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"CHILEAN PENSION FUND REFORM AND ITS IMPACT ON SAVING"*/

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CHILEAN PENSION FUND REFORM AND ITS IMPACT ON SAVING

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CHILEAN PENSION FUND REFORM AND ITS IMPACT ON SAVINGS

Abstract

Pension system reform is often argued to have an impact on long run aggregate savings. The replacement of a state-run pay-as-you-go system by private fully-funded schemes is claimed to raise aggregate savings and eliminate factor market distortions, therefore increasing long-term growth and welfare.

However, at a theoretical level, all of these changes will have an uncertain impact on aggregate savings. Their impact will depend critically on individual perceptions, on the actuarial fairness of the pension schemes, on the existence of borrowing constraints, and on the pension fund financial balance.

This paper review the Chilean experience with pension fund reform and its impact on aggregate savings. Using econometric techniques, it is found that in the Chilean case, the implementation of a fully-funded pension system in the decade of the 1980's had a positive impact on aggregate savings.

CHILEAN PENSION FUND REFORM AND ITS IMPACT ON SAVINGS

1. PENSION SYSTEM REFORM.

Pension system reform is often argued to have an impact on long run aggregate savings. The replacement of a state-run pay-as-you-go system by private fully-funded schemes is claimed to raise aggregate savings and eliminate factor market distortions, therefore increasing long-term growth and welfare.

However, at a theoretical level, all of these changes will have an uncertain impact on aggregate savings. Their impact will depend critically on individual perceptions, on the actuarial fairness of the pension schemes, on the existence of borrowing constraints, and on the pension fund financial balance.

Even the introduction of a state-run pay-as-you-go pension system ¹ in a situation without any social security at all, may not affect long-run aggregate savings in a society. This will happen if the individuals perceive that the social contributions they pay are in fact savings for their retirement age, so they reduce actual savings by the same amount of the social contributions, leaving the aggregate level of consumption intact. However, in the transition to a long run situation, probably there is an adverse effect on aggregate savings ².

In order to have a positive impact on aggregate savings in the long run, one of the following things should at least happen: people don't perceive their future pension benefits so they see the social contributions as taxes; some people have borrowing constraints and are forced to save for their future pension more than they wanted; at an individual level pension payments are not matched by worker contributions; the

¹ In a pay-as-you-go system, actual workers contribute with a fraction of their wages in order to finance actual pensions. In principle, no fund is needed to finance a pay-a-you system, since only a redistribution between generations take place.

By contrast, in a fully funded system every worker has a saving account, and the pension is paid out of his accumulated savings. This scheme requires a fund in order to finance the pension payments.

² Of course, the short run impact could reduce aggregate savings, since the first generation will receive a pension (higher income) without any past savings. They will enjoy an increased level of consumption, thus reducing aggregate savings.

pension system is not financially balanced³. The existence of most of these effects is an empirical matter, so the impact of a pension reform on aggregate savings may differ between countries.

On the other hand, the introduction of a fully-funded and earnings-related scheme in a situation without any social security, may also leave aggregate savings unchanged. This will be the case in an economy formed by optimizing individuals with rational expectations, without borrowing constraints, that have voluntary savings exceeding mandatory savings. In this case, some of the previous effects mentioned above should be introduced in order to have a positive impact on aggregate savings.

The replacement of a pay-as-you-go system for a fully-funded pension system will have uncertain effects on aggregate savings. Many features will determine how substituting one scheme for another will affect the economy's macroeconomic variables including aggregate savings. Some features that will have critical macroeconomic effects in such a pension fund reform will be the following⁴:

a) **The distortionary nature of pay-as-you-go contributions.** Pay-as-you-go contributions are typically proportional to wages and therefore may distort labor market decisions if there is a weak link between workers contributions and benefits. This link may be weak due to explicit income redistribution policies build into a pay-as-you-go pension system. For some workers, the benefits from this system will be less than their contributions, so the difference will be perceived as a tax. In an attempt to reduce the excess burden of the tax, some workers may reduce their supply of labor or shift into informal markets.

In addition, the average rates of return on contributions will differ from market interest rates. In a mature and balanced pay-as-you-go system with constant rate of population growth, pensioners are paid on average a real rate of return on their savings equal to the real rate of growth of the wage bill of the economy. In a fully-

funded system, pensioners may receive the marginal productivity of capital as their rate of return on savings. This latter figure is always higher in a dynamically efficient economy. Otherwise the economy would be to the right of the Golden Rule.

Both effects will mean higher growth potential and welfare in a fully-funded system. However, their impact on aggregate savings is uncertain.

b) **Myopia.** Myopia is the inability of relating adequately current pension contributions to old-age consumption. In the extreme myopic case, all workers see their full

³ In this case the public sector surplus (deficit) is changed, which will have an impact on aggregate savings provided that the economy doesn't show a Ricardian equivalence.

⁴ For a more detailed discussion, see Corsetti and Schmidt-Hebbel (1994), pages 2-8.

contribution as a pure tax, even when a fully-funded system is introduced. In this case, the adoption of any mandatory scheme has similar distortionary effects. However, the characteristics of a fully-funded system that link benefits with contributions make myopia less likely to occur. Therefore a switch from a pay-as-you-go system to a fully-funded system may have a positive impact on welfare and growth. As before, the impact on aggregate savings is uncertain.

