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Introduction

Life expectancy at birth in Chile has increased steadily in the last 30 years from 69.89 years in 1984 to 81.50 in 2014 (World Bank 2015). Chilean life expectancy at birth has surpassed that of the United States (78.94), the European Union (80.67) or even that of Germany (80.67). The advances in life expectancy have paralleled economic growth; Chile's economic growth in the last 30 years has averaged over 5%. The country has the highest per capita GDP in Latin America (ECLAC, 2015) and is one of the fastest growing economies in the world, comparable to the Asian Tigers.

Although most poor countries do have a social security system in place, a significant share of the population only makes occasional payments to social security throughout their lives. This implies that many of their elderly are not entitled to social security pensions; caring for them requires extensive and expensive non-contributory pension plans. Although these plans may be unfeasible in poor countries, countries that have undergone prolonged periods of fast economic growth and are no longer poor can tackle the problem. Sooner or later these countries face the fact that many of their elders are below the minimum poverty lines and that this is considered unacceptable given the current income standards.

The solution unavoidably involves a non-contributory, flat pension that guarantees that all the elderly reach a minimum income, regardless of previous earnings or occupation. These pensions are particularly helpful for women who either never joined the labour market, or did so sporadically, for farmers and for workers that spent most of their lives in the informal sector. By reducing or supressing the link between social security contributions and income in retirement, non-contributory pensions for the elderly secure for them a minimum income.

Yet, there is ample evidence on the negative impact that social assistance pension programs for the elderly have on senior labour force participation. Non-contributory

pension programs for seniors may cost considerably more than what they may appear to, as they may induce seniors to reduce their participation in the labour market. This is particularly important in countries where life expectancy is high because financing social security pensions requires moving in exactly the opposite direction and finding modes that induce seniors to increases their labour market participation.

This paper researches on the unwanted negative impact over senior labour participation that arises when a mean-tested social assistance pensions is established for elders. The 2008 Chilean social assistance reform provides a remarkable window with which to research on the effect of such changes on a fast growing emerging country. As the reform just affected some groups of individuals, we take advantage of the exogenous variability in the amount of assistant pensions received across different types of people to measure its effects econometrically. Section two presents a very brief literature review, section three presents the data sources and descriptive statistics, section four shows the econometric methodology and section six concludes.

The social assistance reform

The Chilean social security system divides in three. First there is a small and diminishing part of the population still ascribed to the pre-1981 system, basically a traditional defined benefit plan similar to the US social security system. This system is not open to those that began contributing after 1981 or those that switched into the new system at the time or thereafter. The only exception applies for the armed forces and police that participate in separate defined benefit plans.

Second, the large majority of the workers in the formal labour market contribute to a compulsory fully funded capitalization system run by private sector pension investment funds. Mandatory contributions to the pension plan amount to 10% of the monthly income and apply for all wages up to approximately US$ 2,000. It is

important to explain that workers can seek employment or keep their jobs after they start collecting their pension. They have no obligation to retire from the labour market.

Until the social assistance reform of 2008 individuals had to contribute to social security for at least 240 months to secure government support if and when the pension secured through their social security contributions, and administered privately, failed to fund the minimum pension. The system was based on that a part of an individual's salary was saved into a retirement fund that they could spend on old age. On 2008, the government dispatched two laws: one creating the non-contributory Basic Solidarity Pension (PBS) and another one creating the Solidarity Complement (SC). The PBS provided a pension independently of whether a person had contributed or not to social security. Instead individual are now only required to show that their household incomes stand below the 60th income percentile to receive a government pension equivalent to 120 USD. SC was designed to help the poorer households that received small pensions to increase their value up by 120 USD as long as the individual's pensions added to less than (approximately) 500 USD.

The PBS replaced an existing set of very small and hard to get social assistance benefits for those seniors that were not entitled to a social security pension. The PBS provides means-tested assistance benefits of around USD 150 tripling the previous social assistance pensions.

Literature Review

Our paper is related to the literature that studies the effects of pension reforms on the labour force participation rates of older people. For example, Laun and Wallenius (2015) develop a life cycle labour supply to analyse the effects of a pension reform that replaced a pay-as-you-go system with a combination of a pay-as-you-go notional defined contribution and a contribution that is privately managed. Their main result shows that the reform increased the average retirement age by 2.5 years from 62.1 to 64.6.

