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Pensions and Saving: New International Panel Data Evidence

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Abstract

This paper contributes to the empirical literature on pensions and saving by studying the influence of funded pension systems on the gross national saving rate using a sample of 48 developed and developing countries over the 1980-2004 period. To the best of our knowledge, this updated database –which builds on the one assembled by Lopez Murphy and Musalem (2004) - is the largest on pension funds stocks and flows. Our panel data econometric results suggest that a one-dollar increase in pension saving increases national saving by between 0 and 20 cents. The structure of the system in terms of mandatory participation and portfolio composition does not affect the results, but the maturity of the system does seem to be a robust driver of national saving, inducing an increase of the saving rate of 0.3-0.5 percentage points for each additional year of existence. Reforming countries does not seem to have attained higher saving rates than others. Concerning other saving drivers, the old age dependency ratio and the urbanization ratio (even though the latter loses significance in some regressions) were negatively correlated with saving, while GDP growth, inflation, the terms of trade, and the current account displayed a positive sign. In terms of saving projections, the rather declining trend in pension saving implies that this is unlikely to boost the national saving rate, but the rising old age dependency ratio might cause, over a 25-year time horizon, a fall in the saving rate of 2.1 and 3.3 percentage points in OECD and non-OECD countries, respectively.

I. Introduction

1.1 Pension reform aimed at increasing the level of funding is often claimed to be triggered by the need to boost national saving. However, the underlying theory does not have a conclusive verdict on this matter. Moreover, available evidence is scarce and, with few exceptions, focused on developed economies. Last but not least, the impact of pension saving should not be assessed without previously control for other factors correlated with the national saving rate.

1.2 The present paper contributes to the literature by providing new evidence for a broad sample of countries and years. The database comprises 48 countries (19 from the OECD and 29 from the developing world) spanning the 1980-2004 period, and builds on the one assembled by Lopez Murphy and Musalem (2004), which included information up to 2002 for 43 countries. In light that the panel is strongly unbalanced, the Annex lists the country and time coverage, as well as the sources of information.

1.3 The work is organized as follows: Section 1 reviews the existing theory and evidence, Section 2 statistically describes the database and highlights several stylized facts, and Section 3 reports the econometric findings. Some conclusions close.

II. Section 1: Working Hypotheses and Literature Review

2.1 This section will be devoted to establish the expected outcome of the econometric analysis in light of the theoretical predictions and previous empirical findings. The review does not intend to be exhaustive whatsoever, but instead will try to tightly summarize the existing body of work –the interested reader is referred to Kohl and O`Brien (1998), Lopez Murphy and Musalem (2004) and Davis and Hu (2004) for thorough surveys of the literature on pensions and saving.

2.2 The natural benchmark to gauge the effect of pension saving on national saving is the frictionless permanent income model. In this model, a representative, rational and forward-looking agent, who has access to perfect capital markets, makes consumption plans factoring in his expected lifetime wealth. Moreover, since his preferences are such that the marginal utility is decreasing, he will strive to smooth consumption on a period-by-period basis (consumption will be constant over time only when the interest rate equals the rate of time preference, though). Under these circumstances, pension saving will have no impact on total saving: since the agent is supposed to have already decided how much to save, changing the form in which he does it is immaterial –he will just reduce other saving components to offset for the increase in pension saving.

2.3 Nevertheless, there are at least four crucial assumptions underneath the ineffectiveness of pension saving, namely: (i) pension savings are liquid, (ii) agents do not face financial constraints, (iii) there is no precautionary saving, and (iv) agents are homogeneous, fully rational and altruistic. Ruling out some of these conditions drastically modifies the earlier statements. Specifically, saving can actually change in a variety of cases:

(a) Contributions are mandatory, there are financial constraints and voluntary saving is initially low. In this case, the desire to maintain the previous consumption level may not be attained via borrowing (negative saving) due to the credit market imperfection, and so the increase in pension saving will translate into a net increase in household saving;

(b) Pensions –either voluntary or mandatory- are illiquid and not accepted as collateral, so pension wealth is not a suitable vehicle for precautionary saving. As a result, liquid non-pension saving will not fall one-for-one with pension saving;

(c) Unlike unfunded regimes, which set a mandatory minimum retirement age, workers in funded regimes may be given the option to retire earlier. Those exercising this option will save more, in excess of their contributions to the pension system, in order to provide for such early retirement;

(d) As unfunded social security systems encourage free riding behavior on the part of workers, the passage from pay-as-you-go (PAYG) to funded regimes is likely to boost national saving to the extent that the latter scheme ensures the correspondence between contributions and benefits. However, this conclusion might be qualified when transition costs are taken into account, owing to the intergenerational transfer involved –if current workers bear the burden via higher future taxes, their future disposable income will go down and so their current saving will go up, while the consumption of current retirees might increase provided that, under the new system, they unexpectedly receive higher pensions. As a result, the net effect on national saving is ambiguous;

(e) By the same token, the creation of a funded system is likely to raise awareness about the importance of retirement saving, in what is sometimes labeled as a "recognition effect";

(f) Thaler (1990) stresses the fact that individuals are not as rational as economic theory assumes and instead display several psychological biases. Among them, they might take pension wealth as a separate asset class only disposable for retirement or extreme emergencies, and thus not computable as part of traditional permanent income. If that is the case, no substitution between pension and ordinary saving should be observed, suggesting that changes in the former will have a large incidence on national saving.

