Is Pension Reform Conducive to Higher Saving?

Andrew A. Samwick
Dartmouth College
samwick@dartmouth.edu

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Abstract:

Declining fertility, mortality, and productivity rates in developed countries and the popularity of the social security privatization in Chile as a pathway to financial development have sparked a global interest in social security reform. This paper analyzes the effect of social security on saving using a panel of countries over twenty-five years. Variation in the characteristics of social security systems is used to determine whether less reliance on a pay-as-you-go, unfunded system is associated with higher national saving. There is little evidence that countries that implement defined contribution reforms have higher trends in savings rates after the reform. Cross-sectionally, countries with pay-as-you-go systems tend to have lower saving rates, and this effect increases with the coverage rate on the system.

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I. Introduction

As the long-term consequences of population aging have become known and more widely discussed, the financing of entitlement programs in public social insurance systems has received considerable attention. Most developed countries operate some form of unfunded or pay-as-you-go (PAYG) social security system for providing old-age, survivor, and invalidity benefits. Declining fertility rates, lower mortality rates, and sagging rates of productivity growth are currently squeezing almost all of these systems.

There are now many different proposals for ways to reform the system in the United States that would rely on prefunding to pay for future liabilities.¹ Many of these plans are inspired by the success of the Chilean pension reform in 1981 that retired its existing PAYG system and instituted a system of mandatory public pension accounts in its place. In fact, there are several other countries that have implemented reforms similar to Chile’s in the subsequent period. Additionally, social security systems differ across countries in the degree to which they already prefund their liabilities, either implicitly or explicitly.

This paper assesses the impact of public pensions on national saving. The analysis proceeds in two directions. The first is to examine the time-series pattern of saving within countries that have either made substantial reforms of PAYG systems to make them funded or established new systems that are themselves designed to be funded. There is little evidence that countries that implement defined contribution reforms have higher trends in savings rates after the reform. The second is to examine differences in

saving rates in a cross-section of countries as a function of characteristics of their pension programs. Countries that operate unfunded, PAYG systems tend to have lower saving rates, with the magnitude of the effect increasing with the degree of coverage for the system.

The remainder of the paper is organized as follows. Section II discusses the possible savings responses to pension reform based on the standard life cycle model and reasonable extensions. The next two sections contain the empirical analysis, with the time-series evidence on pension reforms within countries presented in Section III and the cross-sectional evidence on the determinants of saving in Section IV. Section V discusses directions for further research and concludes.

II. Theoretical Background

The literature on the effects of Social Security programs on national saving has relied primarily on the Auerbach and Kotlikoff (1987) overlapping generations (OLG) model of consumption as an organizing framework. Under reasonable assumptions about the growth rates of population and economic growth, the model predicts that the introduction of an unfunded or pay-as-you-go (PAYG) system will reduce aggregate saving. The focal point is the transfer of wealth to the initial generation of retirees from current workers and future generations. Only if Ricardian equivalence held through intergenerational linkages would current and future consumption be unaffected. Other sources of changes in saving pertain to differences in redistribution within cohorts under the PAYG and funded systems. This section discusses the potential impact of both inter- and intragenerational redistribution on saving.
Recent proposals for social security reform are based on the scaling back of existing PAYG programs in favor of fully or partially funded systems of retirement income support. Several studies have analyzed transitions from PAYG to FF systems in an OLG framework. Cohorts that are alive during the transition confront the familiar issue of paying for two retirements, their own and that of current beneficiaries of the PAYG system.

As discussed in Holzmann (1997a) and Schmidt-Hebbel (1998), the government’s treatment of this additional financing requirement is critical to the effect of the transition on saving. One option is for the government to issue explicit debt to replace the debt that was previously implicit in the PAYG system. In such a scenario, there are no additional life-cycle reasons for household saving to change, apart from small changes that may arise out of a new distribution of the burden of financing the explicit versus implicit debt. For example, the tax base for the PAYG system in the United States is capped at a maximum taxable earnings level. A switch to explicit debt financed by the progressive income tax would transfer resources from high-income to low-income workers relative to the current implicit debt financed by the regressive payroll tax. This would lower saving due to higher propensities to consume at lower income levels.

A second financing option is to liquidate assets held by the government to help finance the transition. For example, in discussions of Social Security reform in the United States, several proposals have suggested a drawing down of the funds already accumulated in the Social Security Trust Fund to finance initial contributions to a defined contribution system. The recent reforms in both Colombia and Peru made use of the

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2 These include Arrau (1990), Arrau and Schmidt-Hebbel (1993), Cifuentes and Valdés-Prieto (1996), and
reserves in pre-existing, partially funded systems to help finance the transition to the new system. Similarly, state-owned enterprises were sold to help finance the transition in Bolivia’s recent reforms. The effect of such liquidations on national saving, to the extent they are measured, will depend on whether the overall distribution of resources shifts toward consumers with high or low marginal propensities to consume relative to the population as a whole.

