to be distinct with respect to their salient preferences. Thus, our fourth set of null hypotheses states that employees and self employed contributors are indistinct. Corresponding to each null are two alternative

hypotheses, the first stating that the two types of contributor are distinct and the second that self employed contributors are respectively patient and more risk averse.

### *B. Experimental Approach to Data Collection*

In order to test the hypotheses listed above, we require data on the time and risk preferences of employees and self employed contributors and non-contributors to the pension system in Chile. A carefully designed field experiment similar to the laboratory-run experiment of Schubert, Brown, Gysler and Brachinger (1999) generates our data on risk preferences. For time preferences, we adopted an approach developed by Donkers and van Soest (1999) which involves asking a series of hypothetical questions.[3]

Economic experiments are traditionally conducted in university laboratories on small samples of graduate students, as in Poterba (1988), Kotlikoff, Samuelson and Johnson (1988), and Schubert, et. al. (1999). In order to obtain data from a sample more relevant to our questions, we took the experiment to a representative sample of economically active respondents, much as one would a household survey.[4] Our sample was drawn from the pool of respondents to the PRIESO 2000 survey in Greater Metropolitan Santiago (urban, peri-urban, and rural communities), and stratified according to sector (self employment, or wage and salaried employment) status. We selected 115 employees and 115 self-employed from the PRIESO 2000 sample to participate in the experiment. In the interval between the PRIESO 2000 and the field experiment, 23 of the selected self employed became employees. Thus, our final sample contained 138 employees and 92 self-employed. Just under 60 percent of the

[3] Barsky, Juster, Kimball and Shapiro (1997) use a similar approach in their analysis of pension savings and health benefits in the US.

employees and just over 20 percent of the self employed were contributing to a pension system at the time of the experiment.

In the experiment respondents were confronted with a series of gambles framed first as investment and then insurance decisions. Trained numerators asked the respondents to imagine themselves as investors choosing whether to invest in Firm A, whose profits were determined by its chances of success or failure, or Firm B, whose profits were fixed regardless of how well it fared. The numerators explained the probabilities of Firm A's success, the pay-offs from Firm A in each state, and the fixed pay-off from Firm B.[5] The respondents were then asked to decide in which firm to invest. After registering their answer, the numerators would raise the amount of the secure pay-off, and ask the respondents to choose between the two firms again. As the amount of the secure pay-off grew, investing in Firm A looked less attractive to a risk averse respondent. In this way a certainty equivalent - that is the point at which respondents would no longer risk investing in Firm A - was elicited for each gamble. The probability of Firm A's failure was altered three times while keeping the state-specific pay-offs constant, and in the fourth investment gamble, the pay-offs were altered.

The insurance gambles were similarly conducted. Respondents were asked to imagine they were the owners of a share in a company listed on the stock market. They could choose to either purchase an insurance policy that would protect the value of their share from market turbulence, or not to take up the policy and face either a large or a small financial loss. After registering their decision, the numerators would slightly increase the cost of insuring and ask again whether they would insure. As the cost of

[4] A detailed description of the study, and an example of the script and materials used (in English and Spanish), are available from the authors upon request.

[5] The initial pay-off for Firms A if successful was Ch$3,000 (3 thousand Chilean pesos). This is slightly higher than the average respondent's hourly income of Ch$2,282, or US$4.23 at the exchange rate prevailing in June, 2000, of Ch$538.61 : US$1.

insurance increased, the option to protect the share value would become less attractive to the respondent. The probabilities and pay-offs associated with the four insurance decisions exactly matched those of the four investment decisions. Respondents were informed repeatedly, both prior to and after the exercise, that any one of their decisions to invest or insure could determine their earnings from the experiment. Which of their decisions ultimately determined their earnings was picked at random at the end of the interview.

After the investment and insurance decisions, the respondents were asked a series of cascading hypothetical questions designed to measure their time preferences. In each hypothetical, respondents were asked how they would prefer to receive their winnings from a national lottery draw. One of the four cascading hypothetical questions is shown here as an example.

a) Imagine that you win a cash prize in the national lottery and the prize is worth Ch$3,000,000. You can take your winnings at once if you want, but the lottery organizers ask if you would be prepared to wait a year before taking your prize.

   If they were offering you Ch$3,000,000 now or Ch$3,000,000 in a year's time, would you agree to wait?

b) What if they were to offer you more than Ch$3,000,000 if you were prepared to wait - what is the minimum amount of money they would have to offer you in order to get you to wait?

c) Would you accept Ch$ _____ in a year's time instead of Ch$3,000,000 now?