- c) **Demographics.** A higher old-age dependency ratio, due to an older population or a lower retirement age, requires higher pay-as-you-go contributions and hence raises the macroeconomic and welfare effects of adopting such a scheme. A demographic transition towards an older population structure will imply increasing contributions to finance the pay-as-you-go system. By contrast, a fully-funded system is independent of the old-age dependency ratio. Therefore a switch from a pay-as-you-go system to a fully funded system will have a higher positive impact on welfare and growth, the higher the old-age dependency ratio.
- d) **Mandatory saving exceeds initial voluntary saving.** When savings mandated by the compulsory pension system is lower than pre-system voluntary saving, adoption of a fully-funded system implies that mandatory savings is fully offset by lower voluntary saving, and therefore has no effects. However, when mandatory saving exceeds initial voluntary saving, a fully-funded scheme raises saving beyond voluntary levels, thus increasing aggregate savings of the economy.

A special case arises when a certain fraction of the population faces "borrowing constraints", and consumes all income. In this case, voluntary savings are equal to zero, and any mandatory saving scheme will have a substantial positive impact on aggregate savings.

- e) **Voluntary inter-generational transfers.** If people are altruistic so that they leave bequests to their children or children provide support to their aged parents, these voluntary inter-generational transfers can be adjusted to compensate for policy-induced inter-generational transfers, such as those imbedded in a pay-as-you-go system. Under extreme inter-generational altruism, the old leave higher bequests to their offspring or children care less for their parents by an amount which exactly compensates for the young-to-old transfer of a pay-as-you-go system.

Under partial altruism, a pay-as-you go system induces a net transfer of resources from the younger generations to the old ones. Since the marginal propensity to save of older generations is presumably lower than the marginal propensity to save of the working population, this transfer may imply a reduction in aggregate savings.

On the other hand, since a fully-funded system lacks inter-generational distribution effects, the switch of a pay-as-you-go system for a fully-funded system will probably

have a positive impact on aggregate savings, as long as people are not extreme altruists.

- f) **Financial openness of the economy.** Under strict financial openness and perfect integration to world markets, national savings decisions do not affect investment. Changes in saving impinge only on foreign asset holdings. Interest rates are exclusively determined by international rates. In a closed economy, however, changes in national saving affect investment, and hence the capital stock, the real interest rate and the wage rate. A partially open financial market will produce results in between, with some effect on foreign asset holdings, some effect on interest rates and some effects on the capital stock.

If aggregate savings rise as a consequence of a switch to a fully funded system in an economy with partially open financial markets, the probable outcome is an improved current account of the balance of payments (lower foreign assets holdings), an increase in the capital stock, a reduction in real interest rates and an increase in real wages.

- g) **Financing of system transition.** Perhaps the most important feature that influences aggregate savings is the way the transition is financed. The transition of a pay-as-you-go system to a fully-funded system will imply that current workers will save for their future pensions. They cease to contribute to current pensioners. Therefore, the state takes the obligation to pay for the current pensions. This obligation induces a fiscal deficit which can be of considerable magnitude. The way the state finances this deficit is critical to the final macroeconomic outcome.

The straight forward way to finance the reform transition deficit is by issuing new government debt. The old implicit pay-as-you-go debt is swapped for new explicit government debt. Debt financing implies that the national saving, the capital stock and the inter-generational distribution of welfare are only marginally affected, by magnitudes which depend only on the net efficiency gains of the reform. Only implicit government debt is changed by an explicit government debt.

A very different result is obtained when the transition deficit is financed by raising taxes. Tax-financing of the deficit is equivalent to combining the pension reform with a contractionary fiscal policy. A fully tax-financed transition hurts the tax-paying transition generation, which may include workers and current pensioners, and benefits non-taxed post transition generations. Tax financing of the transition—as any restrictive fiscal policy which pays off government debt through taxes and hence shifts resources from current to future generations—encourages higher saving and capital formation.

Another possible restrictive fiscal policy is to finance the reform transition by reducing current government expenditure. This will hurt beneficiaries of these public expenditures, but will benefit the rest of the population. The final result of such a policy may be a significant increase in aggregate savings and a huge accumulation of real capital.

h) **Financial balance of the pension system.** A pay-as-you-go system can be financially balanced, when pension payments are exactly matched by worker contributions. This is seldom the case; when pay-as-you-go systems are immature they often show surpluses, and when they approach maturity they often show losses. This is due to the rigidity in contribution rates applied to wage earnings. It is easy to find many developing countries, experiencing demographic transitions, that show significant losses in their pension fund systems.

On the other hand, a fully-funded system is balanced almost by definition. Therefore a switch of a mature pay-as-you-go system for a fully-funded system will imply a reduction in the public deficit in the long run. This will have a positive impact on the economy's aggregate savings.

i) **Development of a capital market.** A pay-as-you-go system is a mandatory social contract of transfers from workers to pensioners. In order to implement these transfers there is no need to accumulate financial or real capital. By contrast, a fully-funded system is a mandatory saving system which forces workers to save part of their wage income for old age. The accumulated savings must be invested in financial and physical capital. Therefore, the implementation of a fully-funded pension system generates a big demand for all kinds of financial assets and firm shares. This produces a financial deepening process, that can be a decisive factor in order to develop a domestic capital market. This development should have a positive impact on aggregate savings.

2. CHILEAN PENSION REFORM.

In 1980, Chile implemented a drastic pension reform substituting the old pay-as-you-go system administered by the state, for a fully-funded privately managed system. Several privately managed pension funds emerged in 1980, in order to administer the workers' resources in a competitive framework, each of them competing on the basis of giving a higher rate of return to its affiliates and a better quality of service. Each registered person received a personal account where he or she could know the exact amount of its accumulated savings. Any person was free to move his account from one pension fund to another.