A third option is to raise taxes (or cut expenditures) to pay for the cost of the two retirements during the transition. The effect of this tax increase is to reduce the disposable income of current workers. If their consumption falls by the same amount, then national saving increases by the full amount of the tax increase. However, households saving according to the life-cycle model will attempt to smooth the tax increase over the remainder of their lifetimes. Lower private saving will therefore finance part of the tax increase.

As noted by Cifuentes and Valdés-Prieto (1996), the presence of credit constraints may hamper the ability of households to finance the transition tax through lower private saving. For some households, the transition tax, and even the portion of it that they would desire to dissave according to the standard life-cycle model, might represent more than their prior saving rate. Unless these households are able to borrow against their future income, they will have no choice but to lower their consumption. Samwick (1998a, b) further shows that buffer-stock savers of the sort described in Carroll (1992, 1994) will be unwilling to reduce their saving in response to the tax increase because their existing saving was motivated by precautionary rather than life-cycle reasons.

Kotlikoff, Smetters, and Walliser (1997).
Alternatively, consumers might simply exhibit a “Keynesian” propensity to consume their disposable income each year. All three of these theories suggest that under a tax-financed transition, private saving will decrease to offset some of the tax increase but by an amount less than predicted by the standard life-cycle model.

Many reforms, such as those in Chile (1981), Peru (1993), and Colombia (1994), involve the issuing of “recognition bonds” to substitute for the obligations of the PAYG system. Since the true value of the PAYG obligations can only be forecasted imperfectly, recognition bonds may provide a mechanism for governments to partially repudiate some of the implicit debt by issuing bonds for an amount less than the expected value of these implicit obligations. If this occurs, current workers will respond by reducing consumption and increasing saving. However, it is also possible that even if recognition bonds represent a reduction in social security wealth relative to what is implied by current law, they may yet represent a greater return from the existing social security system than workers expected, based on the financial condition of the system in the absence of reform. In that case, the issuing of recognition bonds could lead to an increase in current consumption and a reduction in saving.

The means of financing the transition is the most important factor in determining saving, as it governs the transfer between currently old generations (with high propensities to consume) to currently young generations (with lower propensities to consume). However, other aspects of the reform may also affect the saving response based on transfers between members of the same cohort with different income levels. Households with higher income levels tend to have higher propensities to consume.
In general, the new systems proposed under the FF reforms attempt to accomplish fewer objectives in redistributing income within cohorts than do the PAYG systems they are replacing. For example, an important element of current PAYG systems is the implicit redistribution in progressive benefit formulas (net of taxes paid). If done explicitly, these redistributive policies would be cumbersome to implement and, possibly, politically unpopular. As a result, proposals to transition from PAYG to FF systems do not emphasize procedures to retain the progressivity in the current systems. Because the marginal propensity to consume typically declines with the level of income, transferring wealth within a generation from low-income workers to high-income will increase savings.

The progressive benefit formulas in the PAYG system also provide insurance against earnings risk. Suppose that a worker’s actual earnings over his career turn out to be only half of his expected earnings. A progressive benefit formula will provide him with more than half the benefits he would otherwise receive. If his actual earnings turn out to be fifty percent higher, then his benefits will increase by less than fifty percent. Because the typical formula redistributes from people who (for this example) got unexpectedly high income to those with unexpectedly low income, households face a reduced need to maintain their own precautionary balances against earnings uncertainty in a PAYG system. In the absence of this insurance, the worker may choose to save more while working as a precaution.3

A reduction in the overall progressivity of the retirement income system is more likely in developed countries than in developing countries. The former tend to have fairly
uniform and generous defined benefit systems that will be scaled back in favor of a funded defined contribution system. However, several reforms that have been undertaken in Latin America may have actually increased progressivity. For example, the reforms in Peru and Colombia included the establishment of a redistributive first pillar as a foundation for the new funded system. In Chile, the new defined contribution system is not inherently progressive but is subject to progressive income taxation. The prior defined benefit system was redistributive by design but exempt from income taxes.

PAYG systems almost always pay benefits as an annuity. Because the annuity is mandatory, the government is able to overcome potential adverse selection and provide the annuities fairly cheaply. Many reform proposals permit phased withdrawals or other non-annuity options for receiving benefits. To the extent that these provisions decrease access to annuities, saving may have to increase to partially insure against longevity risk.

It is important to stress that if precautionary motives against longevity or earnings risk are an important component of household saving decisions, then the welfare analysis of pension reform is more complicated. The reduction in saving that may result from the introduction of a social security program, even if that program is PAYG, may on balance represent an improvement in household welfare. If the pension reform eliminates the income redistribution or provides restricted access to fair annuities, then saving may rise while welfare falls.

Other welfare improvements that may result from social security reform are associated with higher saving. In the steady state, after the transition costs have been paid, households will face lower payroll taxes to finance the FF system. They will have

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3 Carroll and Samwick (1997, 1998) find evidence of a precautionary motive for saving by households and
higher disposable income during their working years and choose to save a portion of this higher income. There will also be reduced deadweight loss from payroll taxation, and these gains will also be split between higher consumption and higher saving. The transitions for the United States simulated in Feldstein and Samwick (1997, 1998) suggest that these gains can be quite substantial, accruing as early as the children and grandchildren of the cohorts working at the start of the transition.