If the respondents agreed to wait after part (a) of the question, the numerators recorded their answer, and proceeded to the next hypothetical situation. If they did not agree to wait numerators recorded their answers and moved on to part (b), and then recorded the amount that the respondents would be willing to accept in order to wait.

The numerators would then probe to find out whether the respondents would accept progressively lower amounts. In this way, the numerators would establish the smallest amount the respondents would agree to wait for, to the nearest Ch$25,000. The numerators recorded this final amount in each of the four hypothetical situations, and proceeded onto the last part of the interview.

Prior to receiving their pay-offs from the experiment, the respondents were asked a series of questions concerning their demographic characteristics, participation in the labor market, income, and finally their current contributory status in the pension system.

## IV. Results

Every respondent in the experiment faced four hypothetical decisions relating to time preferences, and two answers were elicited for each, one spontaneous and the other probed. Thus, for each individual we can construct eight measures of time preference. These eight measures all take the form of subjective discount rates.

Figure 1 shows the frequency distributions of the immediate and probed subjective discount rates for each decision. Each row in Figure 1 correspond to a different decision. In the first row we present the subjective discount rates corresponding to an initial amount of Ch$3,000,000 and a wait of one year. The second row shows the subjective discount rates corresponding to the current equivalent of Ch$3,000,000 in three months time. The third row shows the subjective discount rates corresponding to the current equivalent of Ch$3,000,000 in one year's time. The fourth row shows the subjective discount rates corresponding to an initial amount of Ch$300,000 and a wait

of a year. The left-hand column shows the spontaneous answers and the right-hand column the results of the interviewers' probing.

The interviewers' probing took the form of challenging the respondents as to whether they would accept lower amounts of money. Thus, in the decisions about delays, probing may lead to lower interest rates and in the decisions about current equivalents to amounts due in the future, it may lead to higher subjective discount rates. The graphs in rows 1 and 4 correspond to delays and, as expected, we see the histograms shift left when probing is introduced. The graphs in rows 2 and 3 of Figure 1 correspond to speed-ups. In row 3, as expected, the histogram shifts right, while in row 2 there is no detectable shift.

The fixed and random effects regressions presented in Table 1 provide a formal analysis of the effects of treatment variations. The fixed and random effects regressions in the first two columns of the table use only experimental treatment variables as explanatory variables. The random effects regression in the third column includes the respondents' incomes, ages, years of education and sexes as additional explanatory variables. The treatment variables include a dummy that takes the value 1 if the subjective discount rate resulted from the numerators' probing and zero otherwise (*Probed*), a dummy that takes the value 1 if the treatment involved choosing a current equivalent to an amount of money in the future and a zero if it involved compensation for a delay (*Now*), a dummy that takes the value 1 if the choice involved a time period of three months and zero if it involved a year (*Shorter*), and a dummy that takes the value 1 if the decision involved Ch$300,000 and zero if it involved Ch$3,000,000 (*Smaller***)**. In the decisions about delays the probing led to a significant fall in the

subjective discount rate of 10 percentage points, while in the decisions about speed-ups it led to no significant increase.[6]

Both the graphs and the regressions also show that the respondents chose significantly (0.1 percent level) lower subjective discount rates when paying for a speed-up rather than being compensated for a delay, marginally but still significantly (5 percent level) higher subjective discount rates when considering shorter periods of time, and significantly (0.1 percent level) higher subjective discount rates when considering smaller amounts. Note that under 11 percent of the variation in the subjective discount rates is accounted for by the treatment variables and respondent fixed effects. This suggests that there is considerable noise in our time preference data. The respondent characteristics improve the fit of the random effects model only marginally. Consistent with Olson and Bailey (1981), Lawrence (1991), and Becker and Mulligan (1997), higher incomes are associated with greater patience (10 percent level). None of the other respondent characteristics are significant.

The fixed effects regression for the subjective discount rates can be used to construct a single measure of time preference for each of the respondents that takes account of both their immediate and probed responses to all four decisions. For any particular respondent this measure is the coefficient relating to their fixed effect or respondent-specific dummy. It is these respondent-specific subjective discount rates that we use in the analysis of employment status and pension system participation below. The mean subjective discount rate that emerges from this procedure is 43 percent which is significantly (1 percent level) greater than the lending rate of 13.63 percent per annum that prevailed in Chile at the time of the experiments.

[6] The sum of the coefficients on *Probed* and *Probed*Now* is not significantly different from zero at the 10 percent level. Restricting the effect of probing to be the same for the two delay-related

As described in the previous section, each respondent in the experiment also faced eight risky decisions. Thus, for each individual we have eight measures of risk aversion. These measures each take the form of a certainty equivalent. A higher certainty equivalent corresponds to a lower level of risk aversion.