2.4   Against the background of an ambiguous theoretical nexus between pension and national saving, the vast majority of the empirical evidence seems to claim a positive influence of pension saving on national saving, although estimated effects differ markedly. A common finding is that ordinary and pension saving are imperfect substitutes, implying that personal saving increases by less than the increase in pension saving. For example, in the lower bound, Pesando (1997) obtains a coefficient of around 0.4 for the U.S. for private saving, which falls to 0.2 after computing the fiscal cost of tax incentives; in the upper bound, Rossi and Visco (1995) reach a coefficient of 0.66 for Italy. Most studies focus on industrial countries and rely on time series analysis without controlling for additional saving determinants. In contrast, the present work will pursue a panel estimation for both developed and developing countries on the basis of reduced-form national saving equations encompassing a number of explanatory variables. In this line of research, three main preceding papers can be cited: Baillu and Reisen (1997) employ a panel of 11 OECD and non-OECD countries, concluding that funded pension systems increase private saving, but much more strongly in the latter set of countries. Edwards (1995) shows that unfunded social security lowers private saving in developing countries. Finally, Lopez Murphy and Musalem (2004) contend, using a broad sample of countries and years, that mandatory funded regimes increase the national saving rate, but voluntary arrangements do not.

III. Section 2: Descriptive Statistics

3.1   Table 1 reports some statistic features of the sample that will constitute the groundwork for the subsequent econometric analysis. It must be highlighted that:

(a) The national saving rate, measured as a ratio to Gross Disposable National Income (GDNI), is similar in OECD (22.3%) and non-OECD countries (21.5%), but there is much more

dispersion across in countries in the second group (the standard deviations are 4.2% and 8.1%, respectively); [1]

(b) Pension saving to GDNI (with pension saving defined as the annual change in the value of the stock of pension funds) is larger in the OECD zone (3% of GDNI against 2.4% in other countries), but in both cases accounts for a non-negligible portion of national saving (13.5% and 11.2%, respectively). Comparing pension reforming and non-reforming countries, the difference in pension saving is of the same order of magnitude (2.3% in the former and 2.8% in the latter) –note, by looking at the Pension Reform Dummy variable, that reforms have taken place exclusively in non-OECD countries, and that 50% of this group has engaged in such process in the last 25 years;[2]

(c) The stock of pension funds differs significantly, with an average of 27% in OECD countries and of 15.8% in non-OECD economies;

(d) The age of the funded pension system is proxied by the number of years for which information on the stock of pension funds is available.[3] In this respect, OECD systems appear to have been running longer than others;

(e) Mandatory regimes exist in half of the sample, but they prevail more in non-OECD countries (70%) than in the OECD (10%). Breaking down the sample into reforming and non-reforming countries, the former reveal a clear preference for mandatory schemes (90%) and the latter for voluntary programs (70%); and

(f) Pension regimes in reforming countries display financial portfolios with predominance of public debt and bank deposits (71.1%), in contrast with non-reforming countries (37.7%). Once again, the difference resembles that between non-OECD (68.7%) and OECD (28.6%) countries.[4]

3.2   The simple correlation coefficients in Table 2 do not provide any solid clue as to how pension variables affect the national saving rate, as most values, yet statistically significant, are below 50%. Of course, simple correlations are exploratory exercises that ought to be validated or not by multivariate regression analysis. At any rate, the national saving rate seems to be lower in systems that were reformed, have a high fraction invested in public sector and bank liabilities, and are mandatory. Conversely, national saving rates appear to be higher in older and larger funded systems. The other correlations just confirm some salient characteristics noted earlier in this section.

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[1] Eastern European countries are considered as developing countries, regardless of whether they are members of the European Union.

[2] Countries are classified as pension reforming following information provided by FIAP (www.fiap.cl). In spite of its pension reform enacted in 1998 and implemented since 1999, Sweden is not classified as a reforming country because the available information on pension assets mostly comes from the pre-reform period.

[3] While information was available for newly created regimes on the starting year, this was not the case for other countries.

[4] This allocation can be explained by: (i) a preference for domestic assets (in some cases accompanied by mandatory investment guidelines), (ii) the lack of a liquid and well-diversified set of alternative instruments in thin capital markets, and (iii) the crowding out exerted by public debt issues in countries with sizable fiscal deficits.