A transition to a FF system may also increase both welfare and saving by changing the tastes or technology for saving. One of the key justifications for governments to operate social security programs is to counteract myopia on the part of some households. While a PAYG system can keep such households out of poverty in old age, it may not do much to stimulate their own saving behavior. In contrast, a FF system with individual accounts and a more transparent claim of ownership could engender a “recognition effect” in which households begin to realize the importance of saving. More concretely, the introduction of a funded system that is explicitly administered in the private sector may also improve the functioning of and access to capital markets. This capital market development may itself contribute to higher saving. While recognition effects and capital market development are difficult to quantify, they have been prominently advanced as possible explanations for the high saving in the post-reform era in Chile (see Schmidt-Hebbel (1998)).

On balance, a life cycle model extended to account for other motivations for saving predicts that national saving is likely to fall as a result of the introduction of a PAYG system, although a comprehensive model also permits exceptions. Perhaps as a show that precautionary saving may account for up to one half of the typical household’s wealth.
result, the empirical literature using microeconomic data to test this proposition has found surprisingly weak support.\textsuperscript{4} There have also been a more limited number of international studies (e.g., Barro and MacDonald (1979)) that have investigated the proposition using cross-country sources of data. There has been much less work done using cross-country databases on the effects of funded pension systems on saving. An important recent study is Bailliu and Reisen (1997), who find statistically significant evidence that funded pensions do contribute to higher aggregate saving in a panel of OECD and developing countries. A survey of the literature is provided by Schmidt-Hebbel (1998).

Much of the recent literature on the saving response to FF transitions is based on country studies, particularly of Chile’s 1981 reform. The next section considers the time-series pattern of saving in FF transitions using a wide panel of countries. The objective is to use a reduced form model of saving determinants to assess whether the pension reform can provide an explanation for the savings residual in countries that begin transitions. The subsequent section examines whether characteristics of PAYG systems in a large sample of countries are significant predictors of national saving.

\textbf{III. Time-Series Evidence on Reforms}

By now, most countries provide some form of a public social insurance system in which workers pay taxes or contributions in order to provide for retirement benefits. In a PAYG system, current contributions pay for current benefits, whereas in a funded system, current contributions pay for future benefits. As of 1990, a large majority of programs were organized as PAYG systems. As discussed in Demirgüç-Kunt and Schwarz (1996) and Schmidt-Hebbel (1998), there have been several countries in Latin America that have

\textsuperscript{4} See Gale (1998) for a recent overview of the literature.
begun a transition from PAYG to funded systems, based on the example of Chile (1981).⁵
Among OECD countries, Switzerland (1985), the United Kingdom (1986), Australia
(1992), and Italy (1996) have also recently reformed their pension systems in a way that
importantly increases the degree of funding.⁶ The first part of this section examines the
time-series of aggregate saving in each of these countries for which data are available.

The countries that do not operate primarily PAYG systems have instead a system
of “provident funds.” Provident funds levy taxes and accumulate them while individuals
are working and then return them plus accrued interest, often in the form of a lump-sum
benefit, when the individuals are eligible to retire. These systems do not typically
undertake the income redistribution that is common in PAYG systems. Since 1960, two
Asian countries (Fiji and Papua New Guinea) and seven African countries (Gambia,
Kenya, Nigeria, Swaziland, Tanzania, Uganda, and Zambia) have introduced provident
fund systems.⁷ The second part of this section examines the time-series of aggregate
saving for the subset of these reforms that occurred after 1970 for which data are
available.

The main database used in this study was constructed by the World Bank (1997)
and is described in detail in Loayza, López, Schmidt-Hebbel, and Sérven (1998) and
Loayza, Schmidt-Hebbel, and Sérven (1998).⁸ The sample is comprised of 150 countries

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Uruguay (1996), and Bolivia (1997).
⁶ See McHale (1999) for an analysis of recent changes to the pay-as-you-go components of Social Security
systems in G-7 countries.
⁷ Several other Asian countries established provident funds before 1960, the starting point of the saving
data. They are India, Indonesia, Malaysia, Nepal, Singapore, Solomon Islands, and Sri Lanka. The
determination of the benefit type is based on World Bank (1994) and Social Security Administration
(various). Nigeria and Indonesia have recently substituted PAYG systems for their provident funds. See
⁸ These two papers will hereafter be cited as LLSS (1998) and LSS (1998), respectively.
and spans the years 1960 to 1995, though not all variables are represented for each country in each year. The main results in this paper will utilize the data from 1970 to 1994 and, following LSS, exclude nine countries for which data on saving or its determinants appeared suspect.9

The dependent variable in all analyses is the ratio of saving to income. Income is measured as gross national disposable income (GNDI), equal to gross national product plus all net unrequited transfers from abroad. Saving is measured as gross national saving (GNS), expressed as a percentage of GNDI. The results were broadly similar for other measures of saving, including gross domestic saving and the saving of the private sector.