Figure 2 shows the frequency distributions of the certainty equivalents for each decision. Each row in Figure 2 corresponds to a different gamble. The risky option in the first row is Ch$3000 with a probability of 1/6 and Ch$1000 with a probability 5/6. The risky option in the second row is Ch$3000 with a probability of 1/2 and Ch$1000 with a probability 1/2. In the third row it is Ch$3000 with a probability of 5/6 and Ch$1000 with a probability 1/6 and in the fourth row it is Ch$5000 with a probability of 1/2 and Ch$2000 with a probability 1/2. Thus the expected value of the risky option increases as we move down the page. The left-hand column corresponds to the investment frame and the right-hand column to the insurance frame.

As one would expect, the distributions of certainty equivalents shift right as the expected value of the risky option increases. Our respondents required higher certainty equivalents for risks with higher expected values. In addition, the distributions shift to the right as we move from the investment to the insurance frame. Our respondents required higher certainty equivalents, i.e., appear less risk averse when the gambles were framed as insurance decisions.

These results are confirmed by the fixed and random effects regressions in Table 2. All the regressions contain four treatment variables. *Gamble2*, *Gamble3*, and *Gamble4* are dummies that each take the value 1 for the gamble in the corresponding row of Table 2 and zero otherwise. *Insurance* is a dummy that takes the value 1 for the insurance frame and zero otherwise. The certainty equivalents vary significantly (0.1

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decisions and the same for the two speed-up-related questions was accepted by the data.

percent level) from one gamble to another and increase with expected value. Further, the certainty equivalents are significantly (0.1 percent level) greater in the insurance frame.[7] Note that just over 40 percent of the variation in the certainty equivalents is accounted for by the treatment variables and respondent fixed effects although introducing respondent characteristics into the random effects model improves the fit only marginally: only education has a significant (5 percent level) effect on risk aversion.

The fixed effects regression can be used to construct a single measure of risk aversion for each of our respondents that takes account of their behavior in all eight risky decisions. For any particular respondent this measure is the coefficient relating to their fixed effect or respondent-specific dummy. It is these individual certainty equivalents that are used in the analysis of employment status and pension system participation that follows.

Figure 3 contains frequency distributions for the subjective discount rates of employees and of the self employed. The graphs suggest no clear distinction in time preferences between the two agent types. In Figure 4 the two agent types are further sub-divided into contributors and non-contributors. The most striking feature of these distributions is that it is only for the self employed who are contributing that we find the mode subjective discount rate at the extreme left-hand end of the graph suggesting that this group is more patient than each of the others.

For a more formal treatment of our hypotheses we turn to Table 3. This table contains the mean subjective discount rates for the four categories of agents, non-contributing employees, contributing employees, non-contributing self employed, and

[7] The null hypothesis that moving from the investment to the insurance frame had the same effect in all gambles was accepted at the 40 percent level.

contributing self employed, and for various unions of these categories. It also contains the results of a series of two- and one-tailed tests that correspond to the hypotheses presented in Section III. The mean subjective discount rate varies only marginally and not significantly between employees and the self employed. Similarly, the rate varies only marginally and not significantly between waged and salaried non-contributors and contributors. In contrast, self employed contributors and non-contributors have significantly different subjective discount rates (8 percent level on a two-tailed test, 4 percent level on a one-tailed test). The mean subjective discount rate for the contributing self employed is also significantly below that of contributing employees (13 percent level on a two-tailed test, 6 percent level on a one-tailed test).

Figure 5 contains frequency distributions for our measure of risk aversion for employees and for the self employed. Once again, these graphs do not suggest that the two agent types are distinct with respect to their salient preferences. In Figure 6 the two types are further sub-divided into contributors and non-contributors. Here, the most striking feature is the absence of low certainty equivalents in the distribution for the contributing self employed.

For a more formal treatment of our hypotheses we turn to Table 4. This table contains the mean certainty equivalents, our measure of risk aversion, for our four categories of individuals as well as relevant unions of those categories. The pattern of preferences that emerges here is strikingly similar to that observed when considering time preferences. The mean certainty equivalent varies only marginally and not significantly between employees and the self employed. It also varies only marginally and not significantly between contributors and non-contributors. The only group with a significantly different certainty equivalent is the contributing self employed. Their mean certainty equivalent is significantly *above* that of both contributing employees (2

percent level on a two-tailed test, 1 percent level on a one-tailed test) and non-contributing self employed (5 percent level on a two-tailed test, 2 percent level on a one-tailed test). Note that these single tailed results are the opposite of the alternative hypotheses that we posed in Section III.