Table 1: Descriptive Statistics (*)

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Full Sample					
National Saving Rate	*1233*	*21.9*	*6.5*	*1.6*	*54.1*
Pension Saving	*574*	*2.7*	*3.7*	*-9.0*	*20.4*
Pension Funds Stock to GDNI	*622*	*21.1*	*24.6*	*0.0*	*119.7*
Age of Funded Pension System	*721*	*10.4*	*7.5*	*1.0*	*36.0*
Pension Reform Dummy	*2250*	*0.3*	*0.5*	*0.0*	*1.0*
Share of public and bank debt (%)	*1394*	*50.9*	*26.4*	*5.0*	*95.0*
Mandatory System Dummy	*2250*	*0.5*	*0.5*	*0.0*	*1.0*
OECD Countries					
National Saving Rate	*599*	*22.3*	*4.2*	*13.3*	*37.2*
Pension Saving	*274*	*3.0*	*4.2*	*-9.0*	*19.2*
Pension Funds Stock to GDNI	*293*	*27.0*	*28.3*	*0.6*	*119.7*
Age of Funded Pension System	*361*	*12.4*	*8.1*	*1.0*	*36.0*
Pension Reform Dummy	*900*	*0.0*	*0.0*	*0.0*	*0.0*
Share of public and bank debt (%)	*619*	*28.6*	*16.2*	*5.0*	*73.0*
Mandatory System Dummy	*900*	*0.1*	*0.3*	*0.0*	*1.0*
Non-OECD Countries					
National Saving Rate	*634*	*21.5*	*8.1*	*1.6*	*54.1*
Pension Saving	*300*	*2.4*	*3.1*	*-7.5*	*20.4*
Pension Funds Stock to GDNI	*329*	*15.8*	*19.5*	*0.0*	*73.9*
Age of Funded Pension System	*360*	*8.4*	*6.2*	*1.0*	*29.0*
Pension Reform Dummy	*1350*	*0.5*	*0.5*	*0.0*	*1.0*
Share of public and bank debt (%)	*775*	*68.7*	*18.3*	*32.0*	*95.0*
Mandatory System Dummy	*1350*	*0.7*	*0.5*	*0.0*	*1.0*
Pension Reforming Countries					
National Saving Rate	*299*	*17.7*	*5.7*	*1.6*	*35.3*
Pension Saving	*125*	*2.3*	*3.3*	*-5.2*	*17.1*
Pension Funds Stock to GDNI	*140*	*9.9*	*14.3*	*0.0*	*68.8*
Age of Funded Pension System	*144*	*6.5*	*4.9*	*1.0*	*24.0*
Share of public and bank debt (%)	*550*	*71.1*	*17.4*	*38.0*	*95.0*
Mandatory System Dummy	*675*	*0.9*	*0.2*	*0.0*	*1.0*
Non-Pension Reforming Countries					
National Saving Rate	*934*	*23.2*	*6.2*	*10.1*	*54.1*
Pension Saving	*449*	*2.8*	*3.8*	*-9.0*	*20.4*
Pension Funds Stock to GDNI	*482*	*24.3*	*26.0*	*0.0*	*119.7*
Age of Funded Pension System	*577*	*11.4*	*7.7*	*1.0*	*36.0*
Share of public and bank debt (%)	*844*	*37.7*	*22.8*	*5.0*	*90.0*
Mandatory System Dummy	*1575*	*0.3*	*0.4*	*0.0*	*1.0*

(*) All saving rates are gross of capital consumption and scaled by GDNI.
See Annex for sample composition and sources.

Table 2: Correlation Matrix (^)

		1	2	3	4	5	6	7
1	*National Saving Rate*	*1*						
2	*Pension Saving*	*-0.03*	*1*					
3	*Pension Funds Stock*	*0.14****	*0.67****	*1*				
4	*Age of Funded Pension System*	*0.12****	*0.19****	*0.42****	*1*			
5	*Pension Reform Dummy*	*-0.36****	*-0.06*	*-0.25****	*-0.26****	*1*		
6	*Share of public and bank debt (%)*	*-0.27****	*-0.11***	*-0.33****	*-0.25****	*0.62****	*1*	
7	*Mandatory System Dummy*	*-0.18****	*0.11****	*-0.02*	*-0.04*	*0.60****	*0.52****	*1*

(^) (***) Significant at 1%; (**) Significant at 5%: (*) Significant at 10%.

IV. Section 3: Econometric Results

4.1   Relying on the theoretical foundations discussed in Section 1, a number of econometric results will be presented next to assess the empirical nexus between pension and national saving rates. In order to avoid misspecification and the consequent undesirable estimate properties, several controls will be introduced in the national saving rate equation following the profuse literature in the field (see Loayza, Schmidt-Hebbel, and Serven (2001) and other research work in the References section). The old dependency ratio (the proportion of people older than 65 to that between 15 and 64) depresses saving rates as a result of life cycle considerations –old people have higher propensities to consume. In a similar fashion, young people consumes but does not produce, and thus the young dependency ratio (the proportion of people younger than 15 to that between 15 and 64) should push saving rates down. In the presence of a precautionary saving motive, it may be expected that people living in urban (as opposed to rural) locations should have better opportunities to diversify their sources of labor income and face less uncertainty, with a resulting negative impact of urbanization ratios on saving. In the spirit of permanent income models, per capita GDP growth increases saving as long as consumers take this income growth as temporary. The inflation rate, a standard indicator of macroeconomic uncertainty, may increase precautionary saving, but on the other hand may reduce it provided consumers decide to spend more in anticipation to lower purchasing power in the future. Given the widespread existence of financial constraints (see Japelli and Pagano (1994) and Shea (1996)), the expansion of credit (measured by the change in the ratio of credit to the private sector to GDP) may act against saving (see Loayza et al. (2000)). These variables come from the World Development Indicators produced by the World Bank.