The government financed the reform transition by reducing its current expenditure, and pursued a balanced budget policy. The privately managed pension funds were severely regulated in their portfolios, and were gradually authorized to invest in a greater variety of financial assets.

The aggregate savings rate of the country increased from an average 16.7 percent of GDP in the pre-reform years (1976-1980) to an average 26.6 percent of GDP a decade after the reform (1990-1994). Of these 9.9 percentage points increase in the savings rate, a significant part may be attributed to the pension fund reform, as explained later. Table N° 1 shows the aggregate savings rate of the country as a percentage of GDP for the period 1974 to 1994.

Of course, other major structural changes were implemented during this period, such as trade liberalization, financial deregulation and privatization, which may also have had an impact on savings, so the classical identification problem arises. In fact, the interaction of different structural reforms and foreign shocks makes it hard to disentangle the specific effects on savings which can be attributed to the pension reform. An attempt to measure the impact of the pension reform on the Chilean saving rate, with the help of a simple econometric model is subsequently described.

The old pay-as-you-go pension system in Chile was administered by 32 different state institutions that financed old age pensioners with contributions from active workers, their employers and the state. The biggest institutions were "Servicio de Seguro Social" (for blue collar workers), "Caja de Previsión de Empleados Particulares" (for private white collar workers), "Caja Nacional de Empleados Públicos y Periodistas" (for public white collar workers). These three institutions concentrated more than 94 percent of the 2.3 millions affiliates in 1979, one year before the pension reform. Total registered person represented around 68 percent of the labor force of that year. Therefore almost one third of the labor force was not covered by the old pension system at all.

Social contributions varied by institution. Blue collar workers (Servicio de Seguro Social) contributed with a 36.2 percent of wages (7.25 percent paid directly by workers and 28.95 percent paid by employers). Of this amount, 22.95 percent of wages was destined to pensions and the remainder 13.25 percent was destined to health, work accidents, family subsidies, indemnity payments, and housing benefits. Private white collar workers (Caja de Previsión de Empleados Particulares) contributed with a 44.04

Table N° 1. Chile: Total Savings 1974 - 1994

(% GDP)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Private Savings										
Pension Funds								0,9	2,0	1,8
Other	15,1	0,4	9,6	7,9	8,4	4,7	5,6	1,5	(2,8)	6,0
Total Private Savings	15,1	0,4	9,6	7,9	8,4	4,7	5,6	2,4	(0,8)	7,8
Public Savings										
General Govt	6,0	7,8	5,1	2,7	3,8	7,4	8,0	5,0	2,2	-2,2
Local Govt	-0,4	-0,3	-0,2	0,1	0,4	0,3	0,3	0,3	0,1	0
Total Public Savings	5,6	7,5	4,9	2,8	4,2	7,7	8,3	5,3	2,3	-2,2
Domestic Savings	20,7	7,9	14,5	10,7	12,6	12,4	13,9	7,7	1,5	5,6
Foreign Savings	0,5	5,2	-1,7	3,7	5,2	5,4	7,1	14,3	9,5	5,6
Total Savings	21,2	13,1	12,8	14,4	17,8	17,8	21,0	22,0	11,0	11,2

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Private Savings											
Pension Funds	1,8	1,7	1,8	1,8	2,7	2,9	2,9	3,0	3,1	3,3	3,4
Other	7,9	5,3	7,6	11,8	13,7	12,9	15,7	15,9	15,5	15,1	16,3
Total Private Savings	9,7	7,0	9,4	13,6	16,4	15,8	18,6	18,9	18,6	18,4	19,7
Public Savings											
General Govt	-1,9	-0,5	1,0	2,5	5,1	7,2	4,9	4,4	5,4	4,8	4,9
Local Govt	-0,9	1,3	1,2	1,1	0,8	0,7	0,3	0,8	0,8	0,8	0,8
Total Public Savings	-2,8	0,8	2,2	3,6	5,9	7,9	5,7	5,2	6,2	5,6	5,7
Domestic Savings	6,9	7,8	11,6	17,2	22,3	23,7	24,3	24,1	24,8	24,0	25,4
Foreign Savings	10,8	9,4	7,3	5,0	0,5	1,8	2,0	0,4	2,0	4,8	1,4
Total Savings	17,7	17,2	18,9	22,2	22,8	25,5	26,3	24,5	26,8	28,8	26,8

Source: IMF, Central Bank, Inst. of Economics UGM

percent of wages (12.33 percent paid by employees and 31.71 percent paid by employers). Of this amount, 24.91 percent of wages was destined to pensions and the remainder to health and other benefits. Public white collar workers (Caja Nacional de Empleados Públicos y Periodistas) contributed with a 35.5 percent of wages (18.5 percent paid by employees and 17.0 percent paid by employers). Of this amount, 15.75 percent of wages was destined to pensions and the remainder for health and other benefits.

The old system was highly redistributive, so that pensions and other benefits paid had a weak link to actual contributions. Therefore, it is likely that these social contributions were regarded by most workers and employers as a tax on wages. As a consequence, labor market decisions were severely distorted with a corresponding loss in social welfare.

Even though the social contribution rates were high, the average pension paid was fairly low. In 1979, the average pension paid to a blue collar pensioner was US\$ 55 per month, which represented some 37.2 percent of per capita GDP. The average pension paid to a white collar worker was US\$ 83 per month (55.7 percent of per capita GDP) for the private sector and US\$ 191 per month (128.2 percent of per capita GDP) for the public sector.

