Pension Reform in Chile: A Difference in Difference Matching Estimation

Reforma de Pensiones en Chile: Análisis de Matching con Diferencias en Diferencias

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Abstract

The present paper estimates the effect over participation outcomes of the new reform to the pension system made in Chile in 2008, using a difference in difference matching estimation. The main results found that the treated group shows a higher withdrawal from the labor market and that they worked an average of 8 percentage points (pp) fewer months than the control group in 2009. The treated group also contributed 18 pp fewer months than the control group, and they have, on average, 6 pp more months in inactive status. Looking at the difference in per capita income, the treated group has an average of US$34 more per month than the control group in 2009.

Key words: *Pension System, retirement contributions.*

JEL Classification: *J18, J26, C23.*

Resumen

La presente investigación busca cuantificar el efecto de la nueva reforma previsional de Chile realizada el 2008 usando un análisis de matching con estimación de diferencias en diferencias. Los resultados encuentran que el grupo tratado trabaja 8 puntos porcentuales menos meses que el grupo control durante 2009, también contribuyen 18 puntos porcentuales menos y están en promedio 6 puntos porcentuales más en inactividad. Analizando diferencias en ingreso per cápita, se encuentra que el grupo tratado tiene en promedio US$ 34 dólares mensuales más que el grupo control en 2009.

Palabras clave: *Sistema de Pensiones, contribuciones.*

Clasificación JEL: *J18, J26, C23.*

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1. INTRODUCTION

The Chilean Pension System changed from a Pay as You Go (PAYG) to an individual capitalization system in 1981. In this new system, working people have to make a compulsory contribution as a percentage of the labor income (10%) to an individual account managed by financial institutions known as Pension Fund Managers (Administradora de Fondos de Pensiones, AFP). These funds are to be used in old age to finance their retirement pensions.

This individual capitalization system has been studied by several countries, including the USA, seeking to introduce changes in their PAYG systems. The main reason to move to a capitalization system is the fact that the aging population and longer life expectancy rates have caused high increases in public spending, compromising the sustainability of the retirement system. In the case of Chile, the system has performed well, although some problematic issues have been identified (Bernstein, 2011).

These issues include the low density of contributions, the low coverage, and the low pension income levels. The main reason for these situations is the fact that the retirement system in Chile only demands compulsory contributions from workers with dependent work, meaning that they have an employment contract. People with jobs in the informal sector, working independently or without contract, are not forced to make contributions but may make voluntary contributions. As a result, the density of contributions is bimodal with the group of contracted agents showing densities over 80% while the other group shows very low densities. An exhaustive analysis shows that the lowest densities are concentrated in the youngest workers, those with low income, and those with independent work (Bernstein, 2011).

In order to solve the issues identified above, a new reform was set in place in 2008. The reform intended to reinforce and integrate the three pillars of the pension system: the solidarity, compulsory, and voluntary pillars. Several actions were taken to improve these pillars and at the same time generate appropriate incentives for all parties involved (public sector, private sector, and workers). The main change introduced, which is analyzed in this paper, was the introduction of the Basic Solidarity Pension (Pensión Básica Solidaria, PBS) in 2008.

Before the new reform, the solidarity pillar included two instruments: a basic public pension (PASIS) for the poorest and most vulnerable population that didn't have a pension, and a minimum pension guarantee (PMG) for those who had a pension but with an amount that was too low[1]. In the new reform; these two characteristics remain but have been improved. The basic public pension is replaced by the PBS; the former PASIS covered about 21% of the population older than 60 years, while the new PBS started with coverage of 40% in July 2008, was increased to 50% at the end of 2009, and reached a final coverage of 60% in 2011. Regarding the amounts of the benefit, the PASIS gave a monthly fixed benefit of US $75 dollars a month[2], while under the new PBS, the amount

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[1]   Insufficient to fulfill alimentary needs
[2]   Amount calculated using an exchange rate of $502 Chilean pesos/dollar

started in July 2008 with US $120 monthly, increased to US $132 in July 2009, and reached US $156 in July 2011[3].