4.2   The baseline regressions are presented in Table 3, where fixed and random effects techniques are alternatively used. Pension saving, the main variable of interest, yields a positive coefficient in the neighborhood of 0.1, which turns out to be statistically significant at 5% under fixed effects and at 10% under random effects. This implies that funded pension systems exert a positive and significant impact on national saving, with a one-dollar increase in pension saving translating into 10 cents of additional national saving. An unreported Hausman test led to reject the random in favor of the fixed effects, and consequently only the latter estimates will be presented. As for the control variables, none of them has a significant effect contrary to the theory. The strongest results are the negative coefficient on Old Dependency Ratio and the positive one on GDP Growth and Inflation. Urban Population is negative but not significant, but it is in the next

estimations. Both regressions include annual time dummies, which are not shown in the table to save space, but are obviously available on request. Wald and F tests of joint significance support the model, in spite of quite low R-squared values, a point we will resume later on.

Table 3: Baseline Regressions

Dependent Variable: National Saving Rate	(1)	(2)
Explanatory Variables		
Pension Saving	0.098	0.12
	(1.71)*	(2.23)**
Old Age Dependency Ratio	-31.37	-64.78
	(-3.42)***	(-3.39)***
Young Age Dependency Ratio	-16.67	-2.83
	(-4.35)***	(-0.48)
Urban Population	-0.035	-0.125
	(-1.06)	(-1.38)
Per Capita GDP Growth	0.19	0.162
	(4.01)***	(3.73)***
Inflation Rate	0.073	0.105
	(2.89)***	(4.57)***
Change in Credit to the Private Sector	0.001	0.001
	(0.04)	(0.05)
Method	Random Effects	Fixed Effects
No. Observ.	518	518
No. Countries	48	48
Longest Annual Period	1981-2004	1981-2004
Time Dummies	Yes	Yes
Country Dummies	No	Yes
R-Squared	0.131	0.008
Wald (RE) and F (FE) Statistics (p-value)	127 (0.000)	5.3 (0.000)

Note: T Statistics in parenthesis, (***) Significant at 1%,
(**) Significant at 5%, (*) Significant at 10%

4.3　　In Table 4, interaction terms are introduced to assess whether specific features of the pension system have any differential explanatory power on the national saving rate. Regression (3) starts by interacting pension saving with a dummy taking a value of 1 if the country has undertaken a pension reform from an unfunded to a funded system. The new variable enters significantly with a coefficient of 0.26, greater than before, but lessens the significance of Pension Saving per se. Conversely, none of the remaining interactive terms are significantly different from zero, as it is Pension Saving, most likely owing to multicollinearity. Columns (4) to (6) implies that: (i) mandatory regimes are not conducive to stimulate saving, (ii) countries with larger market capitalization, in which pension assets can be more efficiently invested, do not enjoy any particular advantage in the eyes of contributors at the time of making saving decisions, and (iii) a heavy exposure to public and bank debt (a symptom of potential fiscal complications, thin capital markets, and high financial risk) is unimportant, as well.

Table 4: Interaction Terms

Dependent Variable: National Saving Rate	(3)	(4)	(5)	(6)
Explanatory Variables				
Pension Saving	0.059 (0.99)	0.116 (1.77)*	-0.067 (-0.97)	0.032 (0.3)
Pension Saving * Pension Reform Dummy	0.258 (2.05)**			
Pension Saving * Mandatory System		0.0025 (0.03)		
Pension Saving * Stock Market Capitalization			0.0007 (1.36)	
Pension Saving * Share of Public and Bank Debt				0.002 (0.86)
Old Age Dependency Ratio	-80.24 (-4.28)***	-80.20 (-4.25)***	-91.37 (-6.19)***	-79.02 (-3.32)***
Young Age Dependency Ratio	-1.13 (-0.2)	-1.19 (-0.21)	4.13 (0.88)	-69.87 (-4.78)***
Urban Population	-0.213 (-2.29)**	-0.219 (-2.34)**	-0.189 (-2.4)**	-0.589 (-5.06)***
Per Capita GDP Growth	0.161 (3.79)***	0.164 (3.83)***	0.029 (0.86)	0.30 (5.28)***
Inflation Rate	0.09 (3.94)***	0.094 (3.99)***	0.118 (4.8)***	0.101 (4.39)***
Change in Credit to the Private Sector	-0.0027 (-0.18)	-0.004 (-0.31)	-0.0000 (-0.01)	-0.005 (-0.3)
Method	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
No. Observ.	518	518	518	332
No. Countries	48	48	48	30
Longest Annual Period	1981-2004	1981-2004	1981-2004	1981-2004
Time Dummies	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
R-Squared	0.005	0.006	0.0023	0.147
F Statistics (p-value)	5.22 (0.000)	5.04 (0.000)	5.02 (0.000)	4.6 (0.000)

