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TAX INCENTIVES TO SAVING AND BORROWING

Tullio Jappelli and Luigi Pistaferri

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ABSTRACT

Tax Incentives to Saving and Borrowing*

The Paper reviews the literature on these tax incentives, with special focus on long-term saving, housing, and household liabilities. The Paper addresses several areas of policy intervention: (1) the interest rate effect on personal saving; (2) the effect of tax incentives on long-term mandatory saving programmes; (3) government programmes that target saving for home purchase; (4) government programmes that target health and saving for education; (5) the effect of tax incentives to borrow, rather than to save. For each of these five important issues, the Paper provides empirical evidence on the main characteristics of government programmes, with a special focus on middle-income countries. It also addresses a number of issues that should be of interest to policy-makers. First of all, on which grounds government policy should target some assets rather than others. Second, if tax-sheltered assets and liabilities lead to substitution away from more heavily taxed savings instruments or if they affect the overall level of saving. Finally, if there is any lesson that can be drawn from the experience of developed countries for the design of saving and borrowing incentives in middle-income countries.

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Tax Incentives for Household Saving and Borrowing

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Introduction

Modern theories of intertemporal consumption choice emphasize that individuals may save for variety of motives: to smooth life-cycle fluctuations in income (the retirement, or life-cycle motive), to face emergencies arising from income or health risks (the precautionary motive), to purchase durable goods and housing, and to accumulate resources for one's heir (the bequest motive) (cf. Browning and Lusardi, 1996). Individual choice may be affected by the government policies that, in virtually all countries, target private saving. Government targeting is selective, and tends to affect not only the overall level of saving, but also the allocation of saving among its many different forms.

Raising the overall level of saving is often viewed as an effective way to raise investment and growth. Many forms of government intervention thus aim at increasing saving *tout court*, but leave the ultimate decision about the allocation of saving to the individual. But in other cases government intervention mandates individuals to save in specific forms, or for specific purposes. For instance, in almost all countries governments promote retirement saving, because having insufficient resources during retirement entails a high burden not only for the elderly lacking these resources, but also for the society as a whole. Promoting saving for housing and other goods to which policy makers assign high priority (education, health, or life protection) is also a popular goal. The chapter reviews the literature on these tax incentives, with special focus on long-term saving, housing, and household liabilities.

In very poor countries households rely on informal markets for credit transactions, so government intervention has a limited role in shaping household saving and portfolio allocations. The chapter therefore places special emphasis on the importance of tax incentives and saving instruments available in middle-income countries with relatively developed financial markets (as several Latin America and East-Asian countries). It is precisely in middle-income countries that mandatory saving instruments are more widespread, and often the only effective way of raising the overall level of saving and shaping household portfolios. In this area, the most developed countries have accumulated a wide experience in designing and implementing various tax incentives schemes. This experience can be used to evaluate the effectiveness of tax incentives and to draw lessons for middle-income countries.

A careful review of the international tax codes reveals that in most middle-income countries the tax system targets long-term, retirement saving instruments. This is hardly surprising given the role of retirement saving as the most important and widely available household financial asset. The tax features of pension funds are of special interest, given the recent wave of reforms of the social security system in Latin America and East Asia. Almost invariably, mandated contributions to pension funds are tax exempt, and very often voluntary contributions to long-term saving instruments are also heavily favored by the tax code. The chapter therefore concentrates mainly on mandated contributions to pension funds, although it devotes some space also to the tax treatment of other, more "sophisticated" assets, available in industrialized countries. The second area of widespread government intervention in middle-income countries is incentives to save for housing accumulation plans. These programs are absent in industrialized countries, but quite common in several middle-income countries.

The chapter is divided in five parts, each addressing a particular saving instrument and area of policy intervention. It starts out in Section 1 by reviewing the interest rate effect on personal saving. The specific question addressed is whether public policies affecting the real rate of interest impact the overall level of saving. Section 2 turns to examine the effect of tax incentives on long-term mandatory saving programs. In the absence of tax incentives, mandated assets are a substitute for private accumulation and should not affect national savings. However, the tax deductibility of mandated contributions that we encounter in almost all countries can be an effective way of influencing not only the composition of wealth, but also the overall level of saving. On this front, we present international evidence based on regression analysis showing a positive association between the national saving rate and the stock of mandated assets in household portfolios.