The PMG of US $150 involved a commitment from the government to supply any additional amount to complement individual pensions under this minimum and up to this level. Under the new reform, this minimum pension guarantee was replaced by the Solidarity Contribution (Aporte Previsional Solidario, APS), which started with a guaranteed minimum pension of US$ 139 monthly in 2008. The amount was increased in 2009 to US$ 239 and reached US$ 508 in July 2011.

These two components have an immediate effect on the wealth of people who qualify for this benefit and cause an important decrease in the poverty status of older people. However, this increase in available income also affected behavior. In particular, one can argue that a fully funded system increases savings because agents can assign a direct and individual benefit to the retirement savings, since the amount saved is going to benefit them directly in their retirement period. Schmidt-Hebbel (1997) shows that the introduction of the fully funded system in Chile caused an increase in the aggregate savings and had additional positive effects, such as higher efficiency in the labor market.

The new reform introduces changes to the fully funded concept and moves the Chilean system closer to a publicly financed system in the sense that now people can receive a pension independently of their contributions, which therefore diminishes the incentives to make private contributions during younger working years. On the other hand, one could argue that the amount of the benefit is low enough not to alter the incentives over contributions, or that myopic behavior causes young agents to discount their future at high rates, and that, therefore, there is no relevant change in younger ages with respect to changes in the pension framework or in private savings. This argument is supported by several studies that analyze the little knowledge that agents have about the pension system (Superintendencia de AFP, 2008).

In the present study, the preliminary effects that this reform had on contributions are evaluated, and the report provides several indicators of labor participation. The approach followed is a difference in difference matching estimation (DIDM). The present analysis focuses on the PBS and not on the APS, because the APS was introduced in 2008 and there is not enough data or specific knowledge to evaluate this feature. The PBS, on the other hand, is the improved version of the former benefit PASIS, and more knowledge and data has accumulated.

The present study uses a panel survey, to identify the beneficiaries of PBS in 2009. This group is identified as the treatment group. Then, using the eligibility criteria for being able to receive the PBS, a sample of eligible agents was identified and, using matching technique, a control group was selected. Because EPS is a panel survey, the control and treated groups identified in 2009 can be identified in the older 2006 data and then the difference in difference approach (DIDM) was used to evaluate the change in several relevant outcomes. The difference in difference approach enables control by unobserved constant characteristics because the same agents in two periods of time are evaluated.

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[3]   In average, a working agent earned US $965 per month and an inactive agent earned US $311 per month for autonomous income in 2011.

This approach enables identification of the group of beneficiaries as the "treated group" and selects another group that, although satisfying the eligibility conditions, didn't receive the benefit. The latter group is the "eligible group". These two groups are different people and therefore have different observable and unobservable characteristics that must be controlled in the study. The matching method allows us to select from the eligible sample a control group that is similar in observable characteristics to the treatment group. The difference in difference approach also enables control by non observable characteristics that may affect the control and the treated group in different ways, and if this is not controlled can bias the effect of the treatment. Therefore a DIDM approach identifies with excellent reliability the effect of PBS over the labor outcomes selected here, because it controls by observed and unobserved constant characteristics.

The effect of the PBS over labor participation is made by comparing five variables: months contributed, months in working status, months in inactive status, months in unemployment, and per capita income. The measure of each variable in the analysis is made in months in each status as a percentage of total months registered in the labor history between two surveys. As a result evidence was found that the treated agents showed a higher degree of withdrawal from the labor market in 2009 when compared with the control group. In addition, the treated agents worked an average of 8% fewer months than the control group; also, they had a higher percentage of months in unemployment and in inactive status, with an average of 2% and 6% more months in each status, respectively. Regarding contributions to the retirement system, the treated group showed an average of 18% fewer months with contributions. Finally, there did not appear to be any significant statistical difference in per capita income, with the treated group having an average US $35 more dollars per month in per capita income than the control group.

The present research is divided in four sections. Following this introduction, Section 2 presents the methodology of the DIDM approach and explains the main features of the reform. In Section 3 results of the DIDM evaluation are presented, and in Section 4 are the conclusions of the present study.

2. Methodology and Data

2.1. Data

The present paper uses EPS Survey (Encuesta de Proteccion Social); this survey is representative of the national population since 2006 and has the form of a panel survey. It follows people through the years and collects relevant information about agents older than 15 years, about labor history, socioeconomic characteristics, income, and social security history. The round in 2006 interviewed 16,443 people, while the round in 2009 interviewed 14,463. The number of people who responded in both rounds is 13,371.