Note: T Statistics in parenthesis, (***) Significant at 1%,
(**) Significant at 5%, (*) Significant at 10%

4.4   Next, Pension Saving is interacted with Pension Fund Assets. The underlying hypothesis is that, as the system evolves and matures, a gradually catching "recognition effect" is more likely to be at work, inducing more saving. However, Regression (7) does not pick it up, even though the Pension Saving coefficient doubles compared with the baseline Regression (2). Regression (8)

reexamines this effect by introducing a proxy for the age of the pension system (i.e., for each observation, the number of accumulated years for which there is information on pension assets – see also Footnote 3 above).5 The coefficient is again not different from zero. However, when Age is included separately instead of interacted with Pension Saving, the estimate not only is highly significant but renders a coefficient of 0.5, meaning that each additional year adds 0.5 percentage points to the national saving rate, everything else equal. The presence of outliers is tested by dropping all observations before 1990. When keeping 414 out of the total 518 observations, the Pension Saving coefficient loses its statistical significance. Nevertheless, as shown by Regression (11), Age remains highly significant.

Table 5: Additional Interaction Terms and Time Series Subsamples

Dependent Variable: National Saving Rate	(7)	(8)	(9)	(10)	(11)
Explanatory Variables					
Pension Saving	0.248 (2.26)**	0.181 (1.73)*	0.118 (2.26)**	0.01 (0.26)	0.01 (0.26)
Pension Saving * Pension Fund Stock	-0.002 (-1.48)				
Pension Saving * Age of the Funded Pension System		-0.0044 (-0.7)			
Age of the Funded Pension System			0.49 (3.99)***		0.316 (4.98)***
Old Age Dependency Ratio	-80.45 (-4.28)***	-79.93 (-4.24)***	-80.21 (-4.26)***	-93.82 (-6.46)***	-93.82 (-6.46)***
Young Age Dependency Ratio	-0.30 (-0.05)	-0.81 (-0.14)	-1.19 (-0.21)	6.31 (1.26)	6.31 (1.26)
Urban Population	-0.217 (-2.33)**	-0.218 (-2.33)**	-0.219 (-2.34)**	-0.224 (-2.86)***	-0.224 (-2.86)***
Per Capita GDP Growth	0.165 (3.86)***	0.166 (3.86)***	0.164 (3.83)***	0.063 (1.91)*	0.063 (1.91)*
Inflation Rate	0.084 (3.57)***	0.091 (3.86)***	0.094 (4.11)***	0.091 (3.84)***	0.091 (3.84)***
Change in Credit to the Private Sector	-0.004 (-0.28)	-0.005 (-0.34)	-0.005 (-0.31)	-0.004 (-0.35)	-0.004 (-0.35)
Method	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
No. Observ.	518	518	518	414	414
No. Countries	48	48	48	48	48
Longest Annual Period	1981-2004	1981-2004	1981-2004	1990-2004	1990-2004
Time Dummies	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes
R-Squared	0.005	0.005	0.03	0.0001	0.005
F Statistics (p-value)	5.13 (0.000)	5.06 (0.000)	5.21 (0.000)	5.38 (0.000)	5.38 (0.000)

Note: T Statistics in parenthesis, (***) Significant at 1%,

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[5] This variable may also capture another effect linked to the maturity of the system. The institution of a funded mandatory system may increase the share of illiquid assets of the private sector beyond its desired level. Since changing the stock of such assets is a slow and costly process, the public may restore their optimal mixed of liquid and illiquid assets by increasing current saving to accumulate the former.

(**) Significant at 5%, (*) Significant at 10%

4.5 The next robustness check consists in partitioning the sample into OECD and non-OECD countries. At first glance, Regressions (12) and (13) lead to believe that the significance of Pension Saving is driven by non-OECD countries, a finding that can be justified by the more extended prevalence of borrowing constraints and the lack of use of pension wealth as collateral. However, a closer examination casts doubt about this conclusion. Regression (14) repeats the exercise by excluding observations before 1990 and including the age of the funded pension system, as in Regression (11). Now, Pension Saving becomes non-significant, while Age passes the test once again. Since Pension Saving remains non-significant after excluding Age in Regression (14), we infer that there might be influential observations in the pre-1990 period.