The independent variables in the regression are listed in Table 1. The first is the log of GNDI per capita expressed in constant 1987 dollars. Conversions from local currencies are made using the World Bank Atlas exchange rates. Countries with higher income also tend to have higher saving rates. Income growth, measured as the change in per capita income from the previous period, is also included as a regressor. To the extent that this variable captures future growth in income, it should reduce saving. However, if high income growth simply reflects past increases in income, then it could be associated with a higher saving rate.

The regressions also contain several demographic variables: population in millions, the old-age dependency ratio, the young dependency ratio, the share of the population living in urban areas, and the life expectancy at birth. The old dependency ratio is the ratio of those over age 65 to those age 15 to 64. The young dependency ratio

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9 These countries are Botswana, Brazil, Bhutan, Guyana, Kuwait, The United Arab Emirates, and Yemen. LSS also excluded some years for Nicaragua and Israel due to their periods of high inflation. In this study, I exclude all years for these countries.
is the ratio of those under age 15 to those age 15 to 64. Since saving propensities are highest for households that are working, higher dependency ratios should reduce saving. Life expectancy at birth is reported periodically for most countries. It has been interpolated for the intervening years. Higher life expectancy generally means a greater fraction of life spent retired, and as a result it should increase saving for life cycle reasons. However, if differences in life expectancy are driven primarily by differences in mortality before retirement, then it might be the length of the working years that increases with life expectancy and the saving rate may fall. Population and urbanization are included as additional control variables.

The final variable is the ratio of private credit to income. Higher values of this variable indicate a more developed financial sector. If that development is used primarily to relax liquidity constraints, then this variable will negatively affect saving. However, if greater financial depth serves primarily to facilitate saving, then it may be associated with higher saving rates. Other variables that determine saving, such as the real interest rate, were excluded because their coverage in the dataset is more limited and would restrict the number of observations.

The methodology followed here is to estimate a panel regression of the saving rate on these variables. The regressions also include dummy variables for each year of the sample as well as five sets of interactions of the year effects and dummy variables for the different regions in the World Bank database. The year effects and interactions allow for separate business cycles or trends for each region. The regressions also include fixed effects to allow for different average levels of saving for each country in the sample. The time-series of residuals from this regression is then graphed for countries that adopted
reforms during the sample period. An increase in the saving residual after the reform is consistent with a positive effect of the reform on saving.

Table 1 presents summary statistics for these variables, and the regression results are presented in Table 2. The first two columns in Table 2 use any countries and years that have data available on all of the variables. This generates 2,485 observations from 121 countries. The regression is estimated using both ordinary least squares and a fixed effects model. The fixed effects raise the goodness of fit substantially, as the R-squared increases from 0.46 to 0.69. The level of income per capita and its growth rate have positive and significant effects on saving in both specifications. The youth dependency ratio, the percent of the population in urban areas, and the ratio of private credit to income are negatively related to saving. Population, the elderly dependency ratio, and life expectancy are insignificant in the fixed effects regression. The results are similar when the sample is restricted to the fixed sample of countries from LLSS.

The residuals from the “full sample, fixed effect” regressions can be used to assess the changes in savings patterns associated with pension reforms. For each country in which a pension reform is implemented, the following regression is run:

\[ res_t = \beta_0 + \beta_1 \text{year}_t + \beta_2 \text{after}_t + \beta_3 (\text{year}_t \cdot \text{after}_t) + \beta_4 \text{during}_t + \epsilon_t, \]

where: \( res_t \) is the annual residual, \( \text{year}_t \) is the sample year, \( \text{after}_t \) is a dummy variable for the sample years after the reform, \( \text{during}_t \) is a dummy variable for the year of the reform, and \( \text{year}_t \cdot \text{after}_t \) is the interaction of the year and the post-reform period. The predicted values from this regression will trace out a line from the beginning of the sample to the year preceding reform, lines joining the year of reform to the years immediately preceding and following it, and a line from the year after the reform to the end of the sample. This
specification allows for separate effects of the reform on the level and subsequent growth rate of the savings rate in a way that does not depend on the precise value of saving during the year of the reform itself.

Figure 1 shows the time-series of saving residuals for Chile during the period from 1970 to 1994, along with the predicted values from equation (1). The vertical line at 1981 denotes the year of the pension reform. The first column of Table 3 shows that prior to the reform, the savings residual was increasing by 0.55 percentage points per year, with a standard error of 0.37. The second column shows that during the two years surrounding the reform, the savings rate fell by a total of 6.03 percentage points. The third column shows that in the years after the reform, the savings rate increased by 1.27 percentage points more per year than it did in the pre-reform period. The latter two effects are statistically significant at the 1 percent level.10

It is this spectacular increase in saving that has made Chile’s reform the focus of the debate on whether pension reform can increase saving.11 The association of higher saving in Chile with its pension reform has led to many other Latin American countries adopting similar reforms based on the Chilean model (see footnote 5). Each of these reforms occurred too recently to be addressed within the sample period, which ends in 1994. In each of the cases (not shown), the first years after the transition do not show a large change either way in the savings residual. More comprehensive analysis of these reforms must await the availability of more recent data on saving.