In order to realize our matching analysis the treated and control groups needed to be identified. The first group is comprised of beneficiaries of PBS in 2009, they were easily identified because those interviewed answered directly the question about receiving this benefit, although the data can suffer some

measure problems if the agent didn't know or didn't remember receiving the benefit. For selecting the control group, eligible people must be selected, and these are people that, although satisfying conditions for the reception of the benefit, didn't receive it in 2009. From this group, the control group is selected through a matching technique. Because we are comparing the differences between the groups (control and treated) in two years, for 2006 the treated and control group, although the same as the treated and control groups for 2009, were 3 years younger (in 2006).

Information about the pension system in Chile reveals that people have very little knowledge of the system. The EPS Survey includes several questions about general and specific knowledge of the system, and in evaluating the answers to these questions, results show that fewer than 3% of agents answer more than 50% of the questions correctly (Superintendencia de AFP, 2008). Another important data point is the low contribution made by independent workers and agents for whom contributions are voluntary. These two sets of data reveal that there is low planning regarding retirement, and, therefore, the argument that the introduction of the reform in 2008 had little change in behavior in agents studied in 2006 can be made; also, it can be assumed that there was no planning effect altering the behavior of the treated agents in 2006.

In order to select the eligible sample in both years, the fulfillment of the requirements for receiving the benefit is analyzed. These requirements are basically four: a) Be 65 years of age or older; b) Belong to the 40% poorest population; c) Receiving PASIS; and d) don't have another pension. Criterion c) results from the fact that in Fulfilling these requirements were 732 eligible people for 2006 and 677 for 2009. The total numbers for the self reported beneficiaries of PASIS in 2006 and PBS in 2009 were 432 and 439 respectively. Descriptive statistics are presented in Section 3, Results.

2.2. Evaluation Strategy

This study searched for effects of the new PBS over participation variables, henceforth, outcome variables. The relevant outcome variables are months spent working, months in inactivity, and months in unemployment, the per capita income, and contributions made are also included. All these variables, except the per capita income, are measured as percentage of the total months in the labor history. The per capita income is measured in monthly Chilean pesos.

In order to find the effect of the PBS over the beneficiaries, the difference between participation in the program or not was tested. Following Smith and Todd (2003), a dummy variable D can be defined, which takes the value of one if some agents participate in the program and zero if the agent does not participate in it. The main issue arising in DID models is that for each agent only $D = 1$ or $D = 0$ is observed. Therefore, the evaluation has to be made in an aggregate level, calculating averages for the entire population. This effect is the "Average Treatment on the Treated", meaning the difference in outcomes (for participants) between participating and not participating in the program. The equation is thus shown as:

$$ATT = E\left(Y_1 | D = 1, X\right) - E\left(Y_0 | D = 1, X\right)$$

Where represents the outcomes for agents receiving PBS and is the outcome for agents not receiving PBS, but eligible. X represents a set of observable variables that are used to control difference between participants and non participants. The first term, $E(Y_1 | D = 1, X)$, in the equation (outcome when participating) can be directly identified from the beneficiaries of PBS; however, the second term (outcome when not participating) cannot be directly identified because the outcome when not participating for the same agents participating is needed, and this is not possible in natural experiments. As an approximation to the second term, $E(Y_0 | D = 0, X)$, is used, meaning the no treatment outcome for agents that are eligible but do not receive PBS.

This approximation has a selection bias: $B(x) = E(Y_0 | D = 1, X) - E(Y_0 | D = 0, X)$. Matching estimation uses the assumption that conditioning on X eliminates this bias. For this to be true and be allowed to replace $E(Y_1 | D = 1, X)$ with $E(Y_0 | D = 1, X)$, Heckman *et al.* (1997) identified two basic requirements:

a) *Identification Condition:* This feature requires that outcomes must be independent of program participation, conditional on a set of observable characteristics Z (with Z a subset or superset of X). For *ATT*, this condition can be replaced for a weaker one: conditional mean independence:

$$(1) \qquad E\big(Y_0 | D = 1, Z\big) = E\big(Y_0 | D = 0, Z\big) = E\big(Y_0 | Z\big)$$

b) *Positive Probability of Participating and Not Participating:* This means that: $0 < \Pr\big(D = 1 | Z\big) < 1$. This condition implies that a match can be found for all participating or treated persons ($D = 1$). The weaker condition can be tested:

$$(2) \qquad \Pr\big(D = 1 | Z\big) < 1$$

Once these two equations have been tested and satisfied, both groups are comparable, and matching analysis can be performed correctly in order to identify the average treatment on treated effect.

