

# PENSION FUNDS' CONTRIBUTION TO THE ENHANCEMENT OF AGGREGATE PRIVATE SAVING: A PANEL DATA ANALYSIS FOR EMERGING ECONOMIES

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## 1 Introduction

As of the eighties, and later in the nineties, several countries in Latin America began to assess the convenience of substituting existing PAYG earning related pension schemes (as it happened with Chile's pioneering reforms) or adding (as in Argentina) privately managed fully funded pension systems – based on individual capitalization accounts – leaving on contributors hands' (labour and self-employed workers) the decision on the preferred system.

In some cases, the switch took place all of a sudden following bankruptcy situations faced by PAYG regimes, whose causes could be traced back to sharp inflationary processes and economic and demographic unbalances dwindling to unbearable levels the workers/retirees ratio and increasing existing pension regimes' deficits; the massive incorporation of beneficiaries (especially self-employed) through *ad hoc* plans amounting to a bail out<sup>1</sup> and the channeling of pension resources to general fiscal revenues, in order to deal with the important deficits originated by a growing public spending and the difficulties in tax collection and public financing, must also be accounted for at the moment of explaining the collapse of unfunded pension schemes.

Nevertheless, it needs to be acknowledged that a widespread fall in saving rates occurring by the time in many Latin American countries, must also be acknowledged as an important motivation underlying substantial changes in pension systems, as the idea prevailed that the accumulation of pension fund assets would definitely encourage aggregate savings (Bailliu and Reisen, 1997) and contribute also to enlarge domestic capital stock markets (Reisen, 1997; Raddatz and Schmukler, 2008).<sup>2</sup>

The economic appeal that individual capitalization schemes have upon policy makers, especially for their expected positive impact upon saving rates, must however be revised in the light of the very often ambiguous results found in the literature devoted to the analysis of several countries' recent experience. Thus, while some analysts of the micro and macroeconomic performance of pension systems conclude that fully funded pension schemes definitely contributed to enhancing private saving in countries like Chile and Singapore others find running counter evidences for Malaysia (see for instance Corsetti and Schmidt-Hebbel, 1996; Morandé, 1996 and Faruqee and Husain, 1994).

In the context of the American economy, Feldstein (1974) also analyzed the impact upon individuals' decision on saving of introducing social security systems; by resorting to a life-cycle model, his econometric estimations showed that social security funds depressed personal savings.<sup>3</sup> Nevertheless, Feldstein also explored the implications of using an "extended life-cycle model", allowing people to continue working after the age of 65 and in which the net impact of social security regimes upon aggregate savings fell short of being unambiguous.

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<sup>1</sup> Those programmes, known as "moratorias", permitted contributors to enjoy the benefits after a limited number of years of contribution (smaller than the 35 legally required).

<sup>2</sup> The paper by Raddatz and Schmukler is a particularly interesting one as the authors aim at shedding light on the very interesting debate of how pension funds affect capital markets development.

<sup>3</sup> Mainly based on the rationale of a PAYG system, the idea was that the need of counting with savings for future consumption was averted by retirees' guaranteed benefits financed through previously collected social security taxes.

It is to be noticed that the existing theoretical controversy with regard to the real impact of individual capitalization upon saving rates and capital formation is related to the Life-cycle Model's nature, whose conclusions sensitively react to changes in assumptions held, but also to the type of pension system referred to. Bailliu and Reisen's paper (1997) is in this regard worth mentioning as these authors also stressed the ambiguity of pension fund assets' effect upon saving depending for instance on whether there were taxed returns or liquidity constraints, for what they concluded that the sign of the relation between pension fund assets and saving was a matter of empirical resolution.

The empirical treatment of the subject also poses interesting challenges, as shown by econometric attempts forced to deal with the problem of a scarce number of degrees of freedom, this being explained by the relatively short existence of main fully funded pension regimes in the world and the consequent recourse to statistical series yielding information only for a limited number of periods. Grouping data for a set of countries and estimating coefficients by means of a fixed effect panel data model, in order to reflect included countries' specificities, becomes therefore an alternative to sort out the mentioned difficulty.

In the light of preceding paragraphs' content, the paper aims at carrying out an analysis of pension regimes based on individual capitalization (fully funded pensions) implemented since the eighties in six Latin American countries: Argentina,<sup>4</sup> Chile, Colombia, Mexico, Peru and Uruguay, in order to ascertain whether they were conducive to increasing aggregate saving and substantially or somehow helped to strengthen domestic capital stock markets. In pursuing the mentioned objective an updated version of the Life-cycle Model is used to provide the econometric model's theoretical background; finally, it is expected that the econometric estimation of the effect of pension fund assets, as well as those stemming from other economic and demographic variables, upon the selected countries' saving rates, will also serve the purpose of yielding conclusions with economic policy implications on the performance of fully funded pension regimes.

The remainder of the paper is structured as follows: Section 2 provides a review of stylized facts in all the six countries; Section 3 presents a theoretical analysis of the life-cycle framework including social security; Section 4 conducts a fixed effect panel data model's econometric estimation and analysis of results; and Section 5 concludes. An Appendix is included in which main features of domestic individual capitalization regimes are outlined.

## 2 Review of stylized facts

The review of the fully funded pension regimes in all the six countries chosen, as well as the analysis of determined features of their investment portfolio structure and the evolution of some other related variables and indicators is intended to shed some light on individual capitalization' performance in the Region following something more than a decade since it came into being.<sup>5</sup>

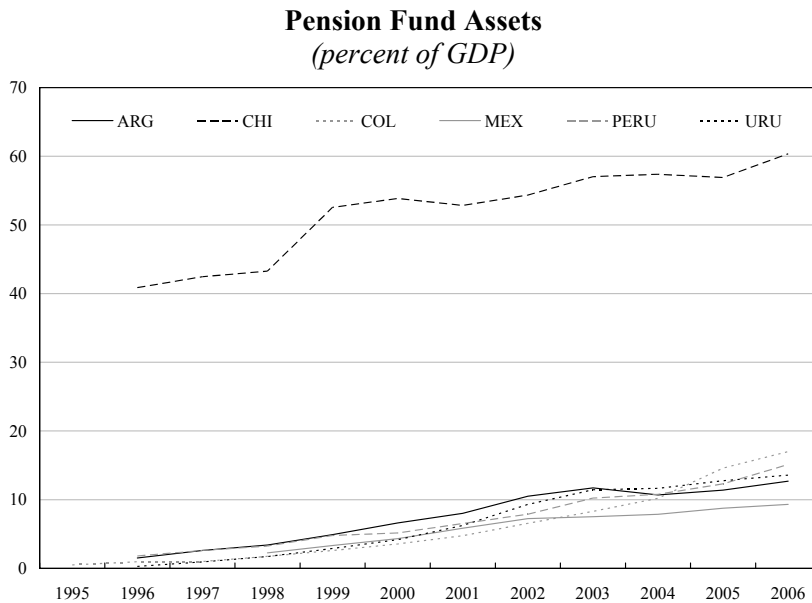
A first feature deserving a comment is the relative size and evolution of pension fund assets, in terms of gross domestic product, as depicted by Figure 1.

Although an increasing path is observed in all cases, differences emerge once countries are individually considered; thus, while the ratio reached more than 50 per cent in Chile only in

<sup>4</sup> As is publicly known the Argentine Congress enacted, in November 2008 and following a project received from the Executive Branch, a law that stopped the privately managed fully funded pension scheme based on individual capitalization. From that moment on, the ANSES (Social Security National Administration) already managing the PAYG regime, took over exclusive responsibility for the collection of all social security taxes and the payment of pension benefits.

<sup>5</sup> Except for Chile, where the system dates from 1980.

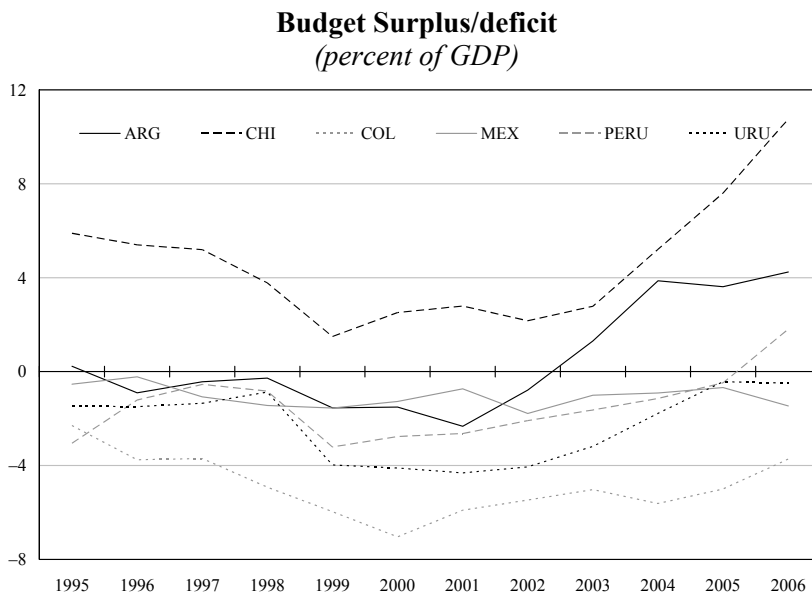
**Figure 1**



Source: Data from FIAP (International Federation of Pension Fund Associations) and national series.

Colombia, Uruguay and Argentina it climbed over 10 per cent<sup>6</sup> in the 1995-2006 period. Two main reasons can be accounted for in explaining differences in percentages: in the first place, individual capitalization started much earlier in Chile for what the regime exhibits more maturity;<sup>7</sup> in the second place, individual capitalization is mandatory in Chile and Mexico whereas PAYG regimes in Argentina, Colombia and Peru have not been eliminated and compete with the former as people are allowed to choose. Uruguay presents in turn an interesting situation as inclusion in either of the two regimes depends on individuals' scale of income or wages.<sup>8</sup>

**Figure 2**



Source: International Monetary Fund Financial Statistics.

<sup>6</sup> With an average of 6.8 per cent for the remainder five countries.

<sup>7</sup> Nevertheless, the assets' yearly percentage growth is higher in the other five countries as suggested by Bailliu and Reisin (op.cit., p. 23) due to the fact that, by being more recent, they have greater contributors/retirees ratios.

<sup>8</sup> People can however express their decision to be included in one of them.

An analysis of the evolution of government budget surpluses is next in order, since the model to be presented below in Section 4 suggests a negative relationship between pension fund assets and this variable. Except for Argentina and Peru, as of 2003 and 2006 respectively, Chile was the only of the six countries exhibiting an outstanding budget surplus throughout the

period considered (Figure 2), due to a sound fiscal discipline and the setting of debt targets and stabilization funds following the effect of favourable cyclical conditions for Chilean copper exports. Contrariwise, persistent fiscal deficits were the prevailing situation in the rest of countries, save for the already mentioned exceptions.

The mentioned disparities regarding public sector saving are somehow reflecting price behaviour in the region; thus, whereas Chile,<sup>9</sup> and to a lesser extent Colombia and Peru achieved a gradual reduction in their

inflation levels to around an annual 3 per cent increase, Argentina (leaving behind the extreme price stability of the Convertibility period) and Uruguay, had more inflation than the rest and did not show evidence of their curbing the pattern of sustained price increases.

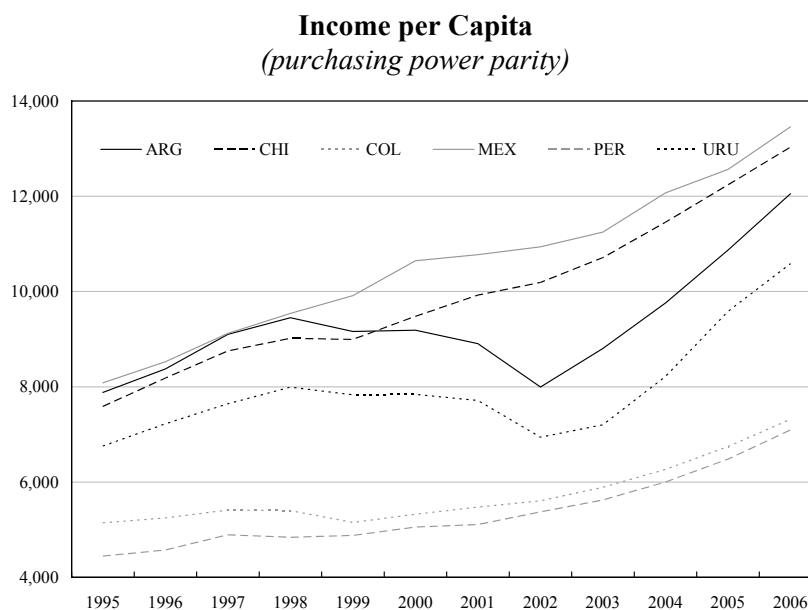
With regards to another of the variables included in the econometric model, persisting inflationary levels caused that Argentina began experiencing decreasing real interest rates (and even negative figures in 2005 and 2006); however, positive real rates of interest prevailed during the period in the rest although variability in time showed notorious differences among countries.

Two alternatives were in turn considered for assessing income per capita's performance in the six countries, variable whose importance resides in that the theoretical framework suggests a positive relationship with saving rates:<sup>10</sup> income per capita measured in current dollars and income per capita in purchasing power parity (seeking data to be comparable among countries); the second variant seems more appropriate for the analysis as it is to be expected that income measurement should somehow reflect individuals' average purchasing power.