## V. Summary and Conclusions

These findings suggest that in Chile there is no systematic difference between employees and the self employed with respect to either time preferences or levels of risk aversion. They are also consistent with the hypothesis that employees are not free to choose whether to contribute to the pension system in accordance with their preferences, while the self employed who are not covered by the mandate are free to make such choices. Consistent with theory, it is the more patient self employed who choose to contribute to the pension system. However, in conflict with the assumption that the formal pension system is the only source of insurance against poverty in old age, self employed contributors are significantly less risk averse than either the non-contributing self employed or contributing employees.

This last rather surprising finding suggests that the Chilean system may be viewed with some trepidation by its pool of potential clients. This may be because those who are more risk averse prefer to rely on alternative, traditional, family-based forms of social security or may be deterred by the financial risks associated with the capital markets in which retirement savings are invested under the new system.

Alternatively, these potential clients may be poorly informed about the system and the performance of the private fund managers who have earned a real average annual return of 11 percent for participants since the inception of the system (SAFP, 1999).

Bearing in mind that risk aversion declines with education, the participation of the economically active who are free to choose could be enhanced by a campaign carefully designed to raise awareness, allay fears, and inform people of the benefits of saving for retirement in the formal pension system.

Finally, our findings motivate a closer look at the informal strategies the self employed may be using to insure against poverty when they become no longer able to work.

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**Table 1: Regression analysis of subjective discount rates from hypothetical questions relating to time preferences**

| | fixed effects | | random effects | | random effects | |
|---|---|---|---|---|---|---|
| | **Coef.** | **s.e.** | **Coef.** | **s.e.** | **Coef.** | **s.e.** |
| ***Constant*** | 0.439 | 0.029 *** | 0.439 | 0.033 *** | 0.400 | 0.100 *** |
| ***Probed*** | -0.098 | 0.033 *** | -0.098 | 0.033 *** | -0.098 | 0.033 *** |
| ***Now*** | -0.298 | 0.041 *** | -0.298 | 0.041 *** | -0.297 | 0.041 *** |
| ***Shorter*** | 0.074 | 0.033 ** | 0.074 | 0.033 ** | 0.074 | 0.033 ** |
| ***Smaller*** | 0.271 | 0.033 *** | 0.271 | 0.033 *** | 0.275 | 0.033 *** |
| ***Probed x Now*** | 0.145 | 0.047 *** | 0.145 | 0.047 *** | 0.146 | 0.047 *** |
| ***Income*** | | | | | -0.071 | 0.039 * |
| ***Age*** | | | | | 0.001 | 0.002 |
| ***Yrs of ed.*** | | | | | 0.004 | 0.006 |
| ***Female*** | | | | | 0.010 | 0.044 |
| **R-sq:** | | | | | | |
| **within** | 0.146 | | 0.146 | | 0.147 | |
| **between** | 0.000 | | 0.000 | | 0.017 | |
| **overall** | 0.107 | | 0.107 | | 0.112 | |
| **Observations** | 1840 | | 1840 | | 1832 | |
| **Groups** | 230 | | 230 | | 229 | |

| | |
|---|---|
| ***Probed*** | Dummy which takes the value 1 if the interviewer probed. |
| ***Now*** | Dummy which takes the value 1 if the question elicited a current equivalent of an amount of money available in the future and the value 0 if the questions deals with a delay. |
| ***Shorter*** | Dummy which takes the value 1 if the period of time in question is 3 months and the value 0 if the time period is one year |
| ***Smaller*** | Dummy which takes the value 1 if the questions relates to $300,000 and the value 0 if the questions relates to $3,000,000 |
| ***Income*** | Total monthly income of individual in millions of Chilean Pesos adjusted in accordance with CEPAL (1999) |
| ***Age*** | Age in years of individual |
| ***Yrs of ed.*** | Number of years of formal education of individual |
| ***Female*** | Dummy which takes the value 1 for females |

Notes: *** - significant at the 1% level, ** - significant at the 5% level, * - significant at the 10% level.