2.3. Special Considerations

When working with matching, some considerations must be made. These are discussed in the following:

- Dimensionality Problem

In order to make the control and treatment group comparable, conditioning on some variable X has to be made. When this set is too big, conditioning can be a problem. If X is discrete, there could be so many cells that it can be possible to have some empty cells, and it won't be possible to find a proper match; if X is a continuous convergence rates will be too slow.

Rosenbaum and Rubin (1983) proved that when outcomes are independent of program participation conditional on X, they are also independent conditional on the propensity score, which is the probability of participation: $P(D = 1 | Z)$.

Therefore the dimensionality problem can be reduced by matching on a univariate propensity score instead of generating cells. This approach is followed here.

- Common Support Region

The easiest way to test if equations (1) and (2) hold, is to draw the density of the propensity score for the treated and for the control group to find whether they span the same range. When this is not satisfied, then the analysis must be performed over the "common support region", meaning that our estimations are valid only in the area where the support of X overlaps for $D = 0$ and $D = 1$:

$$S = Supp(Z|D=1) \cap Supp(Z|D=0)$$

- How to choose variable X

There is no rule to determine which variables are to be included; however, the set Z must be such that $E(D|Z, P(Z)) = E(D|P(Z))$. Then if, after conditioning on P(Z), there is still dependence of Z, and some degree of misspecification in the model should be suspected. One way to test this would be to test if there are differences in Z means between $D = 1$ and $D = 0$ groups after conditioning on $P(Z)$.

Two approaches for determining the variables Z are:

- Balancing Property: Estimate $P(Z)$ and divide observations into strata, so there is no difference in the mean of the estimated propensity score between control and treated groups. Then make a mean difference test for each variable in Z between control and treated groups. If there are differences, include in the model higher order and interaction terms of those variables and repeat the process until no differences remain. This approach is followed here.
- Prediction Capacity: Another approach is to choose the specification with a better prediction of the probability of participation. This is the approach used in the present study.

3. RESULTS

The total sample answering the survey in both years included 13,371 agents. From this sample, the eligible population in 2006 and 2009 was selected using the four eligibility criteria; the same criteria were used in both years:

a) Age of 65 or more;
b) Belong to 40% of poorest population;
c) Receive PASIS (Independent of age);
d) Don't receive any other pension (in the fully funded sector).

Table 1 shows descriptive statistics for the data. Regarding number of members in the household, the sample for eligible and beneficiaries show households have fewer members than the data including all population interviewed (full sample). The full sample also shows an average number of members per households of 4.2

for 2006, while this number decreases to 3.7 for both eligible and beneficiaries' agents in the same year. Eligible and beneficiaries have also less per capita income and less schooling than the full data of agents for 2006. Lastly, in the full data there is an equal distribution between men and women, while in the eligible and beneficiaries data there is a larger percentage of female interviewed[4], this could be explained because women have a longer life. As we can see in Table 1 there is little difference in the statistics between eligible and beneficiary samples; the only variables in which there is significant difference is schooling for 2006 and sex for 2009 where we can see more women as beneficiaries of PBS.

In order to proceed with the matching, the probability of participating in the program was calculated, meaning the probability of receiving PBS. As the dependent variable we used a dummy variable that takes a value of one if the agent receives PBS in 2009 and zero otherwise, this variable includes the sample of actual beneficiaries and of people that while being eligible did not access the benefit. Because an intertemporal effect influencing the probability of receiving PBS existed, in 2009 data of 2006 were used as independent variables. The behavior of the agent in previous years, such as contributions and savings, have a great incidence in the social security status in 2009, and therefore in the probability of receiving PBS. The model is run using a logit regression that shows a slightly better adjustment than the probit. The model, as estimated, is:

$$
\begin{aligned}
\Pr(&Participate) \\
&= \beta_0 + \beta_1 Jefe + \beta_2 Sex + \beta_3 Housing + \beta_4 Schooling + \beta_5 Age \\
&\quad + \beta_6 Membership + \beta_7 LifeExpectancy + \beta_8 Independent + \beta_9 Schooling^2 \\
&\quad + \beta_{10} Age^2 + \beta_{11} nmembers + \beta_{12} Eligible + \varepsilon
\end{aligned}
$$