10 In terms of the coefficients of equation (1), the columns are $\beta_1$, $\beta_1 + \beta_2 + (\text{transition year + 1}) \cdot \beta_3$, and $\beta_3$, respectively.
11 For a description of the Chilean reform, see Diamond (1994). Recent work by Holzmann (1997b) and Schmidt-Hebbel (1998) suggests that the effect of the pension reform on saving may have been secondary to the effects of other fiscal policy changes and higher GDP growth.
There have been three important pension reforms in the OECD during this same sample period: Switzerland in 1985, the United Kingdom in 1986, and Australia in 1992. As the Australian reform is too recent to have sufficient post-reform saving data, the saving residuals for Switzerland are graphed in Figure 2 and those for the United Kingdom in Figure 3. Tests of statistical significance are presented in the next two rows of Table 3. The two reforms suggest different saving patterns. In Switzerland, the savings residual shows no trend before or after the reform. During the period in which the reform is implemented, the savings residual increases substantially, by 5.58 percentage points in the two years containing the reform alone. In the United Kingdom, the savings residual is increasing at a rate of 0.18 percentage points per year before the reform and is falling at a rate that is insignificantly different from zero in the period after the reform. The savings residual falls by 1.33 percentage points during the two years surrounding reform.\textsuperscript{12}

The evidence from these two reforms in OECD countries shows no tendency for savings to increase in the post-reform period. In the United Kingdom, the reform itself is associated with a short period of lower savings, whereas in Switzerland, the reform occurred in the middle of a period of rising savings.

The second type of pension reform that can be examined in this way is the establishment of new provident fund systems over the sample period. Establishing a lump-sum provident fund should increase saving to the extent that it overcomes problems of moral hazard and myopia by individuals and facilitates the growth of capital markets.

\textsuperscript{12} Another reform of Social Security in the OECD that occurred during this period was the 1983 Social Security legislation in the United States that began the process of prefunding future entitlements and
The countries that established such a fund within the sample period are Papua New Guinea (1980) and Gambia (1981). These reforms are shown in Figures 4 and 5 and the last two rows of Table 3.

In Papua New Guinea, the trend in the savings residual switches from negative to positive after the reform, but this difference of 0.96 percentage points per year is not statistically significant. The two years surrounding the reform show a significant reduction of over 11 percentage points in the savings residual. In Gambia, the trend in savings residual is insignificantly lower after the reform than the trend before the reform. The change in the predicted value across the reform shows virtually no change, even though the actual savings residual is highest in the year of the reform.

In summary, none of the four countries other than Chile that implemented a new defined contribution element to the public pension systems experienced a significant increase in the trend in the savings residual after the reform. This characteristic of Chile’s experience is not a robust feature of the data. There is no clear pattern in what happens to saving in this sample of countries before or during their reforms.

IV. Cross-Sectional Evidence on Social Security Characteristics

This section supplements the time-series evidence for particular countries that have undertaken substantial pension reforms in Section III with cross-sectional evidence on the determinants of saving. The dependent variable is again gross national saving as a share of gross national disposable income, this time averaged over the period from 1991 to 1994. The explanatory variables include characteristics of pension systems at the

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reduced the scope of those entitlements. In an analogous exercise for the United States in 1983, the graph looks quite similar to that of the United Kingdom in Figure 3.
country level as well as the other determinants of aggregate saving that are implied by the life cycle model and used above.

Most importantly, the regressions include the average predicted value (including the fixed effect) from the “full sample, fixed effects” regression in Table 2. The use of the predicted fixed effect controls for possible variation in whether countries are simply inclined toward high or low saving on average, even though the regression includes only one time period. The average effects of the other demographic determinants of saving from Table 2 are also incorporated into this variable. Thus, the coefficients on those determinants in the cross-sectional regression reflect not the total effect of those variables but the difference in their effects in this sample of countries and this time period relative to the full sample in Table 2.

The regressions includes three additional variables that characterize the public pension programs. The first is an indicator variable for whether the country in 1990 had a PAYG type of pension program. The countries for which this is true include all countries except Chile and those identified as having a provident fund in the previous section. This classification scheme matches that in World Bank (1994) and Palacios (1996), which is in turn based on Social Security Administration (various). Approximately 83 percent of the countries have PAYG systems in 1990. Based on the discussions in the previous section, the expected coefficient on this variable is negative.

The second variable is the coverage rate on the Social Security system, also based on World Bank (1994) and Palacios (1996). The mean of this variable is 0.40, suggesting a 40 percent coverage rate, with a median of 0.29. The top decile has universal coverage,

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13 Data on Swaziland are missing in the sample years prior to its 1974 establishment of a provident fund,
while the bottom quartile has less than 10 percent coverage. This variable is included both by itself and interacted with the PAYG dummy variable. By itself, this variable should increase saving, since higher participation in non-PAYG or funded systems will result in higher contributions. Interacted with the PAYG variable, the coefficient should be negative, as a greater coverage of the public system implies less total saving done for retirement in formal capital markets.