By contrast, under the new pension system, with lower social contributions, the average pension paid for all workers (blue collar and white collar) is substantially higher. In 1994, the average old age pension paid was US\$ 163 per month, which represented 52.5 percent of per capita GDP.

The old social security institutions in Chile generated a growing deficit. In 1979, the Chilean state transferred 2 percent of GDP in subsidies to cover the yearly deficit of the social security institutions. The combination of poorly administered social security institutions with a dramatic decline in the relation between active (contributing) and passive workers lead the pay-as-you-go system to bankruptcy. In 1960, Chile had 10.8 active workers for each pensioner. Ten years later (1970) the relation had declined to 4.4. By 1979, the country had only 2.3 active workers for each pensioner⁵.

The new fully-funded pension system was created in 1980. Eleven new private firms emerged to replace the old state social security institutions. The distinction between different categories of workers was abolished. Each worker could open a mandatory saving account in any firm (administradora de fondos de pensiones or AFP) and change his accumulated funds to another firm any time he wanted. Private pension funds (AFP) had to compete among each other to get the preferences of the contributors. New workers were required to join the new system. Old workers could opt to join the new system or remain in the old one.

The new system implied a big reduction in social contribution rates. All workers were required to contribute with 20.5 percent of their wages. Of this amount, 10 percent of

⁵ Heman Cheyre (1988), page 69.

3. CHARACTERISTICS OF THE NEW PENSION SYSTEM.

The new pension system started with 12 private firms in strong competition for the affiliates resources. Total beneficiaries represented around 37 percent of the labor force in 1981-82, of which around 70 percent were active contributors. During the following years there was a clear upward trend in both registered and active contributors (See Table N° 2). In the end of 1994, registered person represent almost 94.6 percent of the labor force, and active contributors, 58.7 percent of that figure.

The number of firms has also increased, indicating a more competitive environment. The number of firms remained stable in the decade of the 1980's and increased dramatically in 1992 (See Table No 2). At the end of 1994 there were 21 private pension firms. The share of the biggest three firms shows a clear downward trend during the whole period. In 1981, the biggest three firms concentrated 71.3 percent of all the pension funds. In 1994, this share has declined to 52.7 percent (See Table N° 2).

The Herfindahl index also shows increased competition levels. The index takes the value of 0.217 in 1981, which is equivalent to almost five competing firms of the same size. The same index takes the value of 0.126 in 1994, which is equivalent to almost 8 competing firms of the same size.

Most of the competition in the market is through advertisement and sales effort. Each firm has a big sales force that tries to capture the rivals clientele. This effort explains the reduction in market concentration, but means high costs for the pension funds. In fact, a puzzling result is that the average commission charged in dollar terms has increased during the years despite the higher number of firms (See Table N° 2).

A Superintendency of Pensions regulates this sector, specially in matters concerning pension funds portfolio. Only financial instruments approved by the authority could be eligible for investing the pension fund resources. At the beginning only public bonds, bank deposits, housing mortgages, and selected firm bonds were allowed. In 1981, the pension fund portfolio had 62 percent of bank deposits and 28 percent of public bonds (See Table N° 3).

In 1986, pension funds were allowed to buy firm shares, which represented an increased portion of the fund. In 1993, pension funds were allowed to invest outside the country in igh grade financial instruments issued by some foreign governments. In 1994, pension funds received authorization to invest in bank bonds and investment funds. In 1994, the pension fund portfolio had 40 percent of public bonds, 12 percent of mortgages, 6 percent of bank deposits, 5 percent of firm bonds and almost 34 percent of shares (See Table N° 3)

Over time, the increased investment opportunities have produced a significant real rate of return on the pension fund. The average real rate of return for the period 1980-94

wages went to an individual saving account administered by the AFPs; 7 percent of wages went to health institutions; and the remaining 3.5 percent was destined to cover an insurance policy. A big incentive to join the new system was an approximate 10 percent increase in the workers net wage, due to differences in social contribution rates.

Under the new scheme, once a worker reached retirement age (65 for male and 60 for female) he could get a pension from the AFP or could use his or her accumulated funds to buy a lifetime pension from an insurance company. There is a minimum guaranteed pension, so if accumulated savings for an individual is not enough to finance this minimum pension, the state puts the difference.

The pension reform had ample success⁶. At the end of 1981, around 1.4 million workers (40 percent of the labor force) had joined the new system. By 1994, total registered person represented 4.8 million (almost 94 percent of the labor force). Accumulated savings reached US\$ 300 million (0.9 percent of GDP) at the end of 1981.

At the end of 1994, accumulated savings represented more than US\$ 22,435 million (42.2 percent of GDP).

When the system was designed, a 4 percent estimated real rate of return on accumulated savings was used for the calculations. This would produce an average pension equivalent to 70 percent of the last wage. The new pension fund system has generated an average effective rate of return of 13.5 percent in the period 1980-1994.

With this rate of return, workers can expect a pension that is significantly higher than the last wage.

⁶ Even though the new pension system was implemented at the same time of the foreign indebtedness crisis, the pension funds didn't suffer any economic losses. Macroeconomically they played no role in the crisis, since the fiscal sector had big surpluses at the time and didn't use foreign debt to finance the system transition.