Vestad (2013) takes advantage of the variability provided by a program that reduced the lower age limit to study its effects on elderly labour supply. He finds that although the program generated some benefits by allowing a more beneficial early retirement, it also has negative effects because of inducing others to leave the labour force.

Messe, P.J. (2011) set up a model of labour search and finds that a French pension reform that raised the mandatory retirement age and set a tax on early retirement paid by firms to their older workers- to encourage an earlier retirement- may have a negative impact on employment rate of older workers.

Other set of papers that are (less) related to ours are those that study the evolution of the labour force participation rate of older people and try to know in what extent the behaviour of this rate is explained by the prevailing Social Security System.
Blau, D. Goodstein, R. (2010) studies the evolution of the labour participation rate of older men in United States and finds that the effects of increases in Full Retirement Age and Delayed Retirement Credit explain from 1 quarter to one half the increase in this rate during the late 90s.

Larsen, M. and P.J. Pedersen (*2013*), also study the increase in labour force participation rate of the older people –but in Denmark- and they find they this

increment can be related to the postponement of early leave and the increase in age to enter a retirement program. Schirle (2008) study this issue in three countries: United States, Canada, and the United Kingdom and his results suggest that one-fourth to one-half of the increase in older men's labour force participation rates is due to increases to wives' participation rate.

Gruber and Wise (2004) use data for 12 countries and find that there exists a strong correlation between incentives of social security program to retire and the labour force participation behaviour of older people. Specifically, a reform that delays eligibility of benefits by three years reduces the labour force participation rate of men aged 56-65 in about 23 to 36 per cent.

Kanabar (2015) investigates the determinants of post-retirement labour behaviour in England and finds that more educated people, those who have a spouse that is part of the labour force and have a better health status are more prone to stay in the labour market.

Data and descriptive statistics

The data used in this study comes from the Social Protection Survey (EPS according to its Spanish initials), commissioned by the Chilean Government and implemented by the Universidad de Chile in 2002, then in 2000, 2006, 2009, and by Universidad Alberto Hurtado in 2012. It samples approximately16,000 individuals from all of the 15 Chilean administrative regions and it is the oldest Chilean longitudinal panel survey. The survey collects information on the individual's current and past work history and a large set of socio-economic characteristics including education, training, health, social security benefits, assets both for him and his family.

The survey aims to help in the evaluation of governmental programs, and assist in the correct formulation of future ones. Information from EPS was used to design the social assistance reform of 2009 and the rules that granted elders access to

the social assistance minimum pension.

The EPS for 2009 and 2012 builds on representative samples of 14,920 and 16,214 individuals that expand to the entire Chilean adult population of 12,765,015 and 12,718,525. An important glitch in the survey is that 7410 individuals that were sampled in 2009 were not interviewed on 2012 and were replaced. This paper overcomes the limitation by only considering individuals that are both in the 2009 and the 2012 surveys.

The specific subjects that are relevant for this research include the questions on whether or not an individual is active on the work force. The EPC question reads as follows; “In this period, in which of the following conditions were you: working, looking for a job, looking for a job for the first time, inactive.” With respect to income, a succession of questions thoroughly records the amounts individuals received from different sources including main and secondary jobs, savings, property rent, and retirement benefits. The questionnaire also requires age and geographical location.Individuals are also asked what they think of their health status; bad health is defined as 1 by individuals that self-describe themselves as having very bad health and 0 otherwise. Age is specified as a continuous variable.

Geographical location was coded into six categories corresponding to the three most populated ones (Metropolitan Region, Valparaiso, and Bio Bio) another location for all the far Northern regions, another for the 2 remaining regions in the Centre-South and another for all regions south of Concepción.The dependent variable, being part of the work force is defined as 1 for individuals who are working or looking for work and 0 otherwise.

The dependent variables are of two categories, the ones used on the difference on difference and the ones used on control. For the first category, year is defined as 0 for individuals whose interviews were part of the 2009 survey and 1 for individuals who were on the 2012 survey. Treatment is defined as 1 for individuals on 2009 or 2012 who received a retirement benefit of less than 69,000 Chilean pesos (120 USD). The interaction coefficient is defined as 1 for individuals who were part

of the treatment population and whose interview was on the 2012 survey and 0 otherwise.