**Table 2: Regression analysis of certainty equivalents from risk tolerance experiments**

| | fixed effects | | random effects | | random effects | |
|---|---|---|---|---|---|---|
| | **Coef.** | **s.e.** | **Coef.** | **s.e.** | **Coef.** | **s.e.** |
| ***Constant*** | 1665.892 | 32.214 *** | 1667.527 | 41.576 *** | 1390.255 | 144.213 *** |
| ***Gamble2*** | 341.641 | 40.807 *** | 340.053 | 40.905 *** | 335.718 | 40.925 *** |
| ***Gamble3*** | 868.242 | 40.834 *** | 866.905 | 40.930 *** | 865.386 | 40.951 *** |
| ***Gamble4*** | 1638.310 | 40.871 *** | 1634.263 | 40.946 *** | 1625.910 | 40.967 *** |
| ***Insurance*** | 113.030 | 28.915 *** | 111.894 | 28.972 *** | 112.687 | 28.986 *** |
| ***Income*** | | | | | 31.617 | 56.715 |
| ***Age*** | | | | | 2.542 | 2.352 |
| ***Yrs of ed.*** | | | | | 19.121 | 8.522 ** |
| ***Female*** | | | | | -49.960 | 63.564 |
| **R-sq:** | | | | | | |
| **within** | 0.540 | | 0.540 | | 0.539 | |
| **between** | 0.003 | | 0.003 | | 0.013 | |
| **overall** | 0.416 | | 0.416 | | 0.423 | |
| **Observations** | 1800 | | 1800 | | 1792 | |
| **Groups** | 229 | | 229 | | 228 | |

| | |
|---|---|
| ***Gamble2*** | Dummy which takes the value 1 for decisions in which the risky option is $3000 with a probability of 1/2 and $1000 with a probability 1/2. |
| ***Gamble3*** | Dummy which takes the value 1 for decisions in which the risky option is $3000 with a probability of 5/6 and $1000 with a probability 1/6 |
| ***Gamble4*** | Dummy which takes the value 1 for decisions in which the risky option is $5000 with a probability of 1/2 and $2000 with a probability 1/2. |
| ***Insurance*** | Dummy which takes the value 1 for decisions framed as insurance decisions. |
| ***Income*** | Total monthly income of individual in millions of Chilean Pesos adjusted in accordance with CEPAL (1999) |
| ***Age*** | Age in years of individual |
| ***Yrs of ed.*** | Number of years of formal education of individual |
| ***Female*** | Dummy which takes the value 1 for females |

Notes: *** - significant at the 1% level, ** - significant at the 5% level

**Table 3: Comparison of time preferences between employees and self-employed who are and are not contributing to pension funds**

| | Non-contributing | Contributing | All |
|---|---|---|---|
| **Employees** | 44% | 43% | 43% |
| | (57) | (81) | (138) |
| **Self-employed** | 44% | 33% | 42% |
| | (72) | (20) | (92) |
| **All** | 44% | 41% | 43% |
| | (129) | (101) | (230) |

**Tests of differences in means with equal variance not assumed**
(two-tailed test P-values reported first, one-tailed test P-values in square brackets)

| **Hypothesis tests** | | **P-value** |
|---|---|---|
| **1.** | Ho: Waged/salaried employees and the self-employed have the same time preferences | 75% [38%] |
| **2.** | Ho: Among waged/salaried employees non-contributors and contributors have the same time preferences | 83% [41%] |
| **3.** | Ho: Among the self-employed non-contributors and contributors have the same time preferences | 8% [4%] |
| **4.** | Ho: Among contributors waged/salaried employees and self-employed have the same time preferences | 13% [6%] |

Notes: Number of observations reported in curved brackets.

**Table 4: Comparison of risk tolerance between employees and self-employed who are and are not contributing to pension funds**

| | Non-contributing | Contributing | All |
|---|---|---|---|
| **Employees** | 1656.10 | 1658.64 | 1657.59 |
| | (57) | (81) | (138) |
| **Self-employed** | 1666.55 | 1858.96 | 1708.38 |
| | (72) | (20) | (92) |
| **All** | 1661.93 | 1698.31 | 1677.91 |
| | (129) | (101) | (230) |

**Tests of differences in means with equal variance not assumed**
(two-tailed test P-values reported first, one-tailed test P-values in square brackets)

| **Hypothesis tests** | | **P-value** |
|---|---|---|
| **1.** | Ho: Waged/salaried employees and the self-employed are equally risk averse | 44% [22%] |
| **2.** | Ho: Among waged/salaried employees non-contributors and contributors are equally risk averse | 97% [49%] |
| **3.** | Ho: Among the self-employed non-contributors and contributors are equally risk averse | 5% [2%] |
| **4.** | Ho: Among contributors waged/salaried employees and self-employed are equally risk averse | 2% [1%] |

Notes: Number of observations reported in curved brackets.