Table N° 2. Chile: Some Characteristics of the Pension System

	1981	1982	1983	1984	1985	1986	1987
Registered							
Number	1.400.000	1.440.000	1.620.000	1.930.000	2.283.830	2.591.484	2.890.680
% Labor Force	36,7	37,4	40,7	46,5	53,7	60,1	65,8
Active Contributors							
Number	NA	1.060.000	1.230.000	1.558.194	1.774.057	2.023.739	2.167.568
% Beneficiaries	NA	73,6	75,9	80,7	77,7	78,1	75,0
Numbers of Firms	12	12	12	12	11	12	12
Concentration Ratio							
Share Biggest 3	71,3	67,6	65,7	65,4	65,8	66,6	66,7
Herfindahl Index	0,217	0,194	0,180	0,174	0,179	0,182	0,178
Average Commission							
US\$ per Contrib.	NA	45	33	25	15	13	12
% of Fund	NA	8,5	4,4	3,0	1,9	1,4	1,1
Pension Fund Size							
Million US\$	305	606	1.136	1.244	1.532	2.117	2.707
% of GDP	0,9	3,7	6,5	8,5	10,6	12,7	14,2

	1988	1989	1990	1991	1992	1993	1994
Registered							
Number	3.183.002	3.470.845	3.739.542	4.109.184	4.434.795	4.708.840	5.014.444
% Labor Force	69,9	74,2	79,1	85,7	88,9	90,2	94,6
Active Contributors							
Number	2.267.622	2.642.757	2.486.813	2.695.580	2.695.580	2.792.118	2.943.479
% Beneficiaries	71,2	76,1	66,5	65,6	60,8	59,3	58,7
Numbers of Firms	13	13	14	13	19	20	21
Concentration Ratio							
Share Biggest 3	66,3	65,3	62,6	59,0	56,6	54,4	52,7
Herfindahl Index	0,172	0,168	0,158	0,147	0,138	0,130	0,126
Average Commission							
US\$ per Contrib.	75	77	79	90	113	123	135
% of Fund	5,4	4,9	3,3	2,8	2,6	2,4	2,1
Pension Fund Size							
Million US\$	3.585	4.470	6.655	10.064	12.395	15.942	22.435
% of GDP	15,1	17,8	24,4	31,4	30,6	37,0	42,2

Source: Superintendency of Pensions, Inst. of Economics UGM.

has reached 13.5 percent. The maximum rate of return was 28.8 percent in 1982, and the minimum rate of return was 3.1 percent in 1992 (Superintendency of Pensions).

4. A MODEL FOR THE SAVING RATE.

The aggregate saving rate of Chile can be divided into the following components:

$$(1) S = Sp + Spen + Sg + Se$$

where

S: aggregate savings

Sp: private savings

Spen: mandatory savings in private pension funds

Sg: government savings (includes state social security)

Se: external savings

External savings (Se) correspond to the deficit in the current account of the balance of payments. This variable is the result of the interaction of the desired foreign net capital inflow (an exogenous variable to the country) and the Central Bank desire to accumulate foreign reserves (a policy variable) interacting with all sorts of regulations to the capital inflow (also a policy variable). In the period 1974 to 1994, external savings represented 4.8 percent of GDP on average, with a maximum of 14.3 percent of GDP in 1981 and a minimum of -1.7 percent of GDP in 1976.

Government savings (Sg) correspond to the difference between government incomes and current expenditures. This is a policy variable. In the period 1974 to 1994, government savings represented 4.4 percent of GDP on average, with a maximum of 8.3 percent of GDP in 1980 and a minimum of -2.8 percent of GDP in 1984.

Mandatory savings in private pension funds (Spen) is equal to 10 percent of the wage base by definition. This is a variable with a clear upward trend. In the period 1981 to 1994, mandatory savings in private pension funds averaged 1.6 percent of GDP, with a maximum of 3.4 percent of GDP in 1994 and a minimum of 0.9 percent of GDP in 1981.

- Private savings (Sp) is a more complex variable to model. In the period 1974 to 1994 it had an extremely mutable behavior, with an average of 9.3 percent of GDP, and a maximum of 16.3 percent of GDP in 1994 and a minimum of -2.8 percent of GDP in 1982. This variable reflects private sector behavior and constraints. There are several

Table N° 3. Chile: Pension Fund Portfolio (% of the Fund)

	1981	1982	1983	1984	1985	1986	1987
Public Bonds (%)	28,1	26,0	44,5	42,2	42,6	46,7	41,5
Mortgage Bonds	9,4	46,8	50,7	43,1	35,3	25,5	21,4
Bank Deposits	61,9	26,6	2,7	12,9	20,9	23,2	28,3
Firm Bonds	0,6	0,6	2,2	1,8	1,1	0,8	2,6
Shares						3,8	6,2
Foreign Investment							
Bank Bonds							
Investment Funds							
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0
REAL RETURN	12,6	28,8	21,3	3,5	13,4	12,3	5,4

	1988	1989	1990	1991	1992	1993	1994
Public Bonds (%)	35,4	41,6	44,1	34,7	40,9	39,4	39,8
Mortgage Bonds	20,6	17,7	16,1	12,1	14,3	13,1	12,4
Bank Deposits	29,5	21,5	17,4	12,0	11,0	7,5	6,3
Firm Bonds	6,4	9,1	11,1	9,6	9,2	7,0	5,2
Shares	8,1	10,1	11,3	31,6	24,6	32,6	34,3
Foreign Investment						0,5	0,4
Bank Bonds							1,3
Investment Funds							0,4
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0
REAL RETURN	6,4	6,9	15,5	29,7	3,1	16,2	18,2

competing theories that try to explain private savings in terms of observed variables, and each of them puts some emphasis in different factors. An eclectic approach would let the data decide what factor is important for the Chilean case. Some important considerations are the following.