As shown by Figure 3, the income per capita similarly evolved in all the six countries, although in Colombia and Peru the variable exhibited, in absolute terms, much lower levels than the rest with figures only averaging 60 per cent of the other four countries' income per capita (61 per cent in the case of Colombia and 57 per cent for Peru).

It must be borne in mind, in order to better analyze the relationship between pension fund assets and aggregate savings, that let alone Chile whose individual capitalization regime began much earlier in 1980, the implementation took place in the middle of nineties for the rest of

Figure 3



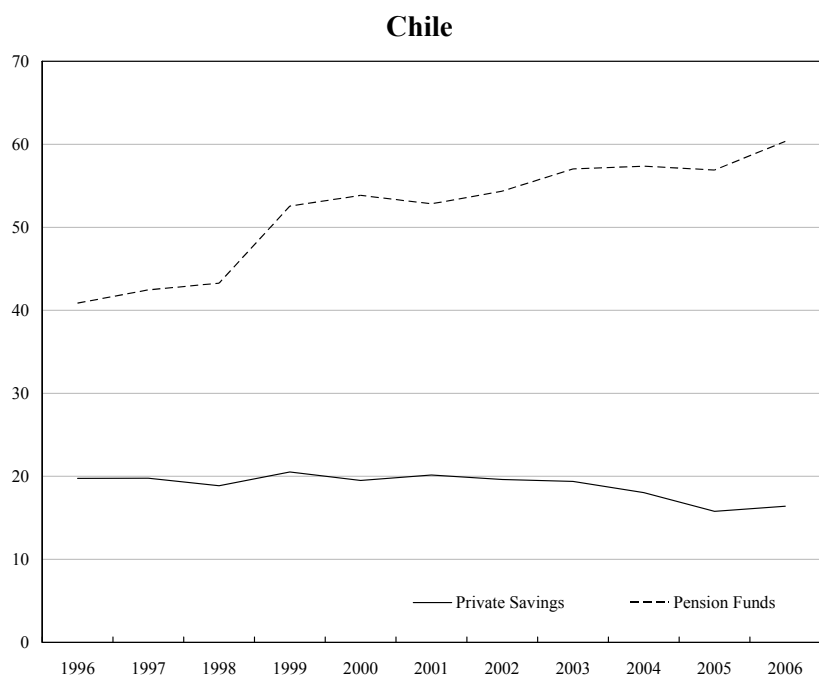
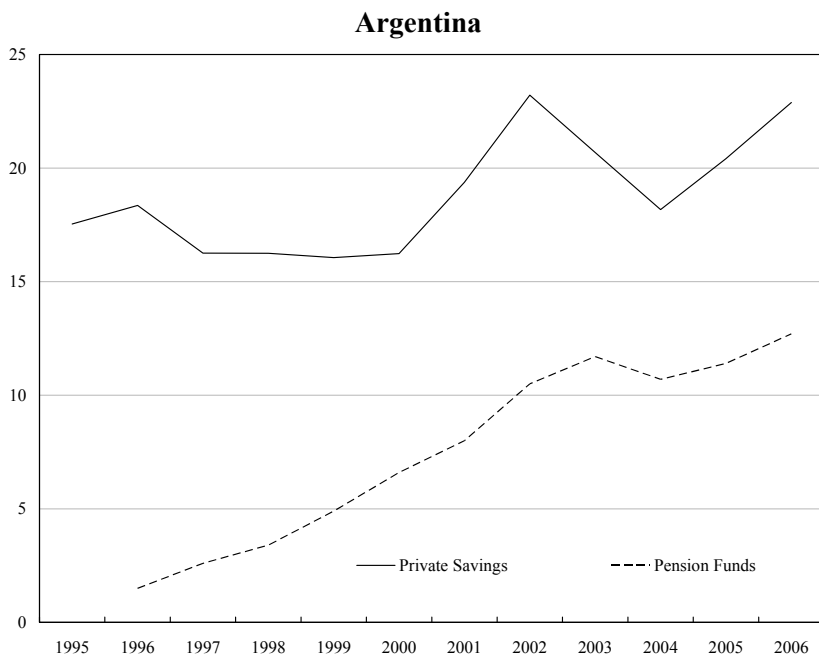
Source: International Monetary Fund Financial Statistics.

<sup>9</sup> Chile is, together with Brazil, a clear example of inflation targeting in Latin America.

<sup>10</sup> Without much need of emphasis higher income levels give more room to save once basic needs are taken care of.

**Figure 4**

**Pension Fund Assets and Aggregate Private Savings, by Country**  
(percent of GDP)



Source: International Monetary Fund Financial Statistics (IMF) and national series.

countries.<sup>11</sup> As will be seen below, this caused an impact on the variables in two ways: the size of the fund relative to gross domestic product and the probable impact of pension funds upon private savings.

Figure 4 features the importance of when the regime was started upon the fund's relative size; thus in Chile, where the regime creation dates from 1980, pension fund assets reached 40 to 50 per cent of gross domestic product, whereas in the newer systems figures normally range from 0-3 per cent, at the beginning of the period to 10/12-15/20 per cent in 2006. It is also worth mentioning that, apart from being the first implemented regime, the mandatory and exclusivity features of the Chilean system must also be accounted for at the moment of explaining the relatively major size reached by its assets.

Figure 4 helps also to visualize the impact of pension funds upon aggregate saving, which will be later econometrically proved in Section 4. Conversely to Chile and Uruguay, where there seems to exist – *prima facie* – a negative relationship between both plots, in the

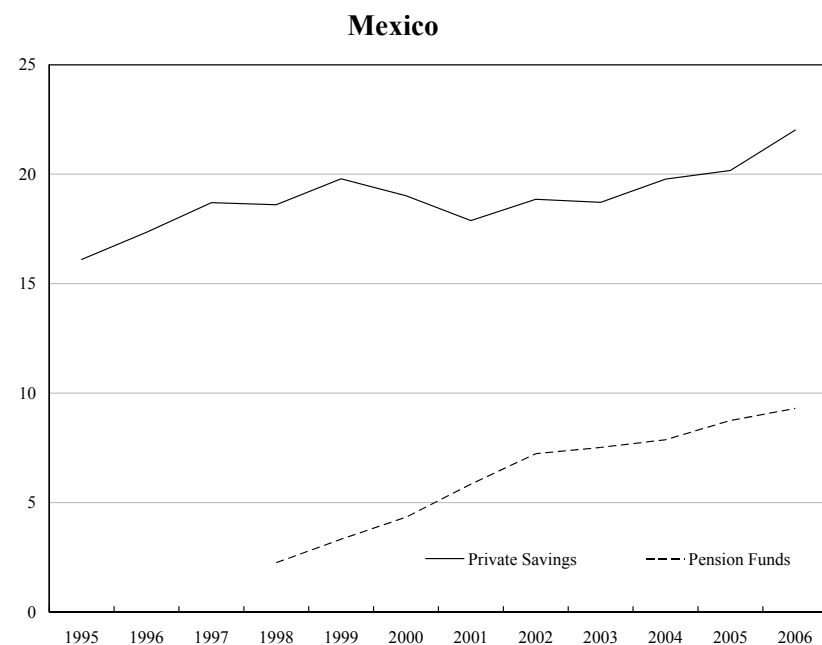
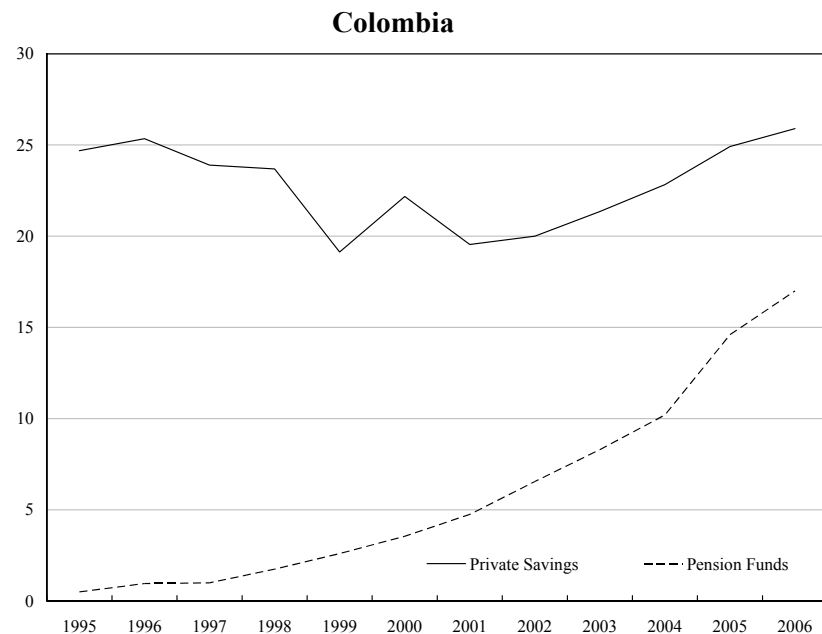
<sup>11</sup> Peru in 1993, Colombia in 1994, Argentina and Uruguay in 1995 and Mexico in 1997.

rest of countries the graph shows that pension fund assets clearly dragged aggregate savings, the effect being more visible generally as of the fifth year of the regime implementation. Argentina is in particular a worth quoting case as aggregate private saving kept stable between 1997 and 2000 although gross domestic product shrank in these years as a consequence of an industrial recession lasting until 2001; it can be inferred therefore that the sustained growth shown by pension funds somehow helped to compensate a fall in savings that would otherwise happened following the reduction of income.

As for the supposedly paradoxical Chilean case, the explanation can again be sought in that, due to the earlier regime implementation, the effect must have been stronger in the eighties when restrictions on foreign investment by the new pension funds existed.<sup>12</sup> In short, the stagnation and consequent small fall in aggregate savings in percent of gross domestic product must be looked at in the light of the

Figure 4 (continued)

### Pension Fund Assets and Aggregate Private Savings, by Country (percent of GDP)

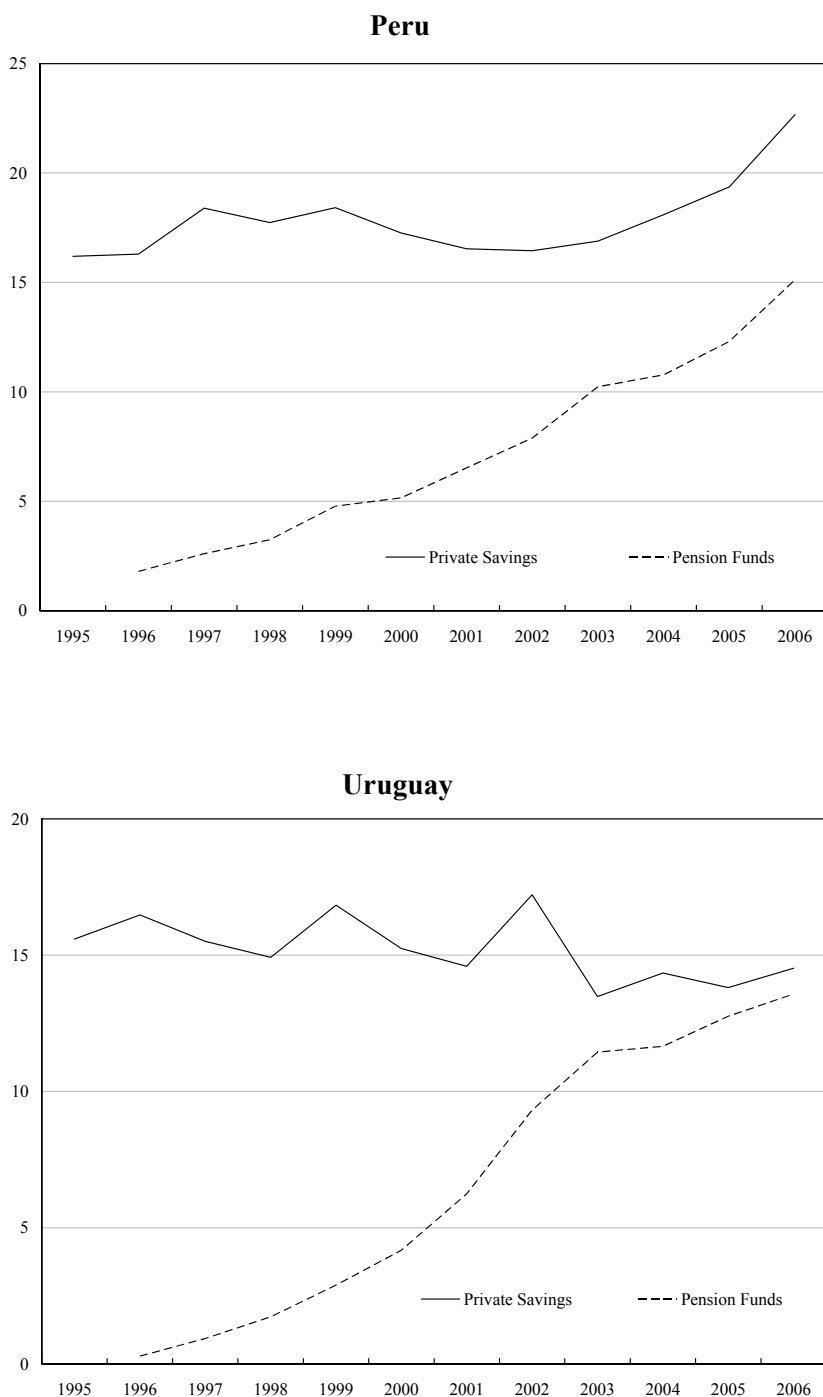


Source: International Monetary Fund Financial Statistics (IMF) and national series.