The independent variables considered were: head of household, sex, housing, schooling, age, membership, life expectancy, independent worker status, squared age, squared schooling, number of members in the household, and an eligibility criterion (that includes all four conditions that agents must satisfy). The variable head of household is a dummy variable taking a value of 1 if the interviewed is the head of household; sex is also dichotomous, taking a value of one if the agent is male; housing refers to the quality of the housing with 1 being the best quality and 7 the lowest quality[5]; membership is a dummy variable taking 1 if the agent contributed at least once to the retirement savings account; independent is also dichotomous, taking a value of 1 if the worker has an independent working status; the eligibility criterion is dichotomous, taking a value of 1 if conditions are satisfied; finally, schooling, age, numbers of members in the household, and life expectancy are continuous variables.

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[4] Sex is a dummy variable where male takes a value of 1 and female a value of 0; therefore, the mean returns the percentage of male.

[5] The best quality being a house and the worst quality being precarious housing.

TABLE 1
DESCRIPTIVE STATISTICS

2006	Base			Eligible			Beneficiaries		
	Obs	Mean	SE	Obs	Mean	SE	Obs	Mean	SE
Sex	13,371	0.49	0.50	792	0.44	0.50	483	0.43	0.50
Age	13,371	47.55	15.19	792	65.65	11.85	483	64.02	13.70
Schooling	13,221	8.73	4.00	777	5.34	3.78	479	4.46	3.30
Number of members	11,607	4.24	1.88	732	3.70	2.23	432	3.67	2.35
Per capita income	11,607	45,361	94,928	732	27,265	35,471	432	24,545	32,191

2009	Obs	Mean	SE	Obs	Mean	SE	Obs	Mean	SE
Sex	13,371	0.49	0.50	789	0.40	0.49	528	0.34	0.48
Age	13,371	50.04	15.18	789	67.18	11.85	528	66.83	13.25
Schooling	13,205	8.73	4.04	787	5.31	3.64	524	5.05	3.46
Number of members	10,785	4.12	1.88	677	3.55	1.93	439	3.48	2.04
Per capita income	10,785	40,839	75,622	677	25,527	41,837	439	27,862	37,089

Source: Own calculation using EPS 2006 and EPS 2009.

3.1. Quality of Matching

With the logit regression the probability of participating (PP) in the program was estimated; PP is the propensity score used to match control and treated agents. Due to the presence of missing observations, the PP is estimated for 175 observations, with only 2 observations out of the common support region. Therefore, the sample for the matching is 58 observations in the treated group and 115 in the control group. Because an oversampling of treated (in relation with the participation rate in population) was found, weights were needed for the sample, but these are unknown. To solve this problem, the PP was modified and a new score was calculated equal to PP/(1-PP), following Heckman and Todd (1995), who showed that consistency of results are restored under this redefinition. The matching was made in base to this monotonic transformation.

Independent variables were selected in order to increase the prediction capacity of the model, and the estimation performed with the model specified above has a 68.84% of success in predicting the PP. A nearest neighbor matching with no replacement was performed because the sample of controls was large enough to allow for non replacement[6]. Finally, the data has all necessary characteristics for performing a good matching analysis (Smith and Todd, 2003): a rich set of conditioning variables; the control and treated groups belong to the same region; and, the dependent variable is measured in the same way for both the control and the treated group.

After the matching by the nearest neighbor, the quality of the matching by comparing means between treated and not treated group was checked according to the variables used as controls in the logit regression. A high quality matching should show no significant difference in the control variables between both groups; otherwise the model is misspecified.

Table 2 displays the mean comparison test for the independent variables used to make comparable the treated and control groups. Standard errors were computed using *bootstrap*. The result shows that both groups are comparable in the observable variables defined; only schooling shows a significant difference at 5%, but not at 1%. Therefore, the matching was of good quality.