The data presented in Table 1 below hints that the reform had a significant effect on reducing the chances that seniors retire as men who were affected by the reform (treatment group) changed their labour market participation rate from 53.3% to working 40.2% (a difference of -10.1%) while their counterparts that were not affected by the reform (control group) went from working 39.4% to working 40.4% (a difference of 1.0%.).

For women the effect is similar as the ones affected by the reform (treatment group) went from working 10.7% to 5.2% (a difference of -5.5%) while their counterparts that were not affected by the reform went from working 15.1% to 12.8% (a difference of 2.3%).

Table 1: Elders participating in the labour force aged 65-74

		Control 2009	Control 2012	Treatment 2009	Treatment 2012
Per cent Working	Men	39.43	40.44	53.29	40.22
	Women	15.08	12.79	10.71	5.15

Econometrics

The Chilean PBS of 2008 importantly increased the coverage and magnitude of the mean-tested social assistance pensions for elders. This non-contributory, flat pension protects the elderly from absolute poverty. Yet, the reform has costs; one of the most important is associated to the negative impact over senior labour participation. As the reform just affected some groups of individuals, we take

advantage of the exogenous variability in the amount of pensions received across different type of people. This provides a useful way to identify the effects of the reform on the labour participation rate.

The effects of the reform can be measured econometrically using the following model:

$$y_i = \theta_{t(i)} + \lambda_{c(i)} + \delta D_{j(i)c(i)} + X_i' \beta_1 + \varepsilon_i \qquad (1)$$

Where y_i is the outcome of interest for the individual *i*; $\lambda_{c(i)}$ is a group fixed effect of individual i, X_i' represents individual i covariates and $\theta_{t(i)}$ is a year fixed effect. The parameter of interest is δ, which measures the difference in difference parameter of labour participation rate across 2 groups before and after the reform.

As we showed before, the reform only affected those individuals entitled to no pension or to pensions that are smaller than the social assistance minimum pension. So, we defined two groups according to the amount they received in pensions in 2009. All those individuals with pensions below the social assistance minimum retirement pension are eligible for the program and therefore belong to the treatment group. All individuals without pension and currently earning incomes below or at the minimum wage are assumed to be eligible for the social assistance minimum retirement pension and thus they also belong to the treatment group. The treated group comprises those who may (potentially) be entitled to receiving the pension, and thus were aged 65-74 in 2009, with no pension at all or pension < 70.000 Ch$, the value of PBS in 2009 (at that time approximately US$ 140). All remaining individuals are assumed to be not-eligible for the benefits of the reform and are included in the control group.

Specifically, the model above is estimated using the following variables: y_i is a dummy variable equal to 1 if the individual i participates in the labour market or 0 otherwise. Time fixed effects are implemented using the dummy variable $Year_i$ that is equal to 1 if the individual was observed in 2012 and 0 if individual i was

observed in 2009. $D_{j(i)c(i)}$ is implemented trough the interaction of two dummy variables: $Year_i$ and $T_{c(i).}$ The dummy variable $T_{c(i)}$ indicates the treatment status of individual i. $T_{c(i)}$=1 if individual i belongs to the treatment group and 0 otherwise. The vector X_i' contains the age of the individual, a dummy variable for health status (bad health status=1 and 0 otherwise) and dummies for regions (a grouping of nearby regions) of residence.

Table 2: Econometric Results

	Men		Women	
Year (2012)	0.067	***	0.027	***
	(0.002)		(0.001)	
Treatment	0.116	***	-0.023	***
	(0.002)		(0.001)	
Interaction	-0.124	***	-0.095	***
	(0.005)		(0.002)	
Controls				
Age	-0.029	***	-0.007	***
	(0.000)		(0.000)	
Health	-0.123	***	-0.082	***
	(0.002)		(0.001)	
Geographic Location	X		X	
Constant	2.517	***	0.669	***
	(0.021)		(0.013)	

Standard errors in parentheses. *** Significant at 1% level.

Results

Table 2 above presents the difference in difference estimations of the impact of the Chilean social assistance minimum pension reform of 2008 on elderly labour force participation. As shown in the descriptive statistics, elderly women labour participation rate is much smaller than men, and they can retire when reaching 60; men can go on pension after they reach 65.

The estimate of the parameter of interest, δ, allows outcomes comparison across time (before and after the reform) by defining these two groups according to whether an individual appears to be entitled or not to receive the social assistance pensions for elders (PBS). The 2009 survey fieldwork occurs right before the implementation of the reform, while for the 2012 survey the PBS reform is fully implemented.