<sup>12</sup> While Fontaine (1996) recalled that until 1989 Chilean regulations banned any international diversification of pension funds, Reisen (1997) in turn asserted that this restriction was crucial in explaining why the Chilean domestic capital market grew in size and depth despite an internal climate of debt crisis and uncertainty.

**Figure 4 (continued)**

**Pension Fund Assets and Aggregate Private Savings, by Country**  
(percent of GDP)



Source: International Monetary Fund Financial Statistics (IMF) and national series.

banning lift in foreign investment, which is in turn confirmed by the figure showing the latter's incidence in portfolios.

In seeking next an explanation for the Uruguayan case, the saving plot's pattern must somehow be reflecting a feature of the implemented system which notwithstanding the fact that it is mandatory for certain wage earner groups, inclusion by default is based on the individuals' income scale.

The variations and lack of similarities in portfolio structures, as shown by Figure 5, are the best examples of differences, in many cases significant ones, that can be found in national legislation concerning how pension fund assets can be invested. In particular, and even if it is taken for granted that public bonds will always be important part of portfolios, countries often place a limit to their share in investment composition.<sup>13</sup> Despite this, countries have somehow managed to find shortcuts to the mentioned limitations, as it is particularly noticeable in the case of Argentina, whose legislation banned

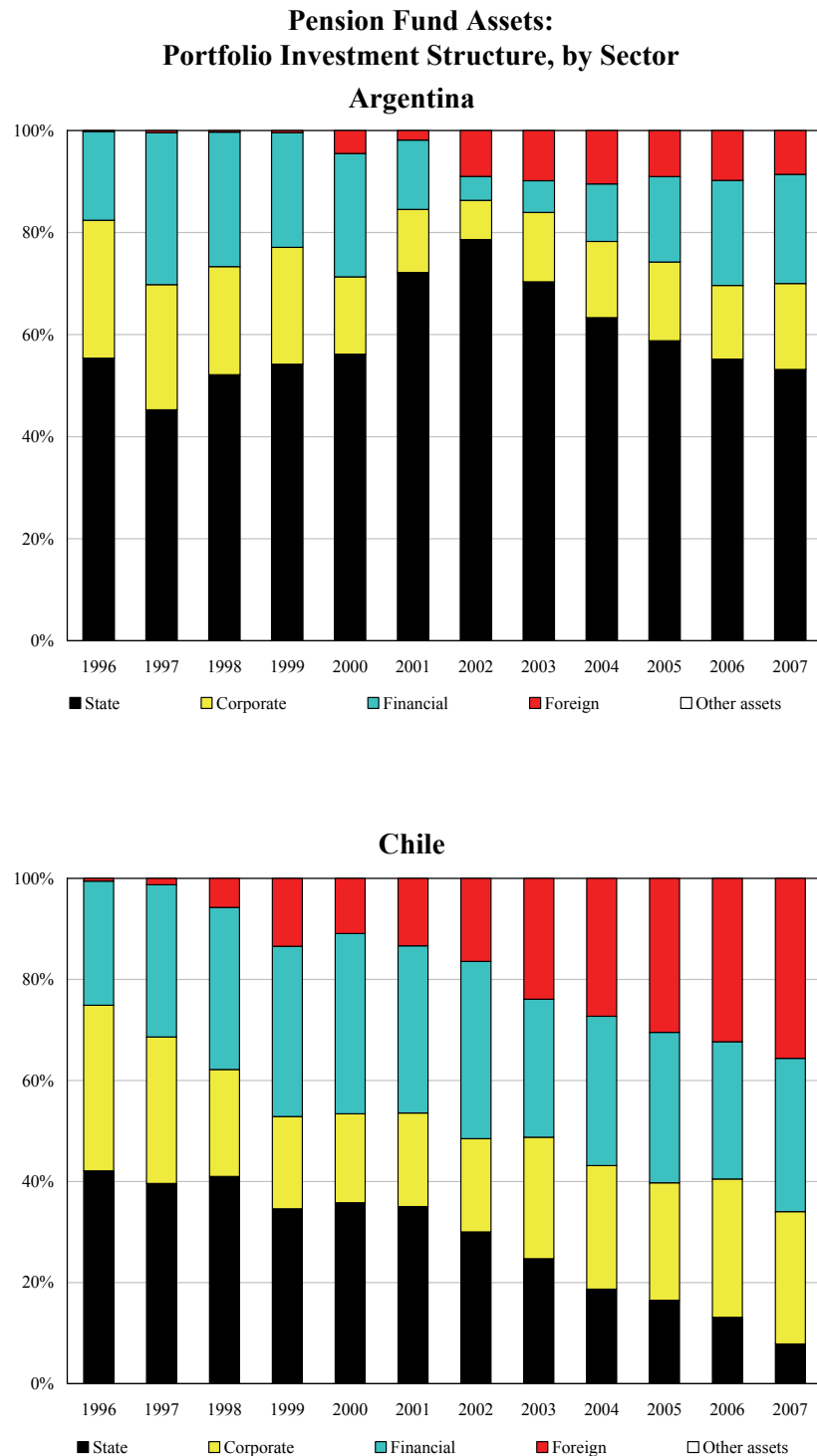
<sup>13</sup> See National Legislation in the Appendix to this paper.

pension funds to invest in public bonds beyond 50 per cent of the whole portfolio. Fiscal matters and the restructuring of public debt must be borne in mind when the excessive government bonds' participation in pension funds is analyzed in Argentina; in particular, severe credit restrictions preventing the access to foreign and domestic financing led the authorities to resort to pension funds which became forced lenders.

As for the rest of countries, Chile and Peru exhibit public bonds' lesser shares but while in the former the evolution shows a downturn trend there is an increasing participation in the latter country. The cases of Mexico and Uruguay are also noticeable in that public bonds participation in portfolios is practically overwhelming<sup>14</sup> whereas Colombia reflects in turn the average situation of around 45-50 per cent.

Figure 5 permits to observe that the participation of other portfolio components also fell short of being stable, or similar among countries, throughout the period considered. In general, there has been a tendency, on the part of

Figure 5



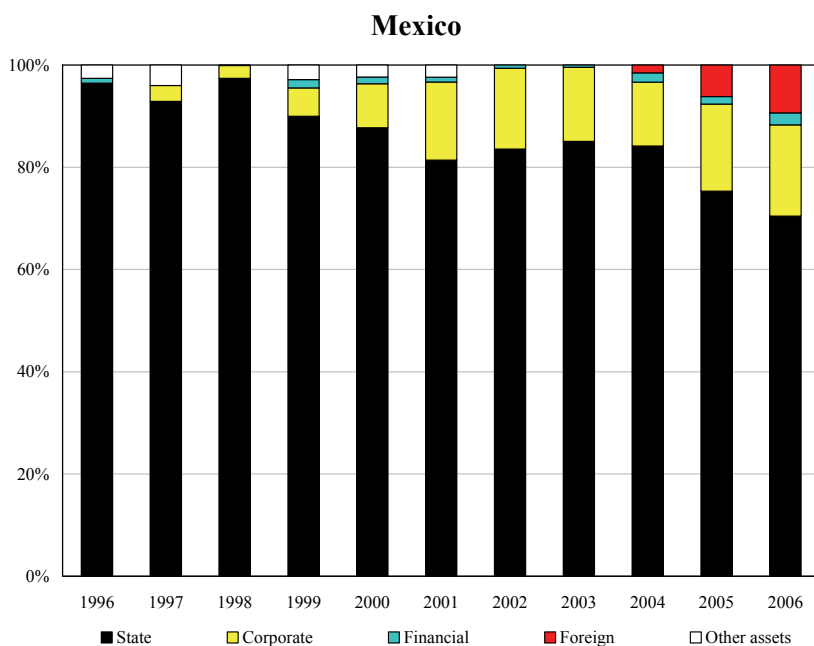
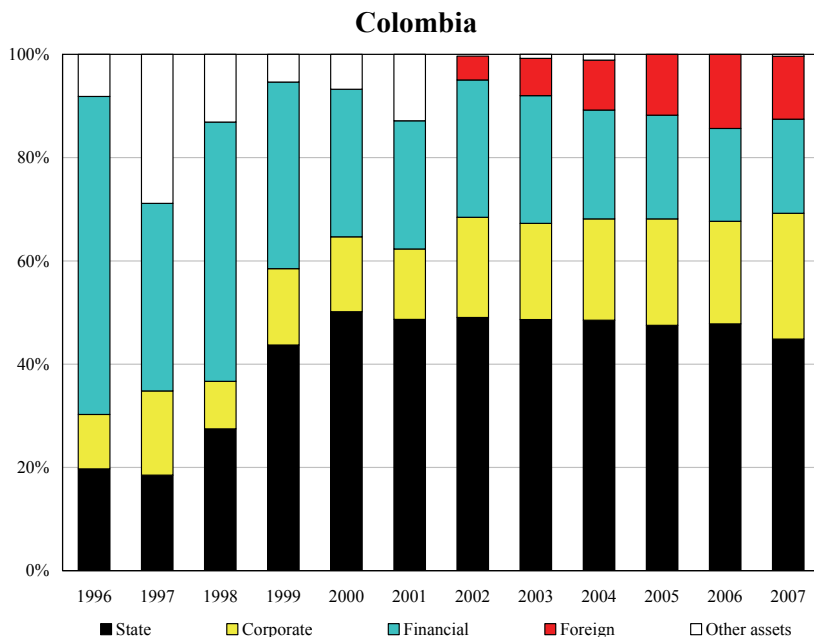
Source: FIAP (Federación Internacional de Administradoras de Fondos de Pensiones).

<sup>14</sup> Investment of Mexican pension funds in government bonds represented more than 90 per cent in 1997, although they later stabilized in around 70-80 per cent for the rest of the period; the opposite took place in Uruguay as the initial participation rounding 60-80 per cent climbed to 80-90 per cent by the end of the considered period.



Figure 5 (continued)

Pension Fund Assets:  
Portfolio Investment Structure, by Sector



Source: FIAP (Federación Internacional de Administradoras de Fondos de Pensiones).

pension funds and except for Uruguay, to increase investment in foreign assets shares although at a slow rhythm and reaching a level that rounded 5 to 10 per cent of total. Chile is however the worth stressing case here as, following the end of the initial banning over pension funds' international diversification of portfolios, foreign assets started to climb reaching to date more than 35 per cent of all applications.

Financial investments by pension funds both exhibited an irregular performance among countries as well as a marked cyclical behavior in the period; except for the case of Chile where they have had a very stable share within the portfolio, with moderate variations within a 25-30 per cent interval, investment in financial assets showed marked cyclical variations in Argentina, Colombia, Peru and Uruguay whereas their participation was negligible in the case of Mexico. Similar conclusions can in general be drawn for the case of firm shares, although in this case Peru was the only country in which the latter's participation kept stable around 40 to 50 per cent of the total public fund's portfolios.

Lack of uniformity among countries is also a prevailing feature concerning the level of fees<sup>15</sup> perceived by pension fund groups (Graph 6), despite the fact that the evolution towards smaller figures is common to all cases; fees' decreasing paths are more notorious in Chile and Argentina than in the rest and only in Colombia stable levels prevailed in the period.