3.2. Final Results

The present research aimed to find evidence of the effect of the new pension reform over the incentives in labor participation. The variables analyzed included: percentage of total months working, percentage of total month's inactive, percentage of total months in unemployment, percentage of total months with contributions, and, finally, per capita income. Total months are the total months reported in the labor history between two surveys. Because statistics over labor outcomes are measured as percentage of the total months in the reported labor history, the results must be interpreted with this in consideration.

The control by observed variables was complete with the matching procedure as discussed above. In order to select agents in the eligible group who are similar to treated agents, a probability score (pscore) was calculated, this score

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6   The quality of the matching doesn't change using replacement.

represented the probability of getting the benefit (PBS) given a selected group of observed variables (independent variables). The matching approach selected as a control the agent with the pscore closest to the pscore of the treated agent. Thus, by using matching, observed differences were controlled between control and treated group.

TABLE 2

EVALUATION OF THE MATCHING QUALITY

	Control	Treated	Diff	SE	t-stat	P-value
Head household	0.79	0.81	0.02	0.07	0.31	0.75
Sex	0.69	0.57	–0.12	0.09	–1.25	0.21
Housing	1.70	1.36	–0.34	0.28	–1.24	0.22
Schooling	7.66	5.83	–1.83	0.74	–2.48	0.01
Age	60.79	59.29	–1.50	1.91	–0.79	0.43
Membership	0.56	0.60	0.03	0.11	0.31	0.76
Life expectancy	77.85	79.74	1.89	1.89	1.00	0.32
Independent	0.56	0.58	0.03	0.08	0.34	0.74
Number of members	3.78	3.60	–0.18	0.45	–0.40	0.69
Eligible	0.38	0.55	0.17	0.09	1.82	0.07

Source: Own calculation using EPS 2006 and EPS 2009.

Because EPS is a panel survey, the agents identified in 2006 were selected as control and treated group in 2009. The 2006 agents were the same as in 2009, except that they were three years younger. Therefore, two observations in time for both, the treated and control agents, are obtained, which enables making a difference in difference analysis in order to control for unobservable characteristics that remain constant over time. In general, beneficiaries of the PBS showed a deeper withdrawal from labor markets, made lower contributions, worked less, and showed longer periods of inactivity, but no significant difference was found in per capita income. Table 3 displays these results[7].

Comparing working months, it was found that in 2006, before agents received the PBS, they worked a high percentage of total months in 2006, reaching averages of 88% and 93% for treated and control groups respectively. The same comparison in 2009, showed a drastic reduction in worked months because, in 2009, agents are 65 years old or older and retirement takes place at these ages. Although the reduction of months worked is observed in both groups, the reduction was higher for the treated group, with a reduction from 88% to 48%, while the control group fell from 93% to 60%. Controlling by the reduction in participation for both groups, it is to be noted that the treated group reduced worked months by 8 percentage points (pp) after receiving the benefit. Thus, on average, treated agents worked less time of the total months reported in the labor history between two surveys. From this finding the argument that the new

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[7]   Results are expressed as percentage of total months, except for per capita income expressed in monthly Chilean pesos.

pension reform has reduced the incentives to work for people older than the legal retirement age can be made. Given the higher life expectancy rates, a drop in working months can cause an increase in the government spending to finance PBS, and this can affect negatively the sustainability of the reform.

Comparing inactive months between 2006 and 2009, the data indicates that due to the retirement effect, the treated group increased inactive months up to 40 pp while the control group increased this percentage by 34 pp. Therefore, beneficiaries of PBS increased inactive months by 6 pp more than the control group.

Regarding months in unemployment, as shown in Table 3, the treated group increased these months in 1.3% while the control group reduced the months in unemployment in 1.1%. Therefore, while control group reduced the months in unemployment, the treated group increased them, so the total effect is an increase in months in unemployment for the beneficiaries of PBS by 2 pp of total months in 2009.