**Figure 1: Frequency Distributions for Subjective discount Rates for Time Preference Decisions**

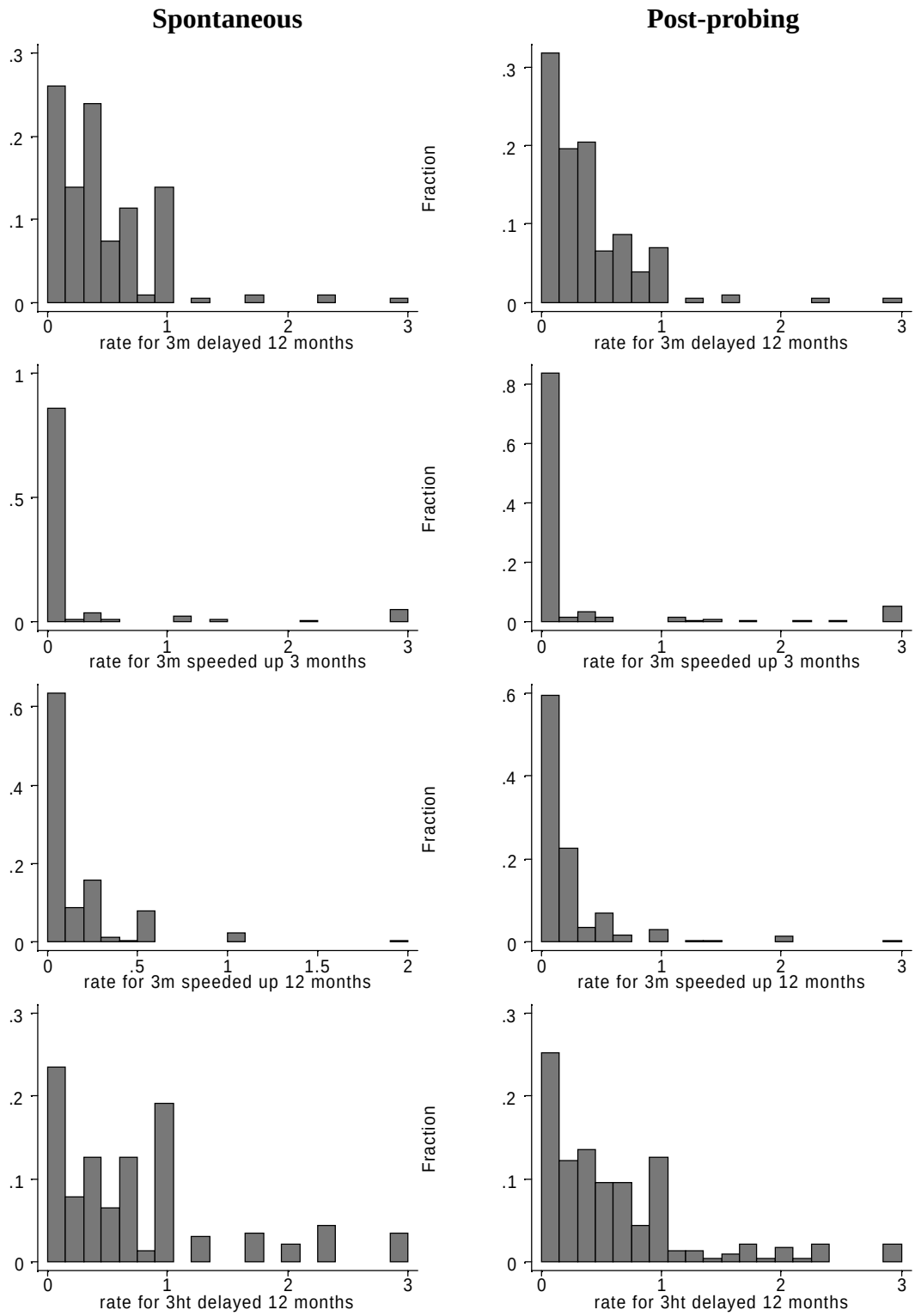

**Figure 2: Frequency Distributions of Certainty Equivalents for Risky Decisions**

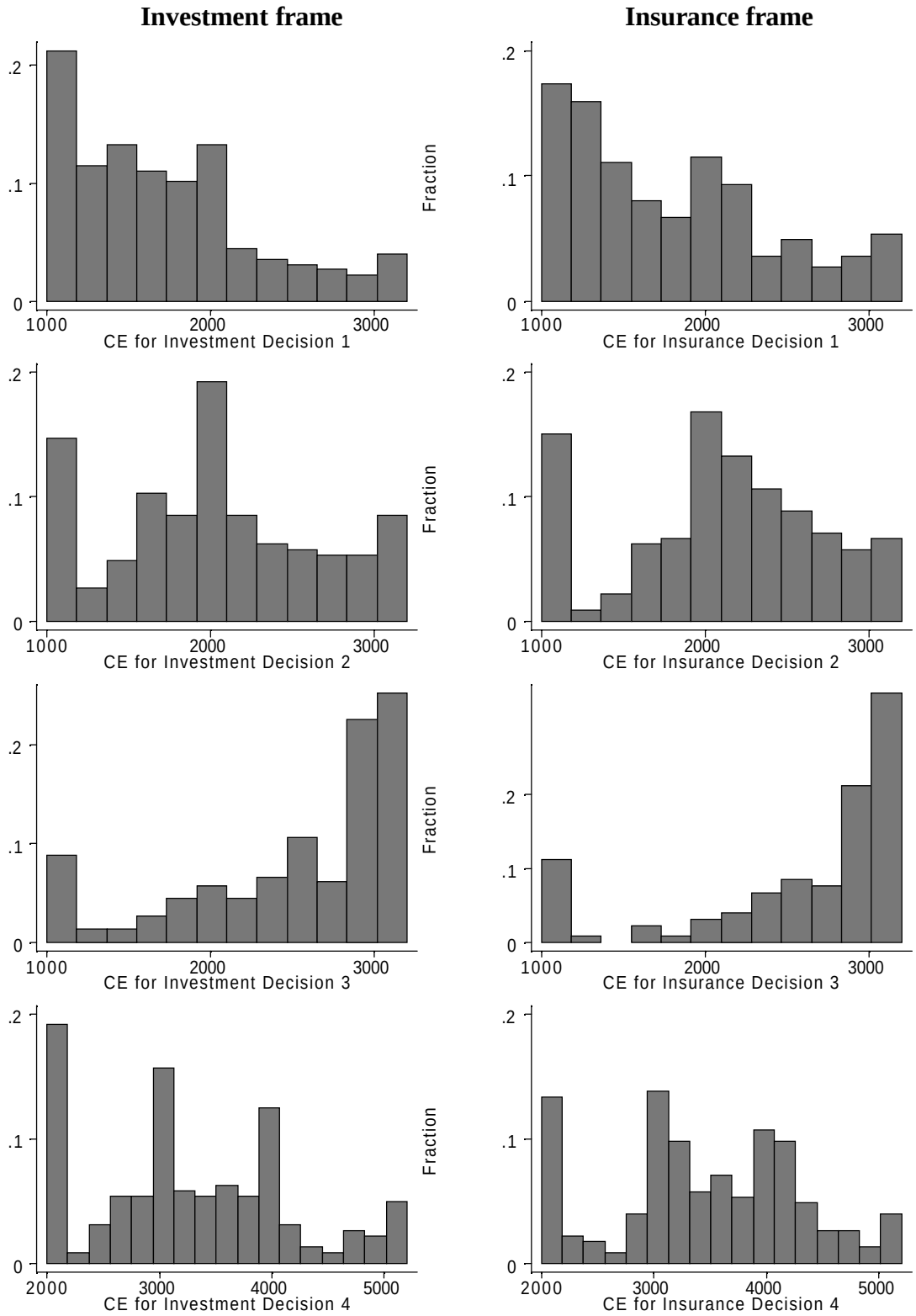