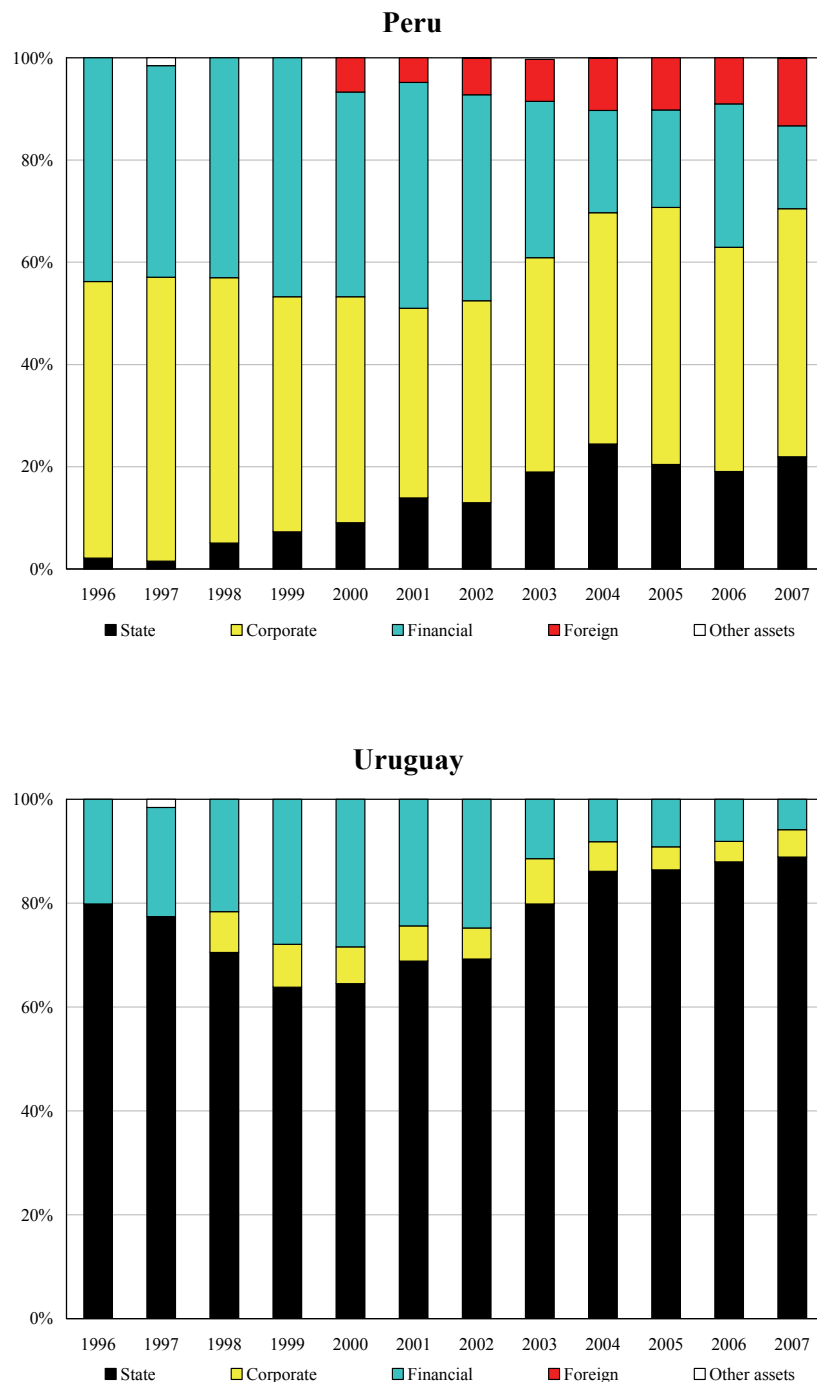
Fees' higher initial levels have normally been explained by the need to face major marketing and operational costs that firms managing pension funds incur when the system begins in a determined country. Once the regime is established, pension funds gradually start to compete to attracting new customers and the level of fees becomes thus one of items regarded by potential new entrants at the moment of choosing a pension fund.

### 3 Theoretical analysis of the life-cycle framework including social security

Theoretical back-grounds based on the

Figure 5 (continued)

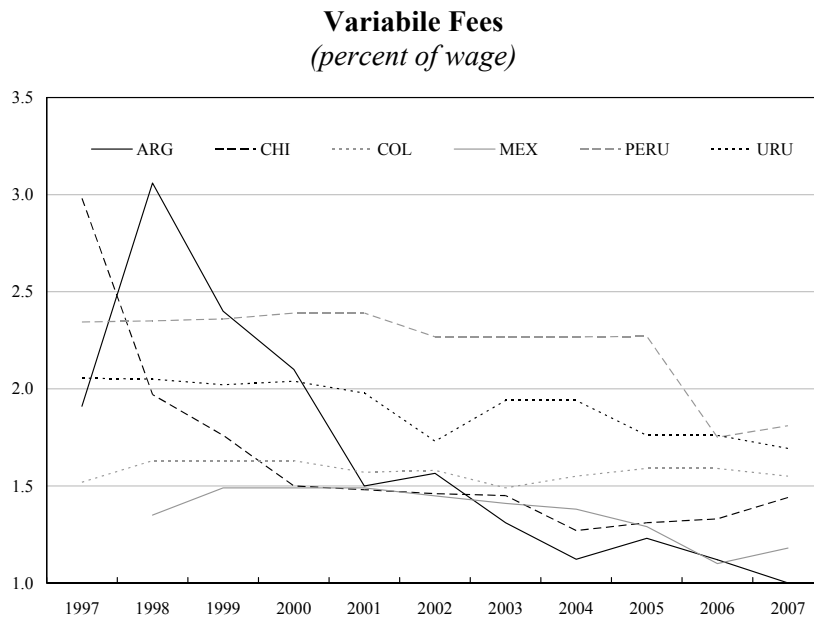
#### Pension Fund Assets: Portfolio Investment Structure, by Sector



Source: FIAP (Federación Internacional de Administradoras de Fondos de Pensiones).

<sup>15</sup> Fees amount to a percent of the wage earned by workers and are supposed to embody the pension funds firms' operational cost expenses and benefits.

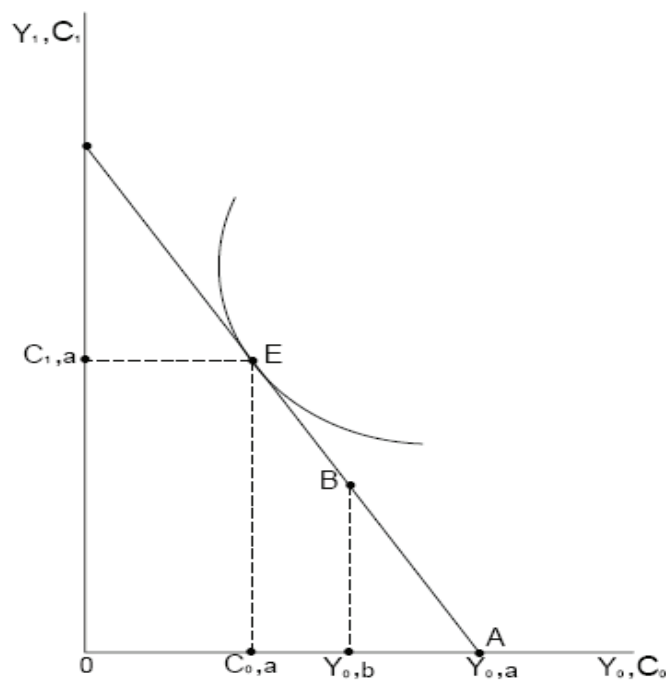
Figure 6



Source: FIAP (Federación Internacional de Administradoras de Fondos de Pensiones).

“life-cycle hypothesis” were generally resorted to in order to analyze the impact of social security systems upon savings. The idea, originally due to Modigliani and Brumberg and later summarized and extended in the paper by Ando and Modigliani (1963), basically states that an individual consumer’s utility is a function of his own aggregate consumption in the current and future periods. As is to be expected, the approach emphasizes that individuals maximize consumption subject to their budget constraint; that is, subject to their lifetime resources, which in turn are the sum of current and discounted future earnings and current net worth.

Figure 7



In simple graphical terms,<sup>16</sup> and assuming a consumer whose life lasts two periods: a working period in which he earns wages and/or other incomes and a second one in which he retires from working and ceases having incomes, the situation is represented in Figure 7.

While  $Y_0$  and  $C_0$ , on the horizontal axis, respectively stand for the individual’s earnings and consumption in period 0,  $Y_1$  and  $C_1$  in turn

<sup>16</sup> This diagrammatical analysis highly relies on Feldstein (1974).

represent income and consumption in period 1. Assuming that the individual only receives earnings during his working life ( $Y_{0,a}$ ), and that there is neither social security taxes nor pension benefits, ( $C_{0,a}$ ) will indicate the desired level of current consumption resulting from the tangency between the utility function and the budget line; the individual's saving decision in the pre retirement period – amounting to  $(Y_{0,a} - C_{0,a})$  and resulting from the rate of interest implied by the slope of the budget line and the current income and consumption – allows him to enjoy a level of consumption equal to ( $C_{1,a}$ ) in period 1.

Figure 7 also permits to analyze how the introduction of social security regimes,<sup>17</sup> whose benefits are financed by collecting social security taxes, affects individual's savings. The collection of a tax immediately causes the current disposable income to reduce by the amount of the payroll tax, in this case  $(Y_{0,a} - Y_{0,b})$  and savings to dwindle also to a new level equal to  $(Y_{0,b} - C_{0,a})$ ; nevertheless, the equilibrium position indicated in E still holds as, by keeping unaltered the original budget line and its slope, benefits paid in the second period (out of capitalized taxes) will still guarantee the consumption level ( $C_{1,a}$ ). The assertion of savings' reduction seems thus to be correct and based on the following two accounts: the reduction of disposable income and the ultrarational idea that payroll taxes are perfectly substituting the impact of private saving fall upon future consumption.

The implication that social security regimes always have a negative impact upon savings has not however gone unchallenged in the related literature, as soon as one departs from the framework of analysis provided by simpler versions of the life-cycle model. Feldstein (1974) himself quoted authors' yielding empirical evidence on that people covered by fully funded regimes save even more than those uncovered individuals, based on a "recognition effect"<sup>18</sup> emerging when people entering a private pension plan realize the benefits of saving for their old age (educational effect) and change their utility function, or a "goal gradient hypothesis"<sup>19</sup> whereby efforts are intensified the closer people are to set goals.

Nevertheless, the dual effect of social security systems upon saving levels has appropriately been analyzed by Feldstein (1974), as shown in Figure 8, whose crucial contribution was to extend the traditional life-cycle model in order to allow for endogenous retirement ages.

As can be seen, the budget line's parallel displacement AN denotes the fact that the individual decides not to retire at the age of 65 and earns also incomes in period 1;<sup>20</sup> the situation regarding consumption and saving will now be  $C_{0,c}$  and  $(Y_{0,a} - C_{0,c})$  respectively whereas E' indicates now the new equilibrium position. By assuming that a social security system is introduced, forcing the individual to retire at the age of 65, it is easily noticed that the situation reverts to point B in Figure 8 since the social security tax reduces period 0's disposable income and the compulsory retirement makes no possible to have earnings in period 1.

Since the situation indicated by B means that E is still the equilibrium position for consumption, the resulting saving level  $(Y_{0,b} - C_{0,a})$  will in this case be larger than  $(Y_{0,a} - C_{0,c})$  showing what Feldstein termed as the dual effect of social security; that is, when individuals retire at the age of 65, social security taxes have the unambiguous effect of reducing saving while for those working beyond 65 social security systems may induce early retirement and the effect of benefits upon savings will in this case be ambiguous.

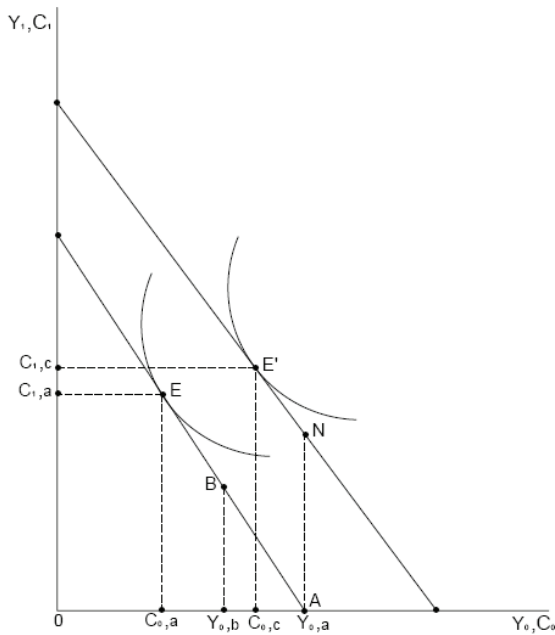
<sup>17</sup> As will be shown, results more clearly depict the case of unfunded PAYG regimes.

<sup>18</sup> First stated by Cagan (1965).

<sup>19</sup> See Katona (1965, p. 4).

<sup>20</sup> As Feldstein (1974) stressed it, N stands for the individual's initial position with incomes in the second period in addition to keeping the same earnings in period one (point A).

**Figure 8**



A very interesting theoretical analysis of the impact of voluntary and mandatory fully funded pension schemes was in turn provided by Bailliu and Reisen (op. cit.) who extended the traditional life-cycle model by allowing for the possibility of heterogeneous individuals, in terms of their saving capacity and of liquidity restraints.

By modifying Figure 7, for homogeneous individuals, a scenario with low and high income earners<sup>21</sup> is presented in Figure 9 in which hypotheses of limited and unlimited tax exempt pensions, and taxable and tax exempt returns, are successively considered in order to assess the impact of fully funded pension funds upon savings.