The third variable is the share of public expenditures that are devoted to Social Security, taken from World Bank (1997). This variable has a mean of 15 percent and a median of 11.7 percent, with first and third quartiles of 1.98 and 21.1 percent. This variable gives an indication of the size of the Social Security program. Larger programs are expected to be associated with lower saving rates. Because large public expenditures are inherently in a PAYG system, this variable is not interacted with a PAYG dummy variable.

The regression results are shown in Table 4. Many of the variables were not available for all countries, even in this single four-year period. The first specification includes only the PAYG dummy variable in addition to the variables from the earlier tables. A PAYG system is estimated to have an average saving rate that over the period that is 3.68 percentage points lower than a country with a provident fund or fully funded system. This effect is statistically significant. The coefficient on the average predicted value from the time-series regression is highly significant, with a coefficient of 0.86, suggesting that actual savings rates in this period are quite similar to their predicted values from the earlier regression. None of the coefficients on the other variables are

and so that reform cannot be analyzed in an analogous fashion.
significant, suggesting that their marginal effects are similar in this sample to their effects in the overall sample used in the time-series regressions.

The second specification includes the Social Security coverage variable and its interaction with the PAYG dummy variable. This variable is only available for 55 of the countries. While none of these three coefficients are individually significant, they are jointly significant with a p-value of 0.0153. The point estimate for a PAYG system is negative, and it increases with the coverage of the Social Security system. The effect of greater coverage is positive for non-PAYG systems and negative of PAYG systems (the sum of the coefficients is –3.634), as expected. Increasing the coverage rate by half of the population more than doubles the predicted effect of having a PAYG system. The third specification adds to the regression the public expenditure share of the Social Security program. The coefficient on this variable is small and insignificant. The other PAYG variables are similar in their effects to the estimates in the second column, with even more emphasis on the interaction variable in this smaller sample.

Adding other controls from World Bank (1997) for the stock of human capital or interest rates did not affect these basic results, nor did adding controls for features of the pension system such as the age of normal retirement, the typical replacement rate, or the years required to obtain full benefits. Specifications were also estimated using the current deficit associated with the pension system, expressed as a share of GDP, taken from the surveys conducted by the International Labour Office (1997). This variable was insignificant in all of the regressions. Lastly, recent studies such as Blöndal and Scarpetta (1997) have made estimates for the size of the unfunded liabilities of the social security system in various industrialized countries. Their measures for the size of the unfunded
liabilities were insignificant when added to the cross-sectional regression on just the OECD countries, even with the average predicted value from the time-series regression excluded.

The results in Table 4 provide evidence to support the claim that PAYG systems are associated with lower rates of national saving, although the statistical significance of the negative coefficients is weak. Additionally, due to the limited number of countries and the single time period studied, no definitive conclusions can be drawn about a causal relationship between the type of pension system and the rate of saving.

V. Conclusions

Pension reforms that transition from pay-as-you-go to funded systems provide the opportunity to increase national saving. If the transition deficits are financed through taxes rather than debt and if capital markets or intergenerational linkages are imperfect, saving is likely to increase. In the steady state, lower distortionary tax rates will lead to welfare gains and potentially higher saving. Other effects, such as a recognition effect or capital market development, may also increase saving. These effects will be larger in developing countries as compared to developed countries.

The analysis in this paper provides a first step in determining whether transitions to non-PAYG systems will result in higher saving. Direct examination of the residuals from a panel regression of gross national saving indicates that no country other than Chile that moved to a system based more on defined contributions during the sample period experienced an increase in the trend in savings rates after the reform. Chile’s experience, which has motivated many similar reforms in Latin America in recent years, appears not to be robust. The cross-sectional results pointed to a lower saving rate in countries that
had PAYG systems, especially if the PAYG system covered a large portion of the population.

This paper complements the numerous country studies and more narrow cross-country studies that have constructed explicit measures of the degree of funding in Social Security systems. Future research efforts must obtain data on the most recent years of saving to begin to analyze the reforms in the other Latin American countries as well as the countries in Eastern Europe that are implementing funded systems.
References