- Almost all saving theories make emphasis on the importance of disposable income as an explanatory variable. A higher disposable income is normally associated with higher private savings. As a consequence, every variable that affects disposable income will have an impact on private savings.
- The first variable that affects disposable income is taxes. A higher tax burden mean lower disposable income and therefore people have to reduce either consumption, saving, or both. The specific incidence on private consumption depend on this decision. The tax burden is therefore an important explanatory variable of the private saving rate.

The second variable is net foreign income. Higher net foreign income also means lower disposable income for a given value of GDP. This variable is defined as net foreign factor payments less unrequited transfers, and in the case of Chile is strongly influenced by interest payments on the foreign debt .

Another important consideration is the existence of a fraction of the population that experiences borrowing constraints. For that population, observed income is the relevant explanatory variable, as in the standard keynesian case. For the rest of the population, the capital market allows complete consumption smoothing, and hence the relevant variable is permanent income. In order to capture the influence on private savings of consumers with borrowing constraints, a variable that measures transitory income was constructed. This variable was defined as the ratio of permanent to observed income⁷. According to the permanent income hypothesis all transitory income is saved. On the other hand, consumers with borrowing constraints may not save anything out of transitory income. Hence, this variable will capture the empirical relevance of these constrained consumers.

- The classical theory of saving emphasizes the role of the real interest rate in influencing intertemporal consumption. Therefore the real interest rate is a natural explanatory variable. For the Chilean case, the real interest rate paid on deposits in the banking system is used as an explanatory variable.
- Mandatory savings on private pension funds may crowd out all or part of the other private savings, as was discussed before. Therefore mandatory savings should be a variable in order to measure if this crowding out effect exists or not.

⁷ This ratio is equal to one whenever transitory income is zero. With positive transitory income (booms), the ratio is less than one, and with negative transitory income (recessions), the ratio is bigger than one.

Foreign savings may also have a crowding out effect on private savings. There is some international evidence on the existence of this crowding out effect at least for Colombia and Bolivia ⁸. Some of the increased foreign savings may end up financing additional consumption. Therefore, foreign savings is used as an explanatory variable.

- Public savings may also have some crowding out effect on private savings. A World Bank study of a sample of developing countries found that less than half of the increase in public saving obtained by cutting government consumption will be offset by lower private saving ⁹. In order to see if this effect is present in the Chilean case, public savings is used as an explanatory variable.
- Pension Funds have been decisive in the development of capital markets. This financial deepening process, can be an important factor in order to induce higher private savings. The size of the pension fund is used to measure the influence of this financial deepening process on private savings. Chilean private savings are modeled as a linear function of all previous variables, expressed as a percentage of GDP. The econometric model used is the following:

$$Sp = a_0 + a_1 * TAX + a_2 * NFP + a_3 * QPERM + a_4 * Spen + a_5 * Sg + a_6 * Se + a_7 * SIZE + a_8 * RINT + e$$

where:

TAX: total tax burden (% of GDP)

NFP: net foreign factor payments less unrequited transfers (% of GDP)

QPERM: ratio of permanent income to observed income

SIZE: size of the pension fund (% of GDP)

RINT: real interest rate paid on deposits

e: error term

Table N° 4 presents the estimated coefficients using ordinary least squares (OLS) and two stage least squares (TSLS) techniques. Since interest rate is an endogenous variable, a simultaneous equation bias may result from OLS. Therefore TSLS is used to solve this

problem. Parameters are robust to different estimation techniques. The third regression uses only significant variables. The main results are the following:

- The model is very good in tracking most of the variation in private savings. Almost 95 percent of the total variation is explained by these variables (See Figure N° 1).

⁸ See for example, Parthasarathi Shome, David Dunn, Erik Haindl, Arnold Harberger and Osvaldo Schenone "Comprehensive Tax Reform: The Colombian Experience", IMF occasional paper 123, page 53, 1995; and The World Bank "World Development Report", page 122, 1991.

⁹ The World Bank "World Development Report", pages 122-23, 1991.

- The total tax burden (TAX) has a significant influence on private savings. A higher tax burden means lower private savings. The estimated coefficient exceeds one, although a null hypothesis of one cannot be rejected by the data. In fact a one standard deviation confidence interval would give a range of -0.92 to -1.63 for this coefficient. This implies that probably more than 90% of each tax reduction increases private savings.
- Net foreign factor payments (NFP) present also a significant influence on private savings. There is a negative coefficient of -0.43 to -0.46 depending on the regression. This means that for an increase in net foreign factor payments equivalent to 1 percent of GDP (due to higher interest payments on foreign debt for example) private savings are reduced in -0.43 to -0.46 percent of GDP and private consumption in the remaining difference.
- Transitory income also exerts a significant influence on private savings. The extreme version of permanent income hypothesis is rejected by the data¹⁰ probably reflecting the existence of borrowing constraints for a fraction of the population. This fraction of the population reacts only to observed income.
- Using the second regression (TSLs) it is found that for each increase in permanent income equivalent to 1 percent of GDP, private savings are increased in 0.41 percent of GDP and private consumption in the remaining 0.59 percent of GDP. On the other hand, an increase in transitory income in the same amount, would induce a rise in private savings in 0.64 percent of GDP and a rise in private consumption in the remaining 0.36 percent of GDP.
- The previous figures suggest that the consumers facing borrowing constraints represent more than one third of total income in Chile. Assuming that constrained consumers belong to the lowest levels of income, and using the income distribution calculated in CASEN studies¹¹, it is found that almost 70 percent of the households would be in this situation. Hence, the first 7 deciles of the income distribution probably spend almost all their actual incomes in consumption. The top 3 decile would do almost all the private saving of the country, and may follow the permanent income hypothesis behavior.
- The coefficient a_4 captures the pension fund mandatory savings influence on voluntary private savings. It reflects the existence or non-existence of a direct crowding-out effect of these mandatory savings. If mandatory savings are fully offset by lower voluntary savings, this coefficient would be -1. On the other hand, if