**Figure 9**

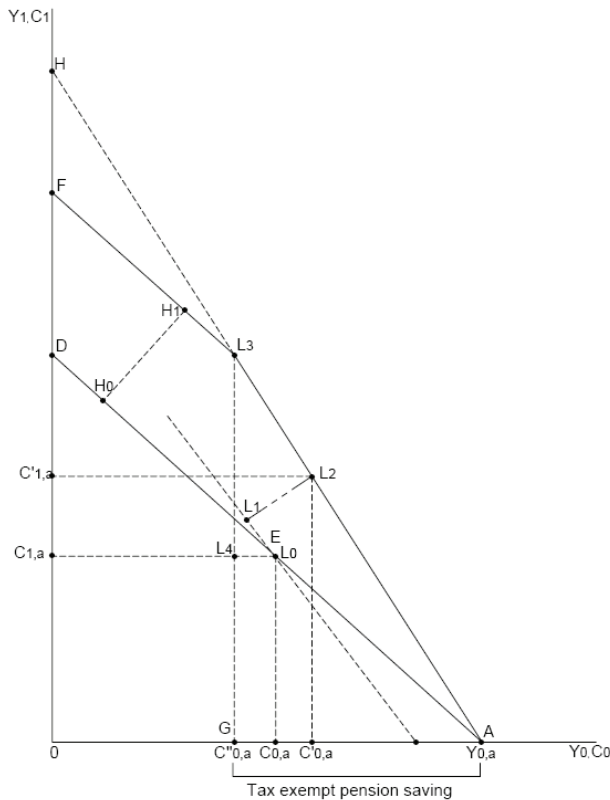


Figure 9 exhibits several modifications relative to the case shown earlier and developed by Feldstein: in the first place, while the budget line  $AD$  stands – as before – for disposable income, the new kinked line  $AF$  resulting from introducing a fully funded system with pension contributions only untaxed up to a determined amount depicts how untaxed

<sup>21</sup> Needless to emphasize, the implication of having heterogeneous agents is that low income persons save little or lesser than high income ones.

returns raise income more steeply for low savers ( $AL_3$  line) whereas tax exempt incomes for high savers is indicated by the parallel displacement of the budget line over the section  $L_3F$ .

If a voluntary pension fund regime, with untaxed contributions limited up to  $AG$ , is established, low savers' final decision on consumption and saving will result from substitution and income effects: on the basis of the former one, a displacement over the broken line parallel to the new budget constraint will take place between  $L_0^{22}$  and  $L_1$ , influenced by the higher rate of interest implicit in  $A L_3$  whereas the income effect will be in turn responsible for the motion towards  $L_2$ . The outcome clearly shows that the impact of voluntary pension fund systems upon savings, when there exists a limit to low savers' untaxed contributions, falls short of being unambiguous: in the case drawn, the income effect prevailed over the substitution effect, consumption increased from  $C_{0,a}$  to  $C'_{0,a}$  and saving consequently shrank; should substitution effects had succeeded in stimulating savings, consumption would have ended somewhere to the left of  $C_{0,a}$ . As, by keeping unchanged the interest rate in the budget line relevant section, high savers' decision will only be influenced by the income effect ( $H_0$  to  $H_1$ ) and consumption and savings will increase and fall respectively for what, and given their relatively higher economic weight, the overall result will undoubtedly be a saving net fall.

Voluntary funded pension regimes hold however the chance of promoting savings when limits on untaxed contributions are abolished or not set, as indicated by the broken section  $L_3H$  of the budget line; in such a case, substitution effects may influence both the behaviour of low and high savers, and prevail over income effects, making a net increase in savings a likely result.<sup>23</sup>

Figure 9 permits also to show Bailliu and Reisen's assertion that savings unambiguously grow when a mandatory pension fund system, with taxable returns, is resorted to as the chosen social security regime. When contributions to the fund are mandatory low savers will displace from position  $L_0$  to  $L_3$ , if pensions are tax exempted and to  $L_4$  if they are not; in either case, the new consumption level will be  $C''_{0,a}$  and the saving level will be greater than the ones implied by  $L_0$  or  $L_2$  over the respective budget lines. In terms of total net savings, compulsory pension funds with taxable returns are a good option as the mentioned low savers' increase in savings will not be impaired by the behaviour of high savers who, in not having the influence of income effects, will choose to stay in  $H_0$ .

In furthering the analysis of pension funds' impact upon aggregate savings, Bailliu and Reisen (op.cit.) introduced the case in which liquidity constraints strengthen mandatory pension funds' capability of increasing private savings, as shown by Figure 10.

Figure 10 depicts a mandatory pension fund, with taxable returns, in which liquidity constraints are highlighted by the dotted line passing through  $L_3$  whose slope, higher than  $AL_3$ , stands for low savers' borrowing costs. If the regime forces the individual to place himself at  $L_4$ , as indicated above when pensions are taxed, he could only move to consumption level  $C'_{0,a} > C''_{0,a}$  (corresponding to position  $L_2$  over the budget line) only by resorting to borrowing against pensions assets, which is precisely averted by loans' interest rates being much higher than the rate of return implicit in the budget line.<sup>24</sup> In sum, and as pointed out by the authors, stimulated and high private savings require liquidity constraints to remain as tight as possible.

It is here worth quoting than Bailliu-Reisin's arguments had been raised earlier by Blinder (1982) who, in analyzing the relationship between pension funds and savings, concluded that

<sup>22</sup> Let it be noticed that  $L_0$  corresponds with the equilibrium situation depicted by point E in Figures 1 and 2.

<sup>23</sup> Nevertheless, Bailliu and Reisen (op. cit.) contend that, in this case, increases in private savings will be compensated by decreases in government savings and the net result is still an unknown.

<sup>24</sup> It is to be noticed that only to the extent that the borrowing cost line flattens, in the direction of the budget line, income and substitution effects will reinforce one other to stimulating higher consumption.

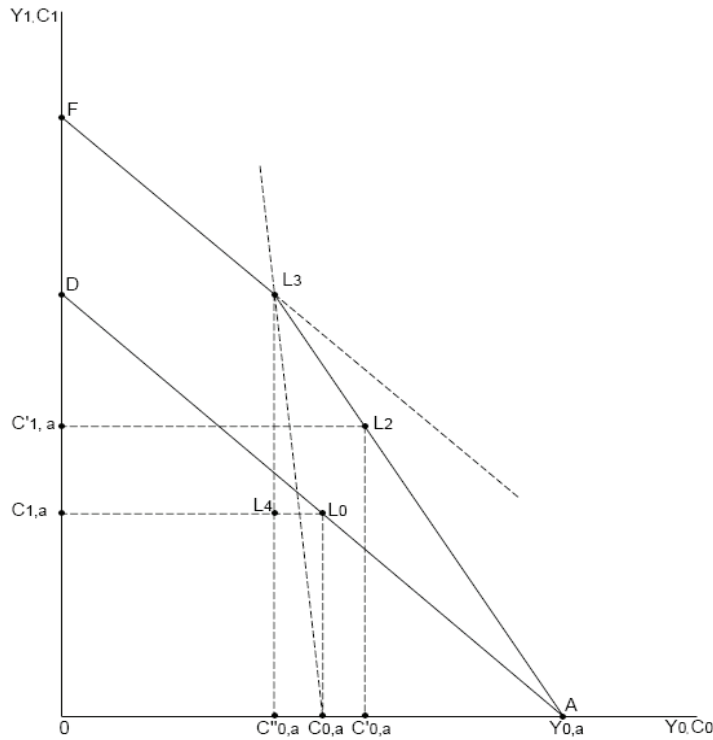
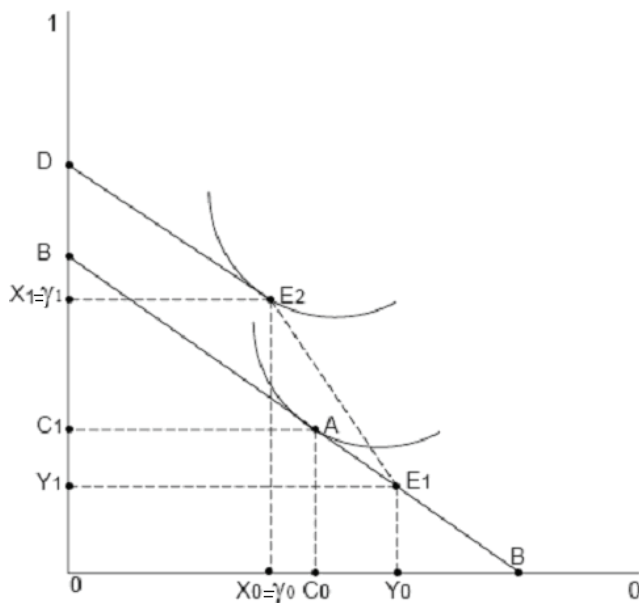


Figure 10

borrowing constraints would increase savings should the pensions impose binding capital markets constraints, as portrayed in Figure 11.

Thus,  $E_1$  depicts the endowment point, corresponding to incomes  $Y_0$  and  $Y_1$  respectively whereas A indicates that – with no pensions – the optima consumption levels  $C_0$  and  $C_1$ ; a mandatory pension will lead to a corner solution like  $E_2$  which will in turn force the highest saving level, as consumption falls to  $\gamma_0$  in period 0 while it climbs up to  $\gamma_1$  in the next period.

Figure 11



Blinder also made the interesting point that while expansions in private pensions, in the presence of capital market imperfections, will raise savings, social security systems of the PAYG system will likely not as – based on the Modigliani Miller Theorem's implications – saving in the latter case is solely aimed at financing consumption on retirement for what, and with no borrowing restraints, while private (funded) pension plans will not have any effect upon savings social security taxes in unfunded regimes will in fact reduce savings, as shown above with Feldstein's developments.

#### 4 Fixed effect panel data model's econometric estimation and results

As mentioned in the Introduction, the relationship between aggregate private savings and pension fund assets will be assessed within the framework of a panel data model of the six countries (Argentina, Chile, Colombia, Mexico, Peru and Uruguay) and using series for the period 1995-2006. As quoted earlier, the recourse to the panel data model aims at sorting out the problem of degrees of freedom stemming from data's scarcity.<sup>25</sup>

The fixed effect variant was considered in place of pooled estimation as, by letting intersections to vary with each country,<sup>26</sup> it permits to capture countries' particular features and yet consider similar variables' coefficients or common slopes for all the cross section units. In line with this, each of the estimated regressions included country's specific individual effects captured by means of a specific dummy variable for each cross section unit or country.<sup>27</sup>

Since not only the impact of pension fund assets over aggregate private savings but also of other economic and demographic variables will be analyzed, the econometric specification is fully described by the ensuing equation:

$$Y_{it} = \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \beta_7 X_{7it} + \beta_8 X_{8it} + \mu_{it}$$

in which:

$Y_{it}$  stands for the dependent variable aggregate private savings, in terms of gross domestic product, for country  $i$  and for period  $t$  (PASV), and

$\beta_{1i}$  represents countries' specific intersection, whereas the explanatory variables are in turn represented by:

$X_{2it}$  pension fund assets, in terms of gross domestic product, for country  $i$  and for period  $t$  (PFS) and whose coefficient's sign is expected to be positive, indicating its stimulating effect upon savings,

$X_{3it}$  government budget surplus, in percent of gross domestic product, for country  $i$  and for period  $t$  (GOVS). As the hypothesis is being held that budget surpluses exert crowding out effects upon the private sector, the coefficient's sign for this variable is expected to be unambiguously negative,<sup>28</sup>

$X_{4it}$  domestic credit (loans) to the private sector, in percent of gross domestic product, for country  $i$  and for period  $t$  (PRICR). The coefficient's sign is expected to be negative as the implication holds that the more accessible credits are, the more consumption will be eased and individuals will be less worried about their future and for building precautionary savings,

$X_{5it}$  short term nominal or real active interest rate, for country  $i$  and for period  $t$  (NIR-RIR). The ambiguity of the coefficient's sign stems in this case of the possibility of substitution effects prevailing over income effects (positive sign) but also of the opposite actually holding (negative sign), as was already analyzed in Figure 3 above,<sup>29</sup>

<sup>25</sup> Chile was the only of the six countries in which the individual capitalization system was already working in the nineties, when the rest introduced fully funded regimes.

<sup>26</sup> Nevertheless, intersections are invariant with respect to time.

<sup>27</sup> Following Greene (2007), in including constants, each dummy represents the country's differential effect relative to the base unit, in this case Argentina. In other words, the fixed effect model captures differences among units through differences in the constant.

<sup>28</sup> This assumption goes in line with Bailey's idea of ultrarationality between public and private saving, which is simply an application of the Modigliani-Miller theorem for the specific case of government finance. See David and Scadding, pp. 239-42.

<sup>29</sup> The sign will also be influenced by borrowing constraints; that is, should the interest rate be too heavy for potential borrowers, these will be discouraged from resorting to bank loans and stimulated to save (see Figure 4 above).



- $X_{6it}$  dependence index standing for the ratio between depending people (inactive individuals placed outside labour markets either for not having yet reached the age, for having reached the legal age of retirement or for being unemployed) and working people (whose used proxy here is the employed economically active population) (DI). Needless to emphasize, the coefficient's sign is expected to be negative as, following the ratio increase (indicating a prevalence of inactive over active people) the economy's earned incomes and savings depress,
- $X_{7it}$  per capita income level, as represented by the current per capita gross domestic product or the gross domestic product in purchasing power parity, for country  $i$  and for period  $t$  (GDP-PGDP). Given that savings are expected to increase following increases in gross domestic product, the variable's coefficient must necessarily bear a positive sign, indicating a direct relationship between the dependent and this explanatory variable,
- $X_{8it}$  gross domestic product's rate of growth, for country  $i$  and for period  $t$  (GDPGR). The coefficient's sign is expected to be in this case unambiguously positive as increases in this variable's rate of growth will move earners to higher income levels and to lower marginal propensities to consume<sup>30</sup> and, finally,
- $\mu_{it}$  stands for the error term meeting the classical assumptions.

Tables 1 through 4 below include results of the diverse econometric estimations carried out, depending on whether nominal or real interest rates and per capita gross domestic product in dollars or in purchasing power parity are used for obtaining the variables' coefficients.