**Figure 3: Individual Subjective Discount Rates for Employees and Self-employed**

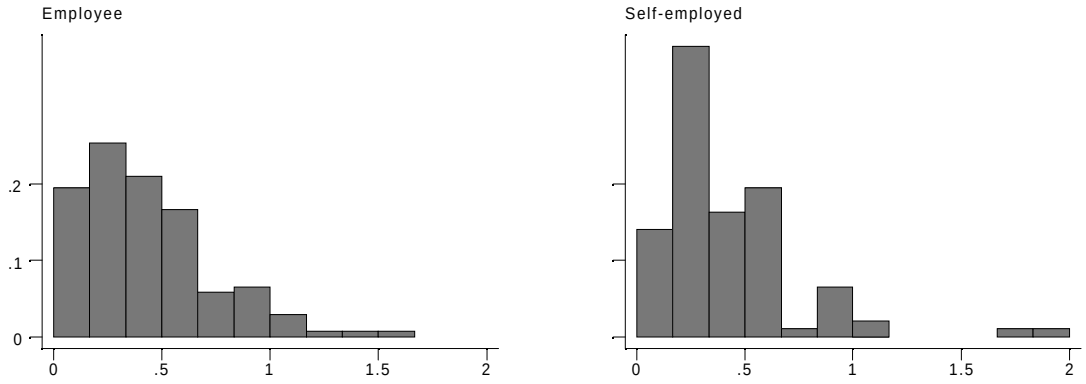


**Figure 4: Comparison of Subjective Discount Rates between Employed and Self Employed, and Contributors and Non-contributors to Pension Funds**