All parameters are statistically significant at the 1% level. The results presented in Table 2 show that the PBS reform had a significant negative effect on labour participation after controlling for age, health and geographical region. Specifically, for men the difference in difference parameter is estimated at 0.124, and at 0.095 for women. This shows that for men in the treatment group, the labour force participation is about 12% lower than it were had the PBS reform not been implemented.

Additional relevant information arises from the control variables. The bad health coefficient was estimated at 0.123 for men and at 0.082 for women. Finally, aging in elders has a significant impact on their labour participation; one more year of age for men is associated with an estimated 0.029 fall in labour participation rate; and an additional year of age has smaller, yet meaningful impact in the participation rate of women, that falls by 0.007.

Sensibility

To check for robustness, the specifications were modified to analyse the effects of changes on the estimates of interest. Models 1 and 2 on Table 3 exclude all men and women that received 0 retirement benefits in 2009. Treatment is then defined as 1 for individuals on 2009 or 2012 who received a retirement benefit of less than 69,000 Chilean pesos, but greater than 0. Both models find the same overall findings as those in Table 2 in the econometric result section, indicating that the

effect is not due to the individuals who retired from the survey between 2009 and 2012.

Women retire in Chile when they are 60 years old, but they can only apply for the PBS benefit when they are 65 years old. Hence, the reform should have no direct effect on women aged between 60 to 64 years old (Eq. 3 on table 3). More so, the effect is now on the opposite direction reflecting that women with low retirement benefits are forced to work more at older age while waiting to apply for the PBS pension.

Table 3: Sensitivity Analysis

	Men+		Women+		Woman *(60-64 years)*	
Year	0.032	***	0.022	***	-0.133	***
	(0.002)		(0.001)		(0.003)	
Treatment	0.080	***	-0.010	***	-0.110	***
	(0.002)		(0.001)		(0.002)	
Interaction	-0.073	***	-0.108	***	0.146	***
	(0.005)		(0.002)		(0.003)	
Controls						
Age	-0.025	***	-0.003	***	-0.058	***
	(0.000)		(0.000)		(0.000)	
Health	-0.143	***	-0.076	***	-0.140	***
	(0.002)		(0.001)		(0.001)	
Geographic Location	X		X		X	
Constant	2.263	***	0.361	***	4.160	***
	(0.021)		(0.013)		(0.024)	

+ Regressions exclude people with no (zero) retirement benefits in 2009.
Standard errors in parentheses. *** Significant at 1% level.

Conclusion

By 2014, income per capita in Chile reached US 22,000, life expectancy had increased to 81.5 (comparable to 79.0 in the USA). Similarly, the birth rate in Chile has fallen to 1.83% per woman in 2012, again comparable to 1.88% for the USA. As a result, the proportion of old-age people has increased steadily, and will continue increasing. As the population grows older, the consequence of the decision seniors make on whether to stay, exit or possibly re-enter the labour market is becoming increasingly important.

In this context, the 2008 social assistance reform that created a minimum means-tested pension that provides a monthly payment to every senior who classified in the 60^{th} percentile of income or lower. This payment is provided independent of whether you did or did not contribute previously to social security, and is independent of whether your spouse provides income. This way the reform provided much needed transfers to one of the most vulnerable groups in society, elders with insufficient social security contributions and no meaningful pension.

Using data from the Survey of Social Protection from before and after the implementation of the reform, a Difference in Difference econometric estimation shows that for those subject to the benefits of the PBS reform, it reduced elderly labour force participation rate by almost 12% for men and 10% for women. These estimates show the strength of the unwanted negative impact over senior labour participation that arises when a mean-tested social assistance pensions is established for elders. It alerts on how the costs of implementing a social assistant system that protects the elderly against the hazards of poverty are higher than that associated to paying for the transfer.

The effect of the reform on the labour market is not likely to be the only consequence. Further research should address questions related to the impact over productivity of the changes in the labour market structure. To the extent that after their reform elders choose to enjoy more leisure time, this represents an

increase in their well being, but it should also imply a decrease in GDP (which lowers consumption possibilities) there could exist a trade off. Moreover, in order to analyse the complete impact of the policy it should also consider the effect of the redistribution from tax-payers to pension receivers.

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