The modified Wald test was applied in order to detect the likely existence of heteroskedasticity in the fixed effect regression model. As known, heteroskedasticity arises when the null hypothesis stating that errors have homogeneous variances<sup>31</sup> is rejected. The possibility of autocorrelation was assessed by running the Wooldridge test in order to confirm or discard the null hypothesis of no autocorrelation.

Whenever heteroskedasticity or autocorrelation could not be ruled out FGLS (Feasible Generalized Least Squares) were resorted to since this method permits to use an error variance matrix in which these effects are accounted for at the moment of performing the estimations.

A first comment, regarding results yielded by econometric estimations (Tables 1 through 4) is that variables' coefficients, save for the case of the dependence index, exhibit statistical significance at the 5 or 10 per cent levels and bear the expected signs according to the underlying theoretical framework.

Econometric estimations also supplied widespread and conclusive support to the crucial assumption of the positive impact of pension fund assets upon aggregate private savings; in this regard, results confirm that the variable's coefficient is significantly different from 0 in all cases but the third variant shown, in which the explanatory power seems to be taken by the real interest rate and the per capita gross domestic product in purchasing power parity. Let it be noticed that these results run counter the ones obtained by Bailliu and Reisin (1997) who, for a sample of eleven countries, could show a positive impact of pension fund assets upon private savings only when the former were demographically adjusted instead of being presented in percentage of gross domestic product.

<sup>30</sup> Bailliu and Reisin's explanation for the sign places the emphasis on the life-cycle hypothesis' implication whereby in growing economies saving by the workers will increase relative to dissaving by the retired (1997, p. 32).

<sup>31</sup> Homoskedasticity would in turn mean a standing null hypothesis stating that  $H_0: \sigma_i^2 = \sigma^2 \quad \forall i$ .

Table 1

Equation 1<sup>(a)</sup>

Modified Wald Test for groupwise heteroskedasticity in fixed effect regression model

$$\chi^2(6) = 30.51 \quad p\text{-value} = 0.0000$$

Wooldridge Test for autocorrelation in panel data

$$F(1, 5) = 75.425 \quad p\text{-value} = 0.0003$$

Dependent variable: PASV

Sample: 1995-2006

Included observations: 62

Coefficients: Generalized least squares

Panels: Heteroskedastic

Correlation: Common AR(1) coefficient for all panels (0.4789)

Variable	Coefficient	Std. Error	t-statistics	p-value
PFS	.1621637	.0628633	2.58*	0.010
GOVS	-.2781099	.1356909	-2.05*	0.040
PRICR	-.0568928	.0329231	-1.73**	0.084
NIR	.0816378	.0156141	5.23*	0.000
DI	-.0331060	.2806352	-0.12	0.906
GDP	.0006660	.0002607	2.56*	0.011
GDPGR	.0553130	.0308271	1.79**	0.073
CHI	-1.7157470	3.3990870	-0.50	0.614
COL	6.1097480	1.9959040	3.06	0.002
MEX	.3817979	1.9959040	3.06	0.002
PER	1.731593	1.7559930	0.99	0.324
URU	-5.645603	1.3236610	-4.27	0.000
CONSTANT	12.630470	2.1332570	5.92**	0.000

<sup>(a)</sup> The series include nominal interest rate (NIR) and gross domestic product in current dollars.

\* Statistical significance at the 5 per cent level.

\*\* Statistical significance at the 10 per cent level.

**Table 2**

**Equation 2<sup>(a)</sup>**

Modified Wald Test for groupwise heteroskedasticity in fixed effect regression model $\chi^2(6) = 12.81$ <span style="margin-left: 100px;"><math>p</math>-value = 0.0461</span>				
Wooldridge Test for autocorrelation in panel data $F(1, 5) = 56.009$ <span style="margin-left: 100px;"><math>p</math>-value = 0.0007</span>				
Dependent variable: PASV Sample: 1995-2006 Included observations: 62  Coefficients: Generalized least squares Panels: Heteroskedastic Correlation: Common AR(1) coefficient for all panels (0.4694)				
Variable	Coefficient	Std. Error	$t$ -statistics	$p$ -value
PFS	.1230335	.0620584	1.98*	0.047
GOVS	-.2333545	.1390807	-1.68**	0.093
PRICR	-.0465444	.0326164	-1.43	0.154
RIR	.0725106	.0176939	4.10*	0.000
DI	.0471230	.3244887	0.15	0.885
GDP	.0004358	.0002981	1.46	0.144
GDPGR	.0550942	.0365475	1.51	0.132
CHI	-1.4019280	3.3287210	-0.42	0.674
COL	5.2789050	2.2901270	2.31	0.021
MEX	.4185314	1.1587690	0.36	0.718
PER	.4964914	2.0247090	0.25	0.806
URU	-5.280247	1.3901730	-3.80	0.000
CONSTANT	14.89972	2.4741820	6.02**	0.000

<sup>(a)</sup> The series include real interest rate (RIR) and gross domestic product in current dollars.

\* Statistical significance at the 5 per cent level.

\*\* Statistical significance at the 10 per cent level.

Table 3

Equation 3<sup>(a)</sup>

<p>Modified Wald Test for groupwise heteroskedasticity in fixed effect regression model  <math>\chi^2(6) = 20.86</math> <math>p</math>-value = 0.0019</p> <p>Wooldridge Test for autocorrelation in panel data  <math>F(1, 5) = 44.892</math> <math>p</math>-value = 0.0011</p>				
<p>Dependent variable: PASV  Sample: 1995-2006  Included observations: 62</p> <p>Coefficients: Generalized least squares  Panels: Heteroskedastic  Correlation: Common AR(1) coefficient for all panels (0.5237)</p>				
Variable	Coefficient	Std. Error	<i>t</i> -statistics	<i>p</i> -value
PFS	.0844234	.0770657	1.10	0.273
GOVS	-.4672454	.1496016	-3.12*	0.002
PRICR	-.0618667	.0335561	-1.84**	0.065
NIR	.0933493	.0163286	5.72*	0.000
DI	.0441775	.3054554	0.14	0.885
PGDP	.0009155	.0002773	3.30*	0.001
PGDPGR	.0720348	.0478833	1.50	0.132
CHI	.3771742	3.88799	0.10	0.923
COL	4.6743260	1.75403	2.66	0.008
MEX	-1.9652530	1.113703	-1.76	0.078
PER	1.2536360	1.491691	0.84	0.401
URU	-6.6743010	1.383662	-4.82	0.000
CONSTANT	9.3865820	2.521955	3.72**	0.000

<sup>(a)</sup> The series include nominal interest rate (NIR) and gross domestic product in purchasing power parity.

\* Statistical significance at the 5 per cent level.

\*\* Statistical significance at the 10 per cent level.

**Table 4**

**Equation 4<sup>(a)</sup>**

Modified Wald Test for groupwise heteroskedasticity in fixed effect regression model $\chi^2(6) = 8.83$ <span style="float: right;"><math>p</math>-value = 0.1833</span>				
Wooldridge Test for autocorrelation in panel data $F(1, 5) = 53.594$ <span style="float: right;"><math>p</math>-value = 0.0007</span>				
Dependent variable: PASV Sample: 1995-2006 Included observations: 62  FE (within) regression with AR(1) disturbances				
Variable	Coefficient	Std. Error	$t$ -statistics	$p$ -value
PFS	.2980042	.1264246	2.36*	0.023
GOVS	-.3792299	.2071593	-1.83**	0.074
PRICR	-.0579133	.0529605	-1.09	0.280
RIR	.072066	.0275331	2.62*	0.012
DI	-.5128899	.3215314	-1.60***	0.118
PGDP	.0007609	.0004911	1.55	0.129
PGDPGR	-.0366699	.0608567	-0.60	0.550
CONSTANT	8.290232	1.509061	5.49*	0.000
$F(7,43) = 3.45$		$p$ -value = 0.0051		

<sup>(a)</sup> The series include real interest rate (RIR) and gross domestic product in purchasing power parity.

\* Statistical significance at the 5 per cent level.

\*\* Statistical significance at the 10 per cent level.

\*\*\* Statistical significance at the 15 per cent level.

The decisive quoted results can however be better understood by resorting to the theoretical analysis of the preceding section, when the point was stressed that regimes' design mattered and that only mandatory individual capitalization regimes would enhance the level of savings. As shown in the Appendix, except for the particular case of Uruguay, contribution to fully funded systems is compulsory in the other five countries.<sup>32</sup>

In relation to the rest of explanatory variables, notwithstanding the fact that the sign of coefficients fell generally in line with what the life-cycle model (when social security is included) predicted, estimations differ as to variables' statistical significance. Thus, the estimated interest rate's coefficient was statistically significant at the 5 per cent level no matter the variant resorted to (nominal or real active interest rate);<sup>33</sup> this result basically features the case – described in Section 2 – in which the substitution effect prevails over the income effect and causes savings to increase. By the same token, it can also be interpreted that the variable's sign and statistical significance is highlighting the favourable impact of tight borrowing constraints upon aggregate private savings, as borrowing for consumption is notably discouraged when tight liquidity prevails.

The government surplus' negative sign also shows that the variable behaved according to the hypothesis of ultrarationality between public and private saving mentioned in the preceding theoretical section; nevertheless, differences arouse in relation to significance as in two cases it met the 5 per cent level and in the other two only the 10 per cent level.

Despite bearing the expected negative sign, estimation of PRICR's coefficient (bank credits to the private sector) yielded much less conclusive econometric results as in two cases showed to be significantly different from 0, but at 10 per cent level whereas in the other two cases results were even weaker.

Poor results were in general achieved with relation to the growth rate of per capita income as only in one case (equation 1) the coefficient was significantly different from 0 at 10 per cent level. Finally, the dependence index exhibited in general a very poor econometric performance and signs running counter the expected ones, the exception being equation 4, in which the sign is correct and the coefficient significant at 15 per cent level. The lack of significance, at conventional levels, is not at odds with Bailliu and Reisin's findings for the dependence index when the main variables are considered in terms of gross domestic product.

## 5 Conclusions

The article aimed at assessing whether fully funded pension regimes, based on individual capitalization, produced the distinctive effect of enhancing aggregate private savings and, in turn, helped somehow to strengthen domestic capital stock markets. Likewise, efforts were devoted to analysing the impact upon private savings of a group of economic and demographic variables which the related literature usually link to the performance of both defined benefit and defined contribution pension systems.

In meeting the sought objectives, the traditional life-cycle hypothesis was resorted to, in the first place, in order to explain how individuals' saving decisions were modified following the introduction of social security taxes within the framework of a PAYG regime. Next, and in line with contributions stemming from Feldstein (1974), Blinder (1982) and Bailliu and Reisin (1997),

<sup>32</sup> Even in the countries in which workers and self-employed individuals can choose between PAYG and fully funded systems, as it was in Argentina until 2008, contributions were compulsory for those deciding for individual capitalization.

<sup>33</sup> That coefficients of both the nominal and the real active interest rate resulted significantly different from 0 raises the question of whether the explanation must be sought in that inflation was not too high in most of included countries during the period analyzed or else, that consumers – in observing the variable's nominal level – were in fact suffering from money illusion and myopia.

the theoretical approach was extended in order to include the cases of endogenous retirement age and fully funded regimes.

The impact of individual capitalization systems upon aggregate private savings was next considered within a life-cycle approach in which various hypotheses were successively upheld, such as: homogeneous and heterogeneous individuals, voluntary and compulsory contributions and loose and tight borrowing constraints. The theoretical analysis permitted to prove that only under mandatory contributions and operating liquidity restrictions private savings would unambiguously be increased by pension fund assets.

In ascertaining the validity of the paper's main hypothesis, the problem of degrees of freedom, stemming from data scarcity caused by the relatively recent implementation of most individual capitalization regimes, had to be dealt with by using a panel data model including statistical series from Argentina, Chile, Colombia, Mexico, Peru and Uruguay for the period 1995-2006.

Also, the recourse to the fixed effect variant whereby intersections were let to vary among countries, permitted to capture countries' particular features and yet consider similar variables' coefficients or common slopes for all the cross section units.

In relation to the econometric estimation of coefficients, results gave ample support to the assertion that mandatory pension fund regimes would have a positive impact upon aggregate private savings as the coefficient of pension fund stocks not only held the expected sign but it was also significantly different from 0 in all but one single case.

With regards to the rest of estimations, coefficients' performance exhibited results of varying econometric soundness, depending on the variable analyzed, but generally falling in line with predictions of the life-cycle model; thus, the interest rate's coefficient was always positive and statistically significant independent of whether the nominal or the real interest rate were used, the main implications being that substitution effects prevailed over income effect and that the assumed hypothesis of a positive impact of liquidity restrictions upon private savings really held.

The idea of ultrarationality between private and public savings resulted also generally proven as the coefficient held the expected negative sign and resulted significantly different from 0 at 5 per cent, in two cases and at 10 per cent in other two cases. On the other hand, the Keynesian relationship between saving and income (with gross domestic product used as a proxy for the latter) gathered in general econometric support as, apart from the bearing the correct sign, results showed coefficients statistically different from 0.

Poor results were however found for the cases of loans to the private sector and the growth rate of per capita income as, in spite of expected signs generally being achieved, higher significance levels (10 or 15 per cent) were required for discarding equal to 0 coefficients.