### Table 1
Summary Statistics for Saving Determinants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev.</th>
<th>25th Percentile</th>
<th>75th Percentile</th>
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<tbody>
<tr>
<td>Gross National Saving, %GNDI</td>
<td>19.04</td>
<td>18.91</td>
<td>9.49</td>
<td>13.11</td>
<td>24.43</td>
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<tr>
<td>Log of Income Per Capita</td>
<td>7.43</td>
<td>7.29</td>
<td>1.36</td>
<td>6.32</td>
<td>8.59</td>
</tr>
<tr>
<td>Per Capita Income Growth</td>
<td>0.0125</td>
<td>0.0192</td>
<td>0.1144</td>
<td>-0.0455</td>
<td>0.0732</td>
</tr>
<tr>
<td>Private Credit / Income</td>
<td>0.3289</td>
<td>0.2092</td>
<td>0.5760</td>
<td>0.1260</td>
<td>0.3893</td>
</tr>
<tr>
<td>Population (millions)</td>
<td>33.91</td>
<td>7.19</td>
<td>116.82</td>
<td>2.85</td>
<td>22.03</td>
</tr>
<tr>
<td>Old Age Dep. Ratio</td>
<td>0.0965</td>
<td>0.0692</td>
<td>0.0566</td>
<td>0.0574</td>
<td>0.1291</td>
</tr>
<tr>
<td>Young Dep. Ratio</td>
<td>0.6747</td>
<td>0.7363</td>
<td>0.2265</td>
<td>0.4577</td>
<td>0.8683</td>
</tr>
<tr>
<td>Percent Urban</td>
<td>46.94</td>
<td>43.68</td>
<td>24.51</td>
<td>26.24</td>
<td>100.00</td>
</tr>
<tr>
<td>Life Expectancy</td>
<td>61.83</td>
<td>64.08</td>
<td>11.14</td>
<td>51.83</td>
<td>71.80</td>
</tr>
</tbody>
</table>

Notes:
1) Source: Author’s calculations from World Bank Savings Database.
2) The full sample includes 2485 country-year observations for 121 countries for 1970-94.
<table>
<thead>
<tr>
<th></th>
<th>Full Sample</th>
<th>Fixed Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>Fixed Effect</td>
</tr>
<tr>
<td>Log of Per Capita Income</td>
<td>5.2841</td>
<td>4.3817</td>
</tr>
<tr>
<td></td>
<td>(0.4786)</td>
<td>(0.7072)</td>
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<tr>
<td>Per Capita Income Growth</td>
<td>7.1474</td>
<td>6.7617</td>
</tr>
<tr>
<td></td>
<td>(2.1672)</td>
<td>(1.9986)</td>
</tr>
<tr>
<td>Priv. Credit to Income Ratio</td>
<td>0.1582</td>
<td>-2.6862</td>
</tr>
<tr>
<td></td>
<td>(0.1886)</td>
<td>(0.6291)</td>
</tr>
<tr>
<td>Population (millions)</td>
<td>0.0130</td>
<td>0.0049</td>
</tr>
<tr>
<td></td>
<td>(0.0009)</td>
<td>(0.0055)</td>
</tr>
<tr>
<td>Old Age Dep. Ratio</td>
<td>-35.7682</td>
<td>11.9903</td>
</tr>
<tr>
<td></td>
<td>(6.0719)</td>
<td>(13.8956)</td>
</tr>
<tr>
<td></td>
<td>(1.9403)</td>
<td>(3.9672)</td>
</tr>
<tr>
<td>Percent Urban Urban Life</td>
<td>-0.0602</td>
<td>-0.1346</td>
</tr>
<tr>
<td></td>
<td>(0.0129)</td>
<td>(0.0588)</td>
</tr>
<tr>
<td>Life Expectancy</td>
<td>0.1695</td>
<td>-0.1996</td>
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<tr>
<td></td>
<td>(0.0469)</td>
<td>(0.1378)</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.4459</td>
<td>0.6944</td>
</tr>
<tr>
<td>Observations</td>
<td>2485</td>
<td>2485</td>
</tr>
<tr>
<td>No. of Countries</td>
<td>121</td>
<td>121</td>
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</tbody>
</table>

Notes:
1) All specifications include year effects for 1971-1994 and the interactions of year effects with regional dummies (not reported).
3) Heteroskedasticity robust standard errors are reported in parentheses.
Table 3
Tests of Level and Slope Changes in Saving Residuals Surrounding Pension Reforms

<table>
<thead>
<tr>
<th>Country</th>
<th>Savings Trend Before Reform</th>
<th>Savings Level Change Across Reform</th>
<th>Change in Savings Trend After Reform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile</td>
<td>0.5457</td>
<td>-6.0294</td>
<td>1.2689</td>
</tr>
<tr>
<td></td>
<td>(0.3721)</td>
<td>(2.1455)</td>
<td>(0.4577)</td>
</tr>
<tr>
<td>Switzerland</td>
<td>-0.0335</td>
<td>5.5768</td>
<td>0.0745</td>
</tr>
<tr>
<td></td>
<td>(0.1198)</td>
<td>(1.2022)</td>
<td>(0.1558)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.1771</td>
<td>-1.3342</td>
<td>-0.2516</td>
</tr>
<tr>
<td></td>
<td>(0.0708)</td>
<td>(0.5567)</td>
<td>(0.0978)</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>-0.3265</td>
<td>-11.2206</td>
<td>0.9579</td>
</tr>
<tr>
<td></td>
<td>(0.5787)</td>
<td>(1.5358)</td>
<td>(0.6119)</td>
</tr>
<tr>
<td>Gambia</td>
<td>1.1976</td>
<td>-0.0205</td>
<td>-0.4208</td>
</tr>
<tr>
<td></td>
<td>(0.5936)</td>
<td>(6.1787)</td>
<td>(0.7615)</td>
</tr>
</tbody>
</table>