4.6 The empirical saving literature stresses that an array of market imperfections break the full offset between private and public saving, on one hand, and between personal and corporate saving, on the other hand. The failure of the Ricardian equivalence and the incomplete piercing of the corporate veil suggest that the government and the corporate saving rates are relevant explanatory variables of the national saving rate. Correspondingly, Regression (15) incorporates these two additional controls. Unfortunately, relatively long series of saving broken down by institutional sector are only available for 16 OECD countries (see Bebczuk and Schmidt-Hebbel (2006), from where data comes). With observations shrank to 200, results are now favorable to a positive effect of Pension Saving of the order of 0.13. Concerning social expenditures, the prior is that public retirement coverage should directly reduce government saving and indirectly private sector saving, with an overall negative influence on national saving. Regression (16) strongly confirms this belief –data limitations narrow down the sample to 321 observations for 37 countries.

Table 6: OECD vs. non-OECD Countries and Social Expenditures

Dependent Variable: National Saving Rate	(12)	(13)	(14)	(15)	(16)
Explanatory Variables					
Pension Saving	0.044 (0.9)	0.204 (2.29)**	0.013 (0.20)	0.131 (2.83)***	0.0136 (0.25)
Government Saving to GDNI				0.662 (9.56)***	
Corporate Saving to GDNI				0.637 (6.08)***	
Age of the Funded Pension System			0.342 (2.15)**		
Social Expenditure to GDP					-116.94 (-14.93)***
Old Age Dependency Ratio	-63.50 (-3.83)***	-117.99 (-2.04)**	-150.1 (-2.83)***	-96.63 (-4.13)***	-56.73 (-1.91)*
Young Age Dependency Ratio	-8.55 (-0.44)	37.66 (3.99)***	19.22 (2.17)**	-80.64 (-4.55)***	-21.71 (-2.52)**
Urban Population	-0.42 (-4.43)***	-0.312 (-2.09)**	0.248 (1.48)	-0.861 (-3.33)***	0.117 (0.69)
Per Capita GDP Growth	0.319 (3.88)***	0.114 (2.22)**	0.037 (0.88)	0.173 (1.89)*	0.046 (0.9)
Inflation Rate	0.059 (2.4)**	0.07 (1.8)*	0.10 (3.28)***	-0.191 (-3.45)***	-0.007 (-0.29)
Change in Credit to the Private Sector	0.003 (0.29)	-0.027 (-0.73)	0.028 (0.98)	-0.013 (-1.07)	-0.006 (-0.37)
Method	Fixed	Fixed	Fixed	Fixed	Fixed

	Effects	Effects	Effects	Effects	Effects
No. Observ.	242	276	234	200	321
No. Countries	19 [OECD]	29 [Non-OECD]	29 [Non-OECD]	16	37
Longest Annual Period	1981-2004	1981-2004	1990-2004	1981-2004	1981-2004
Time Dummies	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes
R-Squared	0.033	0.045	0.017	0.09	0.164
F Statistics (p-value)	4.13 (0.000)	6.91 (0.000)	1.74 (0.03)	11.2 (0.000)	14.02 (0.000)

Note: T Statistics in parenthesis, (***) Significant at 1%,
(**) Significant at 5%, (*) Significant at 10%

4.7   Saving has been found to be correlated with a number of macroeconomic variables. In order to prioritize parsimony, the model chosen so far includes some, but not all, of those macroeconomic regressors. To ensure that results are not being driven by omitted variables, Regressions (17) and (18) add two other popular driving forces of saving: per capita GDP and the current account to GDP. Since it is expected that richer economies have better institutions and that the willingness to save increase with excess income beyond subsistence, the predicted sign is positive. On the other hand, the presence of national financial constraints gives rises to a positive link between the current account balance and the saving rate, in view that national and foreign savings might act as substitutes for each other. The latter hypothesis, but not the former, is supported by the data. More important to this study, this new specification does not affect the positive and significant sign on Pension Saving for the whole sample. The terms of trade, another often used control variable in saving regressions, is incorporated in Regression (19) with the expected positive sign and a reinforced significance of Pension Saving. Also, in an unreported regression, GDP growth was replaced by GDNI growth, a more accurate measure of income changes, but results remain virtually the same in light of the almost perfect correlation between both variables.

4.8   Meanwhile, Regression (20) replaces the contemporaneous values of Pension Saving, GDP Growth, Inflation and Change in Credit for their first lag. The rationale is that, in macroeconomic analysis, there exists the suspicion that some regressors are not strictly exogenous, as implicitly assumed in econometrics. Endogeneity creates biased and inconsistent estimators. While it is unlikely that Pension Saving is an endogenous variable –in particular, mandatory pension saving is exogenous by definition-, this might be the case for other variables. One way to deal with this caveat is to use internal instruments (lagged values of the respective variable) to construct Generalized Method of Moments (GMM) estimators. Even though this is a rather popular and sophisticated technique, it is quite often found that GMM generates weak instruments, which in the end means that the endogeneity issue is far from being solved. Instead, Regression (20) resorts to another, much simpler option, which is to directly use first lags as regressors. Anyway, no major changes come up from the inspection of the new estimates.

4.9   Table 8 replicates the above exercises but restricting the sample to the group of developing countries. It looks reassuring that the coefficients of per capita GDP, the current account and the terms of trade maintain their significance and, even more importantly, that Pension Saving enters positively as well, with an estimate in the range of 0.2-0.3. Additionally, we include the stock of credit to GDP instead of the flow as in previous tables. This variable may either capture financial constraints (with a negative impact on national saving) or institutional strength (with a positive impact). The results in Regression (23) seem to be in line with the latter interpretation.