Finally, the almost null econometric performance of the dependence index is a worth stressing feature as, contrariwise to what it would have been expected, no relationship could be found between this ratio and the level of aggregate private savings and therefore the idea that demographic variables could somehow influence savings could not at this stage be proven. The point is not however ruled out that the short length of statistical series, as well as the way the ratio was computed, somehow conspired against the variable's performance at the moment of assessing its real impact upon savings.

## APPENDIX

### Argentina

By Law 24.241, enacted in September 1993, the so-called Integrated Pension System was created embodying both the existing PAYG Regime and the fully-funded system based on individual capitalization, operating since 1994 and stopped in November 2008.

Integration to any of the mentioned regimes was mandatory, falling on labour and self-employed workers the responsibility to choose. When PAYG was the decided upon regime, workers' contribution amounted to 11 per cent of monthly wages whereas employers' tax would in turn be 16 per cent of salaries paid.

When workers chose the fully funded system their 11 per cent contribution covered a life insurance premium of around 1.50 per cent and a 1.50-2 per cent fee for pension funds' operational expenses and portfolio management; the remainder went to personal capitalization accounts which also allowed the possibility for individuals to make voluntary contributions beyond the legally set 11 per cent. The 16 per cent tax on employers would in this case continue being collected in order to finance pensions of the already retired people within the PAYG System. Pension fund associations, in charge of managing individual capitalization accounts, were regulated and supervised by the Superintendence of Pension Fund Associations.

Benefits included ordinary pensions for the elderly, paid from the age of 65 for male and 60 for female, and disability and death pensions in the case of people under 65 years whose contributions to the system extended for at least 18 months in the last 36 months.

It is worth stressing that, no matter that beneficiaries belonged to PAYG or the individual capitalization system, the State guaranteed to individuals reaching the retirement age,<sup>34</sup> as a part of their pension, a Basic Universal Benefit (PBU)<sup>35</sup> that was equal to 2.5 times the average social security contribution. There was also a Compensatory Benefit (PC), aimed at bridging the years contributed by beneficiaries to the PAYG system before 1994, when the fully funded regime started and amounting to 1.5 per cent of average existing wages and computed on the basis of the number of years individuals belonged to the unfunded regime. The pension, at the age of retirement, completed with the Additional Benefit for Permanence (PAP), equal to 0.85 per cent per year beyond 1994.

The mentioned Law 24.241 was also specific as to the participation that diverse national and foreign assets could reach within pension funds' portfolios, as is indicated below:

- 1) central government's public credit operations: up to 50 per cent,
- 2) provinces, local governments and public utilities' bonds: up to 35 per cent,
- 3) public debt's bonds, with public bid authorized by the National Securities and Exchange Commission: up to 40 and 20 per cent,<sup>36</sup>
- 4) convertible corporate bonds with public bid authorized by the National Securities and Exchange Commission: up to 40 per cent,
- 5) convertible corporate bonds issued by privatized public utilities: up to 20 per cent,
- 6) fixed term deposits in banks and other financial entities: up to 30 per cent,

<sup>34</sup> The PBU was however subject to the condition of potential beneficiaries proving at least contributions for a period of 30 years.

<sup>35</sup> Prestación Básica Universal.

<sup>36</sup> Depending on whether the time to maturity is greater or smaller than 2 years.



- 7) domestic firms' shares with authorized public bid by the National Securities and Stock Exchange Commission: up to 50 per cent,
- 8) privatized public utilities' shares with authorized public bid: up to 20 per cent,
- 9) shares in open-end or closed-end investment mutual funds: up to 20 per cent,
- 10) bonds issued by foreign states or international organisms: up to 10 per cent,
- 11) securities issued by foreign firms: up to 10 per cent,
- 12) contracts negotiated in future and options markets: up to 10 per cent,
- 13) securities holding a mortgage as a collateral and authorized in public bid: up to 40 per cent,
- 14) securities representing participation in investment mutual funds with authorized public bid: up to 10 per cent.

In November 2008 the Argentine Government, following a political decision, sent a project to the Congress seeking to stop the existing fully funded capitalization regime. By Law 26425, Argentina came back to a single unified PAYG system.

## **Chile**

The Decree Law 3500 approved in 1980 the creation of an individual capitalization scheme, whose operations started in 1981. The fully funded regime, based on individual capitalization completely substituted the PAYG system and voluntary contributions are also allowed.

The individual capitalization regime was made mandatory for workers acceding to labour markets as of January 1983, whereas workers already contributing to the PAYG system had the option to switch to the new regime.<sup>37</sup>

Contributions amount to 12.37 per cent of individuals' wages or earnings, 10 per cent out of which goes to individual capitalization accounts while the rest (1.04 and 1.33 per cent) includes the life insurance premium (1.04 per cent) and pension funds' fees aimed at defraying administrative costs and returns. There are no contributions imposed upon employers who only act as withholding agents. Pension fund associations, in charge of collecting and administering social security taxes, are in turn under the supervision of the Superintendence of Pension Funds.

Benefits of the individual capitalization system include ordinary pensions, paid at the age of 65 for male and 60 for female, and disability and death pensions in the case of people under 65 years and survival pensions. Pensions may accrue to beneficiaries under one of the following alternatives: an immediate annuity straightforwardly arranged by contributors with a chosen insurance company; a temporal rent combined with a differed annuity which is made possible by keeping funds in the individual capitalization account in order to enable the pension fund administrator to pay the former during the differed period and a programmed retirement, expressed in UF,<sup>38</sup> taken from the capitalization account by an amount determined by annually dividing the account's effective balance by the capital necessary to pay a unit of pension.

The Chilean state also guarantees a minimum pension to individuals showing contributions for 20 years and to those whose accumulated amount in their capitalization accounts falls short of the minimum required to finance the benefit. Contributors coming by choice from the PAYG system are entitled to a monetary expressed Recognition Government Bond for periods effectively

<sup>37</sup> Self-employed workers kept in turn the option of choosing between the old and the new system.

<sup>38</sup> UF stands for Unidades de Fomento.

registered in the old regime.<sup>39</sup> Welfare-type pensions are also available for individuals under the poverty line, with monthly incomes inferior to 35.000 pesos.<sup>40</sup>

Chilean pension funds divide into five categories, depending on the maxima and minima percentages of their assets they are entitled to invest in equities, as shown by the table below:<sup>41</sup>

<b>Fund</b>	<b>Maximum Limit</b>	<b>Minimum Limit</b>
<b>A</b>	80%	40%
<b>B</b>	60%	25%
<b>C</b>	40%	15%
<b>D</b>	20%	5%
<b>E</b>	0%	0%

Pension funds are asked to offer alternatives B, C, D and E, of lesser relative risk, whereas the setting of option A, more intensive in equities, is not compulsory although effectively offered by all pension fund associations. The table in the following two pages in turn shows investment limits for type of instrument.

## Colombia

The new Pension Regime was legally enacted in December 1993 and its operations initiated in 1994. The scheme is composed of a Non Contributory Public System and a Contributory Compulsory Mixed System in which a public defined benefit Average Premium Solidarity Regime<sup>42</sup> compete with an Individual Capitalization Private Regime<sup>43</sup> allowing also for voluntary contributions. Workers and self-employed individuals must indicate the regime to which they adhere with a switch between systems allowed each five years.<sup>44</sup>

Contributions to the individual capitalization regime reach 15.5 per cent of monthly earned wages (11 per cent goes to the individual pension fund, whereas the pension fund administrator's fee and the insurance premium amount to 1.60 and 1.40 per cent respectively; the remainder 1.5 per cent is absorbed by the Fund of Guarantee for the Minimum Pension, 75 per cent of which is in charge of employers and 25 per cent of workers. Self-employed workers, who finance by themselves the compulsory 15 per cent contribution, have also an additional 1 per cent contribution for the Fund of Pension Solidarity when their incomes exceed four minima wages.

The contribution rate gradually increased from 9 per cent in 2004 to the present 11 per cent. As of 2008, the Government is entitled to add an extra 1 per cent whenever the rate of growth of

<sup>39</sup> This monetary benefit is subject to the condition that individuals prove an effective contribution of at least 12 months to the PAYG regime, between November 1975 and October 1980.

<sup>40</sup> Around US\$ 66.

<sup>41</sup> See also Raddatz and Schmukler (2008).

<sup>42</sup> The Average Premium Solidarity Regime is managed by the Social Insurance Institute (ISS).

<sup>43</sup> Individuals deciding for Individual Capitalization are entitled to the so called "pensional bond" whereby previous contributions to the Social Insurance Institute are acknowledged and will make part, on retirement, of the fund financing the private system pension.

<sup>44</sup> The possibility for individuals to switch between regimes ceases within the 10 years to retirement date.

Instruments	Maximum Limits for Each Type of Fund				
	Fund A	Fund B	Fund C	Fund D	Fund E
1. Bonds issued by the Central Bank and the Treasury; letters of credit, recognition bonds and other bonds and securities issued public agencies and or institutes and bonds issued or bearing the State's guarantee	40%	40%	50%	70%	80%
2. Fixed term deposits, bonds and securities issued by financial institutions	40%	40%	50%	70%	80%
3. Securities guaranteed by financial institutions	40%	40%	50%	70%	80%
4. Letters of credit issued by financial institutions	40%	40%	50%	60%	70%
5. Private and public enterprises' securities	30%	30%	40%	50%	60%
6. Share-exchangeable private and public enterprises' securities	30%	30%	10%	5%	-
7. Shares of open corporate firms	60%	50%	30%	15%	-
8. Shares of open real estate corporations	60%	50%	30%	15%	-
9. Mutual investment funds' quotas referred to by law N° 18.815, plus compromised contributions in subscription promise contracts and payment of national mutual funds' quotas, when ruled by D.L. No. 1.328/76	40%	30%	20%	10%	-
10. Commercial instruments issued by private and public enterprises (promissory notes, credit and investment bonds) if time to maturity is up to a year	10%	10%	10%	20%	30%
11. Credit bonds, securities and commercial papers issued or guaranteed by international or foreign or international banks or foreign states and central banks; credit bonds issued by municipalities, regional states and local governments; shares, securities and commercial papers issued by foreign firms; share convertible bonds issued by foreign banks and firms; securitized credit bonds issued by foreign firms; structured notes issued by foreign entities; participation quotas issued by foreign mutual funds; foreign bonds representing share indices; short term deposits; operations aimed at hedging fluctuation risks among foreign currency or rate of interest risks in a determined foreign currency; investment in foreign countries through participation quotas issued by mutual funds referred to in 9 above, when they have more than 50% of their assets invested abroad	The investment in foreign bonds and securities of the same pension fund's types of funds, plus the amount of foreign investment through mutual funds' quotas and national investment, are limited to 35 per cent of total of the same pension fund's types funds				
11a. Share-convertible bonds issued by foreign banks and firms	Foreign Global Limit	Foreign Global Limit	10%	5%	-

Instruments	Maximum Limits for Each Type of Fund				
	Fund A	Fund B	Fund C	Fund D	Fund E
11b. Current accounts in foreign banks (moving average for the last 30 days)	0.20%	0.20%	0.20%	0.20%	0.20%
11c. Structured notes issued by foreign institutions	4%	3%	2%	2%	-
11d. Overnight and short time deposits	2%	2%	2%	2%	2%
11e. Contracts whose object is the loan or mutual of foreign issuers' financial instruments, computed on the basis of lent instruments	1/3 Foreign investment in each type of fund				
12. Public bid instruments, authorized by the Central Bank and whose issuers are supervised by the Superintendence of Securities and Insurance or of Banks and Financial Institutions	Investment limits for each instruments will range between 1 and 5 per cent of the respective fund's total amount, as determined by the Central Bank of Chile				
12a. Foreign capital mutual funds' quotas	1%	1%	1%	1%	-
12b. Commercial papers of Law 3500's letter I) (not considered in 10 above)	5%	5%	5%	5%	5%
13. Amount of investment in foreign currency without exchange coverage	43%	28%	22%	17%	10%
14. Contracts whose object is the loan or mutual of domestic issuers' financial instruments, computed on the basis of lent instruments	15%	10%	5%	5%	5%
15. Term deposits; bonds and securities issued by financial institutions and securities guaranteed by financial institutions	40%	40%	50%	70%	80%
16. Private and public enterprises' securities, including those permitting their exchange for shares	30%	30%	40%	50%	-
17. Shares of open corporate firms and open real state corporate firms	60%	50%	30%	15%	-
18. Domestic mutual funds' quotas ruled by Law 1.328/76, referred to in 9 above	5%	5%	5%	5%	-
19. Subscription promised contributions and payment of quotas belonging to mutual funds referred to in 9 above	2%	2%	2%	2%	-
20. For each type of financial risk coverage, customarily done in formal secondary markets (limit computed in function of coverage instruments and measured in net terms)	Investment in coverage instruments				
21. Risk cover operations in domestic and abroad markets	Superintendence's Circular No. 1216 determines investment limits to be met by Administrators when undertaking risk cover operations on behalf of Pension Funds				

the gross domestic product reaches an average increase of 4 per cent during the preceding two years. In the case of the Solidarity Regime contributions amount to 15 per cent of earnings, 12 per cent out of which is devoted to finance pensions for the elderly and the constitution of reserves and 3 per cent is used in covering administration costs and pensions for the disabled and death benefit payments.