Notes:
1) The point estimates correspond to the predicted values of the time-series savings residuals graphed in Figures 1 – 5.
2) The first column reports the annual increase in the savings rate up to and including the year before the reform.
3) The second column reports the change in the level of the savings rate during the two year period from the year before the reform to the year after the reform.
4) The third column reports the annual increase in the savings rate from the year after the reform to the end of the sample.
5) Heteroskedasticity robust standard errors are reported in parentheses.
Table 4
Average Saving, 1991-1994, Based on Social Security Characteristics

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>13.8930</td>
<td>2.6852</td>
<td>18.0370</td>
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<tr>
<td></td>
<td>(8.9930)</td>
<td>(19.0439)</td>
<td>(17.6548)</td>
</tr>
<tr>
<td>Pay-As-You-Go System</td>
<td>-3.6809</td>
<td>-1.6630</td>
<td>3.1227</td>
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<tr>
<td></td>
<td>(1.4657)</td>
<td>(3.4475)</td>
<td>(3.8036)</td>
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<tr>
<td>Social Security Coverage Rate</td>
<td>-----</td>
<td>4.9673</td>
<td>21.1225</td>
</tr>
<tr>
<td></td>
<td>(9.4089)</td>
<td>(12.8357)</td>
<td></td>
</tr>
<tr>
<td>Pay-As-You-Go * SS Coverage Rate</td>
<td>-----</td>
<td>-8.6013</td>
<td>-22.8623</td>
</tr>
<tr>
<td></td>
<td>(7.4858)</td>
<td>(7.5315)</td>
<td></td>
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<tr>
<td>Social Security Exp. As a % of Pub Exp.</td>
<td>-----</td>
<td>-----</td>
<td>0.0021</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0864)</td>
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<td>Time-Series Predicted Value</td>
<td>0.8593</td>
<td>0.8177</td>
<td>0.7304</td>
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<tr>
<td></td>
<td>(0.1104)</td>
<td>(0.1231)</td>
<td>(0.1312)</td>
</tr>
<tr>
<td>Log of Per Capita Income</td>
<td>-0.6790</td>
<td>-0.1971</td>
<td>-0.2404</td>
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<tr>
<td></td>
<td>(0.8490)</td>
<td>(1.3001)</td>
<td>(2.3553)</td>
</tr>
<tr>
<td>Per Capita Income Growth</td>
<td>-7.1381</td>
<td>-6.2762</td>
<td>-6.3777</td>
</tr>
<tr>
<td></td>
<td>(7.9941)</td>
<td>(9.8644)</td>
<td>(8.1051)</td>
</tr>
<tr>
<td>Priv. Credit to Income Ratio</td>
<td>0.4632</td>
<td>2.5667</td>
<td>0.6819</td>
</tr>
<tr>
<td></td>
<td>(0.3250)</td>
<td>(3.4204)</td>
<td>(6.1886)</td>
</tr>
<tr>
<td>Population (millions) Old Age</td>
<td>0.0009</td>
<td>0.0011</td>
<td>-0.0018</td>
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<tr>
<td></td>
<td>(0.0029)</td>
<td>(0.0033)</td>
<td>(0.0047)</td>
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<td></td>
<td>(15.2002)</td>
<td>(20.0945)</td>
<td>(34.7450)</td>
</tr>
<tr>
<td></td>
<td>(5.0027)</td>
<td>(9.9055)</td>
<td>(10.2134)</td>
</tr>
<tr>
<td>Percent Urban Life Expectancy</td>
<td>0.0283</td>
<td>0.1276</td>
<td>0.0741</td>
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<tr>
<td>Life</td>
<td>(0.0296)</td>
<td>(0.0582)</td>
<td>(0.0952)</td>
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<td>Expectancy Life</td>
<td>(0.1077)</td>
<td>(0.1743)</td>
<td>(0.2033)</td>
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<td>R-Squared</td>
<td>0.7780</td>
<td>0.8326</td>
<td>0.8940</td>
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<td>P-value for Social Security variables</td>
<td>0.0140</td>
<td>0.0153</td>
<td>0.0095</td>
</tr>
<tr>
<td>Observations</td>
<td>94</td>
<td>55</td>
<td>34</td>
</tr>
</tbody>
</table>

Notes:
2) Heteroskedasticity robust standard errors are reported in parentheses.
Figure 1

Chile: Pension Reform in 1981
Figure 2

Switzerland: Pension Reform in 1985

GNS Residual, %GNDI

Year

70 75 80 85 90 95
Figure 3

United Kingdom: Pension Reform in 1986

GNS Residual, %GNDI

Year

70 75 80 85 90 95

-4 -2 0 2 4
Figure 4

Papua New Guinea: Provident Fund in 1980

GNS Residual, %GNDI vs. Year
Figure 5

Gambia: Provident Fund in 1981

GNS Residual, %GNDI

Year

70 75 80 85 90 95

-20 -10 0 10 12

-20 -10 0 10 20 30 40

70 75 80 85 90 95