Table 7: Additional Macroeconomic and Lagged Regressors

Dependent Variable: National Saving Rate	(17)	(18)	(19)	(20)
Explanatory Variables				
Pension Saving	0.113 (2.15)**	0.101 (2.22)**	0.155 (2.94)***	
Lagged Pension Saving				0.145 (2.8)***
Old Age Dependency Ratio	-82.03 (-4.32)***	-53.64 (-3.24)***	-72.1 (-3.87)***	-78.33 (-4.42)***
Young Age Dependency Ratio	1.72 (0.25)	4.01 (0.8)	-6.09 (-1.05)	0.889 (0.16)
Urban Population	-0.228 (-2.42)**	-0.019 (-0.23)	-0.248 (-2.62)***	-0.058 (-0.58)
Per Capita GDP Growth	0.168 (3.9)***	0.286 (7.39)***	0.175 (4.18)***	
Lagged Per Capita GDP Growth				0.144 (3.37)***
Inflation Rate	0.097 (4.18)***	0.074 (3.67)***	0.091 (4.07)***	
Lagged Inflation Rate				0.068 (3.07)***
Change in Credit to the Private Sector	-0.0031 (-0.2)	0.03 (2.26)	-0.003 (-0.23)	
Lagged Change in Credit to the Private Sector				0.001 (0.09)
Per Capita GDP	-0.00012 (-0.8)			
Current Account to GDP		0.422 (11.79)***		
Terms of Trade			0.119 (6.06)***	
Method	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
No. Observ.	518	518	489	489
No. Countries	48	48	43	45
Longest Annual Period	1981-2004	1981-2004	1981-2004	1982-2004
Time Dummies	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
R-Squared	0.002	0.118	0.019	0.009
F Statistics (p-value)	5.07 (0.000)	10.74 (0.000)	6.66 (0.000)	5.23 (0.000)

Note: T Statistics in parenthesis, (***) Significant at 1%,
(**) Significant at 5%, (*) Significant at 10%

Table 8: Additional Macroeconomic and Lagged Regressors, Non-OECD Countries

Dependent Variable:	(21)	(22)	(23)	(24)
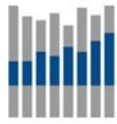
National Saving Rate				
Explanatory Variables				
Pension Saving	0.19 (2.14)**	0.236 (2.92)***	0.282 (2.89)***	0.209 (2.38)**
Old Age Dependency Ratio	-110.05 (-1.83)***	-100.0 (-1.95)*	-153.5 (-2.71)***	-145.1 (-2.54)**
Young Age Dependency Ratio	4.88 (5.03)***	3.56 (4.23)***	-4.17 (4.46)***	4.19 (4.5)***
Urban Population	-0.343 (-2.30)**	-0.088 (-0.65)	-0.324 (-2.25)**	-0.331 (-2.26)**
Per Capita GDP Growth	0.106 (2.12)**	0.194 (4.09)***	0.121 (2.44)**	0.143 (2.81)***
Inflation Rate	0.082 (2.31)**	0.009 (0.27)	0.07 (2.02)**	0.071 (1.96)*
Per Capita GDP	-0.0004 (-1.66)*			
Current Account to GDP		0.349 (6.87)***		
Terms of Trade			0.086 (3.13)***	
Credit to the Private Sector to GDP				0.032 (1.97)*
Method	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
No. Observ.	286	286	263	279
No. Countries	29 [Non-OECD]	29 [Non-OECD]	29 [Non-OECD]	29 [Non-OECD]
Longest Annual Period	1981-2004	1981-2004	1981-2004	1982-2004
Time Dummies	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
R-Squared	0.078	0.002	0.037	0.021
F Statistics (p-value)	7.57 (0.000)	10.39 (0.000)	8.52 (0.000)	7.48 (0.000)

Note: T Statistics in parenthesis, (***) Significant at 1%,
(**) Significant at 5%, (*) Significant at 10%

4.10   Finally, Regressions (24) and (25) include the lagged national saving rate in the right-hand side. This obeys to the presumption, documented in several empirical contributions, that saving decisions have a strong inertial behavior. One rationale for this is that underlying preferences are based on habit formation (see Dynan (2000)). However, a usually overlooked drawback is that, when the other regressors are persistent over time, the lagged dependent variable will be even more significant once it will partly reflect the explanatory power of those variables, creating a serious multicollinearity problem without adding new information. Furthermore, the simultaneous inclusion of the lagged dependent variable and country fixed effects renders the coefficient inconsistent. Nonetheless, Table 9 reveals that there is a considerable inertia in saving decisions, as the lagged value yields a coefficient of 0.7 with fixed effects and 0.89 with random effects. As discussed before, this change creates a noticeable variation in other coefficients, although Pension Saving remains significant in Regression (24). Undoubtedly, the most remarkable news is that the R-Squared jumps to 0.71 (fixed effects) and 0.94 (random effects) from its extremely low levels in previous regressions, signalling that inertia is certainly relevant in spite of the associated econometric shortcomings. Consequently, while repeating that the estimated coefficients are not reliable enough to measure marginal impacts, Regression (25) can anyway be used for out-of-sample projections because of its remarkable goodness-of-fit.
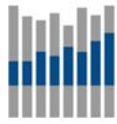
Table 9: Lagged Dependent Variable