Benefits covered by the Pension General System are pensions for the elderly and the disabled, death benefit and burial expenses. Pensions for the elderly are offered under the following variants: annuities, reversible annuities, programmed retirement and programmed retirement with differed annuities. There also exists a minimum pension guarantee whereby the State makes up the possible difference between the pension and the legal minimum wage.

The ensuing list illustrates about alternatives permitted by the Colombian legislation for investing funds from individual capitalization, as well as about the maximum limits, in percentage of the total portfolio, set for each type of instrument:

- 1) issued internal and external public debt's bonds bearing the guarantee of the State,
- 2) other public debt's bonds issued by governmental agencies (up to 20 per cent),
- 3) securities issued by or with the guarantee of the Financial Institutions Guarantee Fund (Fogarín) and Cooperatives Guarantee Fund (Fogacoop) (up to 10 per cent),
- 4) Bank of the Republic's securities,
- 5) mortgage securities (Law 546/1999) (up to 40 per cent),
- 6) debt bonds issued, accepted or guaranteed by institutions under the control of the Colombian Financial Superintendence (up to 70 per cent),
- 7) securities issued by institutions not controlled by the Colombian Financial Superintendence (up to 30 per cent),
- 8) equities (up to 30 per cent),
- 9) current account deposits (up to 2 per cent),
- 10) repurchase agreement operations and active simultaneous operations over admissible investments (up to 10 per cent),
- 11) repurchase agreement operations and active simultaneous operations carried out through agricultural or agroindustrial stock exchanges (up to 5 per cent),
- 12) investment in securities issued by foreign entities (up to 20 per cent),
- 13) protected capital structured products domestically issued or issued abroad whose contractual terms referring to 100 per cent payment of capital and yield are guaranteed by issuers,
- 14) temporal value transfers (only for securities allowed in pension funds' regime of admissible investments) (up to 30 per cent).

## **Mexico**

The Social Insurance Law enacted in December 1995 did away with the existing PAYG system and created a defined contribution regime (individual capitalization) privately managed by the so called Retirement Fund Administrators (AFORES).<sup>45</sup>

As of 1 July 1997, individuals acceding to labour markets freely choose an AFORE whereas they also decide where their contributions will be invested by choosing, on the basis of investment

<sup>45</sup> Their operations actually began in 1997.

profiles, preferences and age, one of the two Retirement Funds Specialized Investment Societies (SIEFORES). Benefits include retirement pensions and pensions for the elderly.

Contributions to the fully funded regime reach 6.5 per cent of earnings, 5.30 points of which go to individual capitalization accounts while AFORES in turn perceive 1.20 points in concept of average fees.<sup>46</sup> In addition to this, a social quota (solidarity contribution) equal to 5.5 per cent of the minimum wage prevailing in the Federal District is provided by the Mexican State to each capitalization account. Individuals can also increase pension fund assets with short and long run voluntary contributions.

Benefits include retirement pensions and pensions for the elderly. Given the regime's defined contribution feature, benefits depend upon the accumulated value and interests in the respective individual capitalization account; beneficiaries have the choice of buying an annuity from an insurance company or deciding for programmed periodic retirements from the AFORES, computed on the basis of the life expectancy and the expected return.

Pension fund administrators are subject to the supervision of an autonomous organism called the System of Saving for Retirement National Commission (CONSAR).

There also exists an insurance for the disabled and the surviving spouse, administered by the Mexican Institute of Social Security (IMSS) and jointly financed by workers, firms and the State (0.62, 1.75 and 0.13 per cent of earned wages respectively).

Workers with proven contributions until June 1997 are entitled to perceive PAYG's benefits, whereas individuals having contributed to PAYG and the fully funded regime have the possibility of choosing between both systems.

A minimum pension, equal to a minimum wage, is guaranteed by the government to individuals proving 1250 weekly contributions and reaching 60/65 years of age.

A multifund system is available from AFORES, as of January 2005, to which pension fund assets can be directed:

- Basic 1 SIEFORE (SB1), whose assets can be only invested in domestic and foreign fixed interest securities and in international permitted bonds and securities from governments and qualified firms.
- Basic 2 SIEFORE (SB2), differing from the preceding one in that investment in equities is also permitted up to a maximum participation of 15 per cent of total. SB3, SB4 and SB5, created in 2008, have authorized participations of 20, 25 and 40 per cent, respectively.<sup>47</sup>

The evolution of the legal framework, from a single fund basically investing in bonds of the domestic public debt to funds respectively investing only in fixed interest securities and in a combination of fixed interest securities and equities, shows that investment alternatives have increased for individual capitalization and that individuals' risk-return profiles are better served now by the five funds available to date.

The new investment regime permitted also to introduce three new possibilities for SIEFORES: investment in private capital and infrastructure (by using structured notes and trusts) and real estate investment (by using trusts).

<sup>46</sup> Since AFORES charge different fees, a single uniform fee for all administrators is computed in terms of the contribution flow, following the CONSAR's methodology.

<sup>47</sup> These three funds can be voluntarily established by the AFORES.

## Peru

The Peruvian retirement structure embodies a public not contributive regime and a mandatory mixed contributive system with public PAYG and private individual capitalization regimes operating in competence. By being affiliation compulsory, workers must decide to which one they will adhere. The fully funded system, enacted in 1992 by Law 25987, started its operation in June 1993.

The average worker's contribution to the private system<sup>48</sup> is 12.66 per cent of his/her taxable income, 10 points of which go to individual capitalization accounts, 0.91 is devoted to finance disability and survival insurances and 1.81 is the fee perceived by the fund administrators. Workers can also realize voluntary contributions. Contributions to the public regime amount to 13 per cent of earned wages.

Benefits from the private system are retirement pensions and pensions for the disabled and the surviving spouse, paid by pension fund administrators or insurance companies under one of the following alternatives: monthly programmed withdrawals from the individual account until funds' exhaustion, family annuities whereby individuals contract an annuity for him/her until death including a survival pension for his/her beneficiaries, temporal rents with differed annuities during a determined first period and a family annuity thereafter.

The Superintendence of Bank and Insurance is in charge of supervising pension fund administrators whereas the PAYG regime is managed by the Prevision Normalization Office.

There are variants whereby pension fund assets can be invested by administrators, the percentage in brackets indicating each instrument's maximum allowed participation within portfolios:

- 1) government bonds (30 per cent),
- 2) Central Bank bonds (30 per cent),
- 3) term deposits and securities from financial system's firms (30 per cent),
- 4) securities issued by financial system's firms (25 per cent),
- 5) subordinated securities issued by financial system's firms and insurance companies (15 per cent),
- 6) investment bonds issued by banks, financial firms and other entities for mortgage financing (40 per cent),
- 7) securities issued by private legal entities not belonging to the financial system (40 per cent),
- 8) short term instruments (15 per cent),
- 9) repurchase agreement operations (10 per cent),
- 10) shares and representative values of rights upon deposited shares registered in the stock exchange (35 per cent),
- 11) certificates of preferential subscription (3 per cent),
- 12) derivatives of values traded in the stock exchange (0,1 per cent),
- 13) financial risk coverage operations (5 per cent),
- 14) participation quotas in investment mutual funds (15 per cent)
- 15) investment instruments representing securitized assets (10 per cent),
- 16) financial instruments issued or guaranteed by foreign states and central banks; shares and values representing rights upon deposited shares registered in the stock exchange; debt bonds,

<sup>48</sup> Contributions to the private system are not deductible from the Income Tax.

- participation quota in mutual funds and risk coverage operations issued by foreign entities (9 per cent),
- 17) share primary issuance and securities representing credit rights oriented to financing new projects (4 per cent),
- 18) promissory notes issued or guaranteed by financial system's firms (5 per cent),
- 19) promissory notes issued or guaranteed by other entities (5 per cent).

The above mentioned investment possibilities are however subject to general participation limits, as indicated below:

- a) bonds issued or guaranteed by the Peruvian Government (30 per cent),
- b) bonds issued or guaranteed by the Central Bank (30 per cent),
- c) the overall sum of a) and b) (40 per cent),
- d) bonds and securities issued by foreign governments and for financial and not financial entities whose economic activity is mostly carried out abroad (17 per cent).

There exist, since 2005, a multifund scheme for mandatory contributions composed of Type 1 Fund (Conservative or Capital Preservation Fund), oriented to a stable growth with low investment volatility; Type 2 Fund (Balanced or Mixed Fund), seeking a moderate growth level with investment medium volatility and Type 3 Fund (Growth Fund), pursuing the fund's highest growth levels with high investment volatility.

Asset investment limits in each fund was set as follows:

Fund type	Instruments and maximum limits for each type of fund			
	Equities	Derivatives	Short-term Securities	Fixed-interest Securities
Type 1	10%	10%	40%	100%
Type 2	45%	10%	30%	75%
Type 3	80%	20%	30%	70%

Finally, no minima limits are established for investment in equities or in fixed interest securities.

### Uruguay<sup>49</sup>

The present Social Security System dates from 1995 (Law 16713), but its operation actually started in 1996. It is a mixed scheme composed of a defined benefit contributive public regime, a private defined contribution individual capitalization regime and derived benefits integrating therefore the Intergenerational Solidarity Retirement System (PAYG) with Individual Capitalization System. Affiliation to the corresponding regime is determined in function of the three following earning levels:

<sup>49</sup> We are very grateful to Alvaro Forteza for his helpful comments on the Uruguayan case.



- a) retirement regime for intergenerational solidarity (PAYG): it includes workers whose monthly incomes are equal to or less than \$ 5,000 pesos (215 dollars),
- b) individual capitalization system: it includes individuals whose monthly income ranges between \$ 5,000 and \$ 15,000 (between 215 and 644 dollars) and those deciding for the fully funded system although their monthly incomes fall below \$ 5,000,
- c) voluntary individual capitalization regime: for all individuals, for amounts exceeding the mentioned compulsory upper limits.

Contributions to the PAYG regime reach 15 per cent of wages and, depending on individuals' earnings and choices, this percentage is split between the public and the private system. Workers with monthly incomes below \$ 5,000 (215 dollars) may also opt for devoting half of their contributions to the individual capitalization regime (voluntary option for the mixed regime).

Contributions to the mandatory fully funded regime reach 15 per cent, of which 12.16 points go to individuals' accounts, 1.854 points is the administrator's fee and 0.988 the insurance premium. Employers' contributions (12.5 plus 5 per cent for mutual insurance for all salary levels) are directed to the PAYG system.

Benefits include pensions for the elderly,<sup>50</sup> computed on the basis of individuals' accumulated assets, the interest rate paid by the insurance company and the beneficiary's life expectancy.<sup>51</sup> Disability contingencies and pensions to the surviving spouse are financed by means of a specific insurance that AFAPS must compulsory take; this insurance's premium is discounted from monthly individuals' contribution to their capitalization accounts.

Pension fund assets are managed by Prevision Save Funds Administrators (AFAP), whereas the Bank of Social Prevision administers the PAYG regime, non contributive benefits, the unemployment insurance, the health insurance and family allowances. The AFAP Control Division, at the Central Bank of Uruguay, is in charge of supervising the individual capitalization regime of second and third pillars.

There also exist a non contributive welfare benefit (62.58 dollars) granted to individuals beyond 70 years who, due to age or disabilities can not accede to a permanent paid job.

The legislation is also specific concerning the participation that diverse national and foreign assets can reach within pension funds' portfolios, as well as the Previsional Save Funds' permitted investments to administrators, as is indicated below:

- 1) bonds issued by the Uruguayan Government (up to 65 per cent),
- 2) securities issued by the Uruguayan Mortgage Bank and instruments of monetary regulation issued by the Central Bank of Uruguay (up to 30 per cent),
- 3) term deposits in domestic financial entities, in national or foreign currency (up to 30 per cent),
- 4) securities from Uruguayan utilities or private firms and mutual investment funds' quota parts, operating in formal markets and authorized by the Uruguayan Central Bank (up to 25 per cent),
- 5) instruments standing for domestically located real estate, industrial, forest and other productive sectors gathering acceptable conditions of safety, return and guarantee, according to the requirements of the Uruguayan Central Bank (up to 20 per cent),

<sup>50</sup> Contrariwise to the capitalization scheme, in which a lower limit does not exist for benefits (pension for the elderly), there is a minimum value for the quota part in the public Intergenerational Solidarity Retirement System equal to \$ 550 (23,60 dollars), which is annually increased in 12 per cent (each year after retirement) with a ceiling of 120 per cent.

<sup>51</sup> Acknowledgement bonds' issuance is not considered by the new regime.

- 6) guaranteed investments in public and private entities whose purpose is to grant loans to social security system's contributors and beneficiaries, Individual loans<sup>52</sup> should be not higher to six salaries or pensions (up to 15 per cent),
- 7) operations aiming at supplying financial risk coverage to the prevision save fund, with limitations and conditions set by the Uruguayan Central Bank (up to 10 per cent),
- 8) fixed interest securities issued by international credit entities, subject to conditions established by the Executive Power (up to 15 per cent).

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<sup>52</sup> Loans granted should be cancelled within the year and their rate of interest will at least equal the evolution of the Wage Average Index plus five percent points.

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