¹⁰ This is tested using a null hypothesis that $a_0 = 100$ (all transitory income is saved). The t test is -4.43988, which implies a rejection of the null hypothesis at a 5% confidence level.

¹¹ Encuesta de Caracterización Socioeconómica Nacional (CASEN) for 1985, 1987, 1990, 1992. See Erik Haindl and Karl Weber "Impacto Redistributivo del Gasto Social", Serie de Investigación No 79, Universidad de Chile, 1986 and Erik Haindl, Emila Budinich and Ignacio Irazazaval "Gasto Social Efectivo", Oficina de Planificación Nacional, 1989.

PRIVATE SAVINGS
% OF GDP

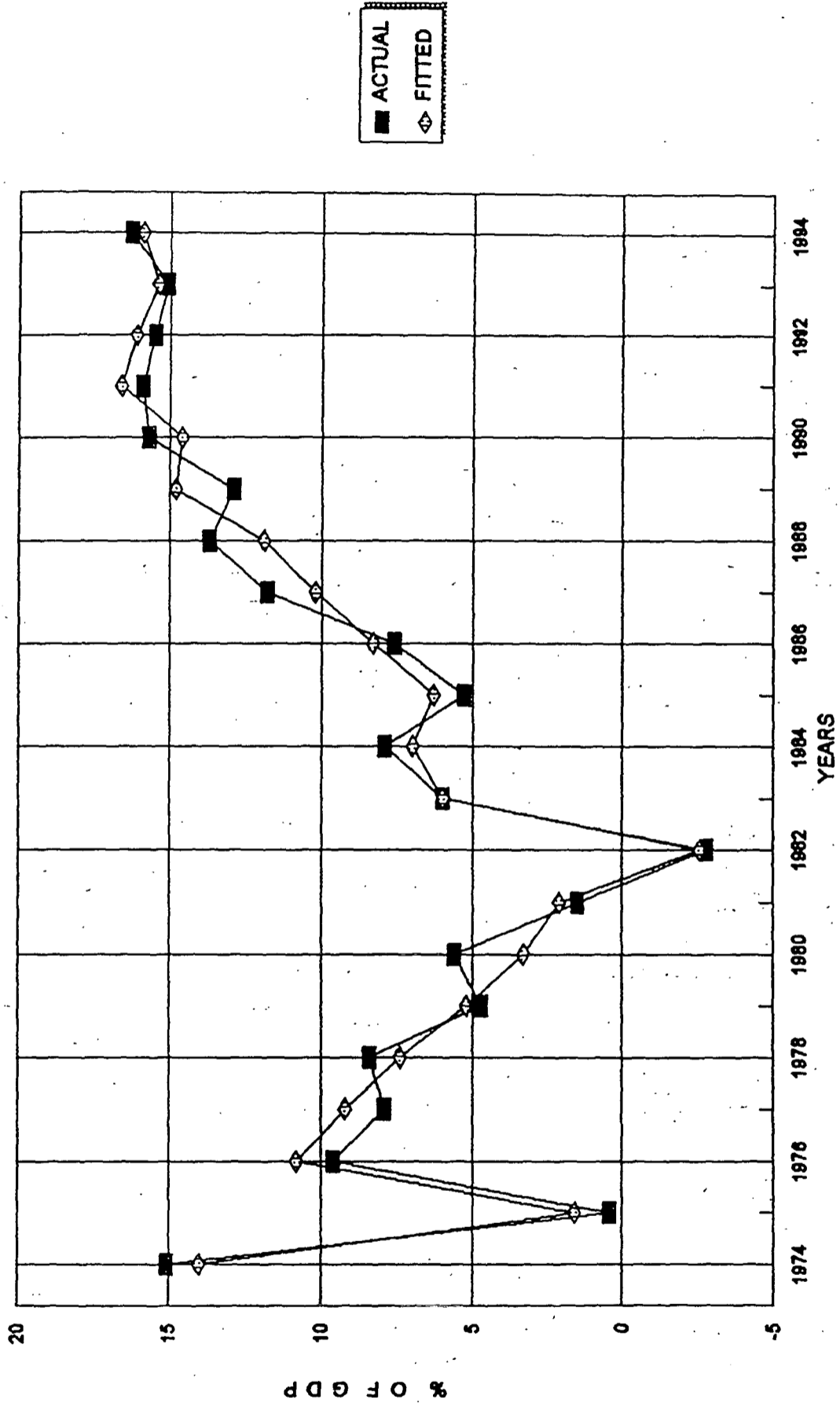


Table N° 4. Chile: Private Savings (t-Statistic values in parenthesis)