TABLE 3
RESULTS

	Treated	Control	Diff	SE	t-stat
Months Contributed					
2006	0.248	0.269	–0.02	0.093	–0.24
2009	0.062	0.263	–0.20	0.071	–3.02
DID Effect	–0.187	–0.006	–0.18		
Months in Unemployment					
2006	0.090	0.043	0.05	0.033	1.290
2009	0.102	0.033	0.07	0.048	1.500
DID Effect	0.013	–0.011	0.02		
In active Months					
2006	0.03	0.03	0.00	0.024	–0.130
2009	0.42	0.37	0.05	0.095	0.580
DID Effect	0.40	0.34	0.06		
Working Months					
2006	0.884	0.927	–0.04	0.049	–0.980
2009	0.475	0.599	–0.12	0.052	–1.310
DID Effect	–0.410	–0.328	–0.08		
Per capita Income					
2006	23013	46442	–23428.89	12794	–1.83
2009	26064	31684	–5619.89	14658	–0.38
DID Effect	3051	–14758	17809		

Source: Own calculation using EPS 2006 and EPS 2009.

Two other relevant variables are contributions made and per capita income. The per capita income was included because the final objective of the reform is to diminish poverty indicators in the group of beneficiaries. Contributions made are included because a negative effect over contributions could affect the sustainability of the retirement system. Once agents retire from the labor market, they don't make compulsory contributions unless they keep working; therefore, the months contributed should decrease rapidly when agents retire from the labor market. Table 3 shows that the treated group decreased months contributed from 25% to 6%, while the control group maintained the contribution in 26%. Therefore, the data shows that beneficiaries of PBS decrease contributions by 18 pp.

Finally per capita income shows little difference. For the treated group, per capita income increased from US$ 46/month to US$ 52 /month in 2009; while the control group decreased per capita income by $ 29 USD (analysis is in constant prices). Therefore, the total effect shows the treated group increased per capita income by $US 34 /month in 2009. Because this amount is very little compared to the poverty line, it is not clear whether the PBS is having a significant effect reducing poverty or is just causing disincentives to work in older ages and crowding out private contributions. Further analysis is required to achieve a definitive conclusion in this regard.

In the same line, further research should investigate how households are spending these new resources. If additional income is spent in health, education or nutrition, then the PBS would affect in a positive way the quality of life of this vulnerable population. However, this analysis is beyond the scope of the present study.

4. Conclusion

The Chilean Pension System changed from a PAYG to a fully funded or individual capitalization system in 1981. In this new system, working people have to make compulsory savings for retirement to an individual account administered by private companies that manage the funds during working years and provide for pensions when agents retire. This individual capitalization system has several benefits, but some issues were identified such as low benefits and a bimodal density of contributions. In order to solve these issues, in 2008 a new reform was enacted in Chile. With this reform, the requirements to get a public pension and the minimum amount guaranteed were changed in such a way that both the amount of benefit and coverage increased[8]. The main change introduced, analyzed in this paper, was the introduction of the Basic Solidarity Pension (Pension Basica Solidaria, PBS).

This paper uses a difference in difference matching approach (DIDM) to measure the effect of PBS over relevant participation and contribution variables.

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[8]   With the former system coverage of public pensions was 21% of population older than 65 years, while the new reform increased coverage up to 60% in 2011.

The results show that in general, beneficiaries of the PBS show a deeper with-drawal of labor markets: they make fewer contributions, work less and show longer periods of inactivity. All in all, occupation decreases 8 percentage points (pp) in the group receiving PBS, while periods of unemployment increased in 2 pp and inactivity increased 6 pp. Finally, contributions decreased 18 pp for the beneficiaries of PBS.

Regarding per capita income, there is no evidence that PBS allocated more income to agents receiving PBS: in fact, the average difference between treated and control group was $34 /month between both periods analyzed. Given that poverty line in 2009 for urban areas was a per capita of US 123 dollar/month, PBS is not reducing poverty.

Therefore, the results show that PBS is reducing incentives to participate in the labor market and this can be explaining the fact that people receiving PBS do not have higher incomes. It seems that there is a crowding out effect of the new pension, where higher income from PBS is being compensated with lower incomes from working activities.

In the future, further analysis can be made with increased longitudinal data. Also, it is important to analyze the consumption made by PBS beneficiaries, to determine whether there is a bias in favor to the consumption of goods related to health or to more or higher quality food, PBS could be affecting the welfare of PBS beneficiaries in a positive way.

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