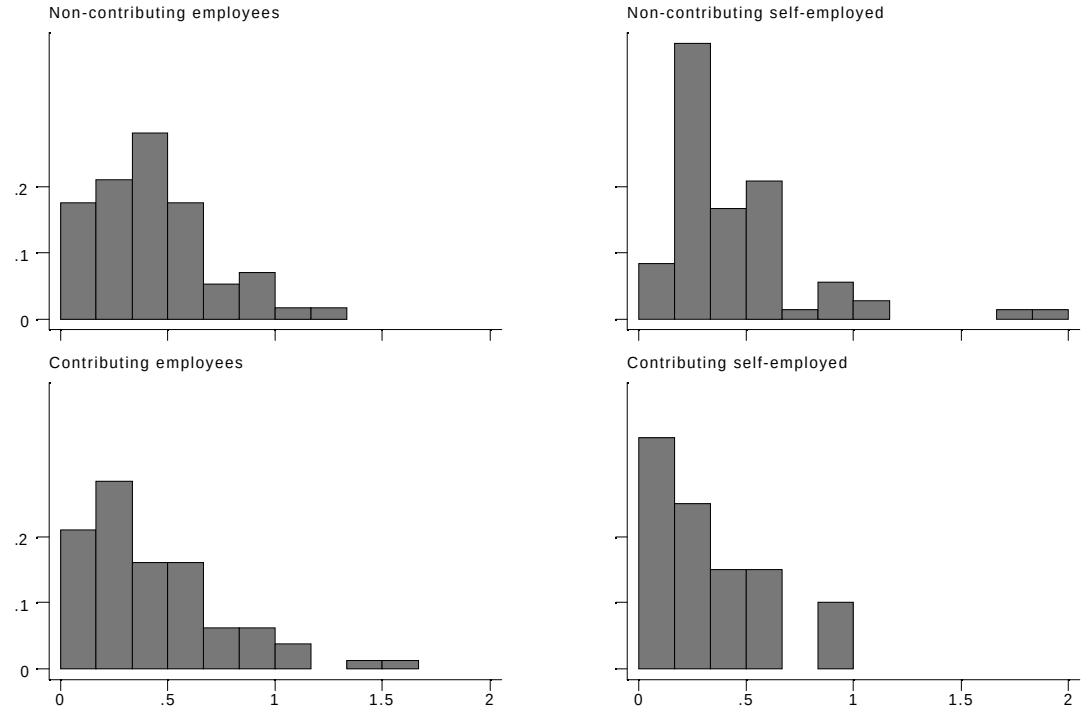

**Figure 5: Individual Certainty Equivalents for Employees and the Self Employed**

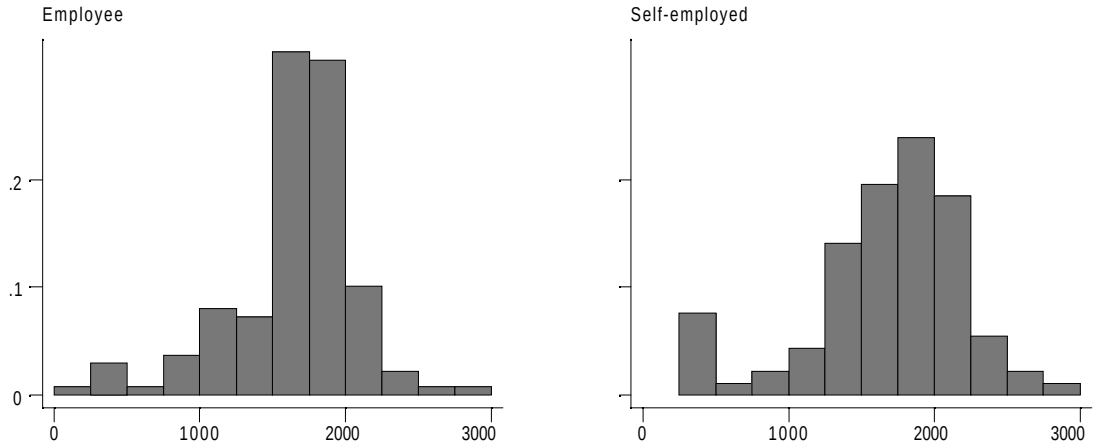


**Figure 6: Comparison of Certainty Equivalents between Employed and Self Employed, and Contributors and Non-contributors to Pension Funds**