Dependent Variable: National Saving Rate	(24)	(25)
Explanatory Variables		
Lagged National Saving	0.705 (25.7)***	0.889 (50.26)***
Pension Saving	0.075 (2.27)**	0.036 (1.2)
Old Age Dependency Ratio	-42.51 (-3.55)***	-10.50 (-3.21)***
Young Age Dependency Ratio	0.818 (0.23)	-5.36 (-3.65)***
Urban Population	-0.008 (-0.13)	-0.006 (-0.67)
Per Capita GDP Growth	0.045 (1.64)	0.037 (1.34)
Inflation Rate	0.045 (3.07)***	0.013 (0.92)
Change in Credit to the Private Sector	-0.017 (-1.8)*	-0.019 (-1.85)*
Method	Fixed Effects	Random Effects
No. Observ.	518	518
No. Countries	48	48
Longest Annual Period	1981-2004	1981-2004
Time Dummies	Yes	Yes
Country Dummies	Yes	No
R-Squared	0.71	0.942
F Statistics (p-value)	32.11 (0.000)	3510.5 (0.000)

Note: T Statistics in parenthesis, (***) Significant at 1%,
(**) Significant at 5%, (*) Significant at 10%

V. Conclusions

5.1   The goal of this paper was to assess the effect of pension saving on the gross national saving rate. After revising the theoretical underpinnings, many different models were run to that end. The results point to a positive impact, even though they are somewhat fragile to particular sample changes. Taking a conservative position, the main finding is that a one-dollar increase in pension saving increases national saving by between 0 and 20 cents. The structure of the system in terms of mandatory participation and portfolio composition does not affect the results, but the maturity of the system does seem to be a robust driver of national saving, inducing an increase of the saving rate of 0.3-0.5 percentage points for each additional year of existence. Reforming countries does not seem to have attained higher saving rates than others. Concerning other saving determinants, the old age dependency ratio and the urbanization ratio (even though the latter loses significance in some regressions) were negatively correlated with saving, while the GDP growth, the inflation rate, the terms of trade, and the current account displayed a positive sign.

5.2 Based on the evolution over the last decade, it looks unlikely that pension saving will be an upward force for national saving rates in the near future, even under a marginal positive effect, simply because pension saving has been declining as of late (for instance, it went down from 4.1% of GDNI in 1995-1999 to 1.5% in 2000-2003 in OECD countries and from 2.2% to 1.6% in non-OECD countries). As for the old age dependency ratio, it has been increasing on average by 0.13 percentage points per year in the former group and 0.11 in the latter since 1995. Using the coefficients estimated in Regressions (12) and (13), this accounts for an annual reduction of the national saving rate of 0.08 and 0.13 percentage points. Over a 25-year time horizon, this implies a pronounced accumulated fall in the saving rate of 2.1 and 3.3 percentage points, respectively.
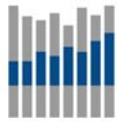
Annex: Sample Coverage and Sources

Country	Period
Argentina	1994-2004
Australia	1988-2001
Austria	1993-2004
Belgium	1981-2004
Bolivia	1997-2004
Brazil	1994-2003
Bulgaria	2001-2004
Canada	1980-2001
Chile	1981-2004
Colombia	1994-2004
Costa Rica	1991-2003
Czech Republic	1994-2004
Denmark	1988-2004
Egypt	1993-2001
El Salvador	1998-2004
Estonia	2002-2004
France	2001-2003
Germany	1980-2004
Hungary	1994-2004
Iceland	1980-2004
India	1990-1998
Ireland	2001-2004
Italy	1990-2001
Japan	1989-2001
Jordan	1980-2002
Kazahstan	1998-2003
Korea	1986-2001
Malaysia	1976-2002
Mexico	1997-2004
Morocco	1988-2002

Annex: Sample Coverage and Sources (cont.)

Country	Period
Nepal	1997-2002
Netherlands	1981-2001
New Zealand	2001-2004
Norway	1980-2001
Panama	1996-2002
Peru	1993-2004
Philippines	1993-2002
Poland	1999-2004
Portugal	1989-2004
Singapore	1983-2002
Slovenia	2001-2004
South Africa	1989-2002
Spain	2001-2004
Sweden	1990-2001
Thailand	1984-1998
United Kingdom	1980-2001
United States	1981-2001
Uruguay	1996-2004

Sources: Lopez Murphy and Musalem (2004), OECD (2005), World Bank EU8 (2005), and FIAP (www.fiap.cl).

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