VARIABLE	Regression 1 (OLS)	Regression 2 (TSL)	Regression 3 (OLS)
Constant	65.0521 (8.2639)	64.4395 (7.2579)	67.4959 (10.5602)
Tax	-1.2647 (-3.6842)	-1.2768 (-3.6093)	-1.5304 (-6.4001)
NFP	-0.4605 (-2.0539)	-0.4290 (-1.3985)	-0.4584 (-3.9943)
QPERM	-24.3805 (-4.2588)	-23.8166 (-3.4777)	-23.3128 (-4.6862)
Spen	-0.1198 (-0.1082)	-0.2261 (-0.1720)	
Sg	-0.1011 (-0.6249)	-0.0904 (-0.5108)	
Se	-0.1271 (-0.8368)	-0.1389 (-0.8189)	
Pension Fund Size	0.1172 (1.3433)	0.1258 (1.2038)	0.0990 (2.3762)
RINT	-0.1740 (-1.8561)	-0.1452 (-0.6838)	
R-squared	0.9569	0.9566	0.9341
Adjusted R-squared	0.9282	0.9276	0.9176
S.E. of regression	1.5096	1.5155	1.6168
Durbin-Watson stat	2.4464	2.4335	2.2366
Sum of squared res	27.3452	27.5606	41.8257
F-Statistic	33.3364	33.0642	56.7351

Period: 1974 - 1994

voluntary savings are not affected by mandatory savings, this coefficient would be 0. The results indicate a small crowding-out effect (between -0.12 and -0.23 depending on the regression), which is consistent with a big part of the population facing borrowing constraints. However results are not conclusive. A null hypothesis of no crowding out ($a_4=0$), or of complete crowding out ($a_4=-1$), cannot be rejected by the data.

- The coefficient a_5 measures the crowding-out effect of government savings on private savings. A full Ricardian equivalence would produce a coefficient of -1. A reduction in government savings would be perceived as meaning higher taxes in the future, and people would increase private savings now in anticipation of the future tax rise. On the other hand, a coefficient of 0 would mean no crowding-out. The results indicate a small crowding-out effect (around -0.10), but the coefficient is not significant. A null hypothesis of no crowding-out ($a_5=0$) cannot be rejected by the data. However, a null hypothesis of a full Ricardian equivalence ($a_5=-1$) is strongly rejected by the data.
- The coefficient a_6 measures the impact of external savings on private savings. An increase in external savings means higher foreign resources available for either investment or consumption. The coefficient a_6 indicates what fraction of these increased resources is actually used to finance investment and what fraction is actually used to finance a higher level of consumption. A coefficient of 0 indicates that all the increase in external savings is used to finance a higher level of investment. A coefficient of -1 indicates that all increased foreign resources finance higher levels of consumption. Regression results indicate a small crowding-out effect (around -0.13), but the coefficient is not significant. A null hypothesis of no crowding out, which implies that all foreign resources are used to finance higher investment cannot be rejected by the data.
- The size of the pension fund is exerting a positive influence on private savings. This probably reflects the financial deepening effects induced by a bigger pension fund as well as the development of a more sophisticated capital market.
- The real interest rate is not a significant variable and has a negative sign. The hypothesis of a zero interest rate elasticity is accepted by the data, indicating that this market is inelastic. On the other hand, the negative values for the elasticity could also be explained by an income effect that systematically exceeds the substitution effect. Since almost all the saving is done by the upper deciles, they would probably be net leaders. Therefore, an increase in the real interest rate would produce a positive wealth effect which stimulates consumption.

Table N° 5. Chile: Explanation of the Increase in Total Saving
(in percent of GDP)

	Pre-Reform 1976 - 80	Post-Reform 1990 - 94	Change in Variable	Effect on Savings
Priv. Savings				
Tax Burden	24.2	19.6	- 4.6	5.9
Net Fact. Paym.	2.4	3.8	1.4	- 0.6
Ratio Per/Obs	0.94	1.0	0.06	- 1.4
Pension Sav.	0	3.1	3.1	- 0.7
External Sav.	3.9	2.1	- 1.8	0.2
Fund Size	0	33.1	33.1	4.2
Real Interest	12.9	6.6	- 6.3	0.9
Residual Fact.				0.0
Private Sav.	7.2	15.7	8.5	8.5
Pension Sav.	0	3.1	3.1	3.1
Public Sav.	5.6	5.7	0.1	0.1
External Sav.	3.9	2.1	- 1.8	- 1.8
Total Savings	16.7	26.6	9.9	9.9

5. CONCLUSION.

Chile has experienced a substantial increase in the total saving rate during the last two decades (1974-94). One significant factor that explains part of this increase is the pension fund reform. From the pre-reform years (1976-80) to the post-reform years (1990-94) the total saving rate of the country increased by more than 9.9 percentage points of GDP, from 16.7 to 26.6 percent. The model elaborated before can be used to explain the cause of this increase. This is done using regression number two (See Table N° 5).

From Table N° 5 it is apparent that the pension fund reform explains an increase in total savings of 6.6 percentage points of GDP. This is the result of the pension saving (3.1 percent of GDP), the fund size effect (4.2 percent of GDP) and the small crowding out of pension savings (-0.7 percent of GDP). Hence, two thirds of the increase in total savings of the country can be attributed to the pension fund reform.

The role of the public sector was also very important in achieving this result. In fact, the government paid the pensioners remaining in the old system with its own resources, without receiving new contributions. This generated a potential deficit of 4.6 percentage points of GDP during 1990-94. The public sector was able to reduce other current expenditures so as to accommodate this deficit and even increase public savings.

The reduction in the tax burden is the other single measure that increased total savings. This factor helped to offset some negative developments in net foreign factor payments and the reduction of external saving.

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