Section 3 examines government programs that target saving for home purchase. Direct subsidies to home mortgages, deductibility of mortgage interest payments, reduced loan rates, are just a few examples of government intervention in this area. But the most striking instruments are mandatory contributions to provident funds designed to accumulate resources for a down payment against home purchase. The interplay between saving for retirement and saving for housing accumulation is also of special interest in this area. Section 4 explores government

programs that target saving for health and education, while section 5 analyzes the effect of tax incentives to borrow, rather than to save.

For each of these five important issues, the chapter examines empirical evidence on the main characteristics of government programs, with a special focus on middle-income countries. It also addresses a number of issues that should be of interest to policy-makers. First of all, on which grounds government policy should target some assets rather than others. Second, if tax-sheltered assets and liabilities lead to substitution away from more heavily taxed savings instruments or if they affect the overall level of saving. And finally, if there is any lesson that can be drawn from the experience of developed countries for the design of saving and borrowing incentives in middle-income countries. Using simple models, three Appendices summarize the effect on saving of the interest rate, mandated pension contributions and tax incentives to borrow.

1. Incentives to voluntary retirement saving

The interest rate effect on personal saving has attracted a long tradition of research, both theoretically and empirically. The specific question that this literature addresses is whether public policies affecting the real rate of interest affect the overall level of saving. Although taxing the return to saving can have a strong effect on household asset selection and allocation, theoretical models, such as the standard two-period model of intertemporal choice presented in Appendix A1 are ambivalent regarding the effect on the overall level of saving, even when one considers models with uncertainty and precautionary saving (Bernheim, 2002).¹ Nor has the empirical literature been able to pin down this effect.

¹ The aggregate tax elasticity of saving depends not only on preference parameters, but also on the distribution of wealth. Cagetti (2001) shows that life-cycle models of wealth accumulation in which the precautionary motive is quantitatively relevant also imply extremely low intertemporal elasticities, in contrast to models without uncertainty (Summers, 1981). Such models thus imply small effects for tax-favored saving instruments on the saving of the median household. But if the richest 5 per cent of the population behaves differently (for example being less risk averse, or being more affected, as entrepreneurs, by capital income taxation), aggregate wealth may still exhibit a large interest rate elasticity. Thus, the distribution of wealth is a crucial parameter to evaluate the impact of tax incentives. This is particularly relevant in developing countries where wealth inequality tends to be higher than in most industrialized nations.

The empirical literature on saving and taxation has grown tremendously in recent years. Bernheim (2002), Besley and Meghir (2001), Honohan (2000) and Poterba (2000) provide surveys of the most recent developments, and we refer the interested readers to these excellent contributions. Here we limit ourselves at summarizing the main empirical strategies that have been used to test the interest rate effect on saving. They can be broadly divided in three groups: estimation of saving function with time series or cross-country data; Euler equation estimates of the intertemporal elasticity of substitution; analysis of specific tax reforms.

The earliest approach consists of specifying a saving function and estimating the interest rate elasticity controlling for other determinants of saving. Many such studies have been performed with time series data from individual countries, and with cross-country or panel data from both the industrialized and developing countries. Honohan (2000) reviews several studies based on individual country time series or cross-country data and concludes that "more studies have found a positive interest rate elasticity than a negative one, but the coefficients have generally been small and often insignificant" (p. 83). Possible reasons why this approach has been inconclusive stem from aggregation problems (some investors might have a positive elasticity of saving, others a negative one) and endogeneity of interest rates and other variables introduced in saving regressions.

The Euler equation for consumption states that consumption growth depends on the difference between the real rate of interest and the intertemporal rate of time preference. The sensitivity of consumption growth with respect to the real interest rate is the elasticity of intertemporal substitution in consumption. Since Hall's (1978) seminal contribution, the possibility of estimating structural preference parameters with the Euler equation has attracted enormous interest among applied economists. More recently, the approach has shifted attention from studies using aggregate data to analyses based on household panel data, which allow rigorous treatment of aggregation issues. After more than two decades of empirical studies, however, one must recognize that the approach has also been largely inconclusive, at least as far as pinning down the interest rate elasticity is concerned.

First of all, it is now clear that estimation of Euler equations poses extremely difficult econometric problems, particularly in the presence of short panel data, omitted variables due to precautionary saving and liquidity constraints, non-separabilities between consumption and leisure (Browning and Lusardi, 1996). Second, the sensitivity of consumption growth to the real interest rate is hard to estimate with panel data on households, because at any given point in time households face the same real rate of interest. Researchers must therefore rely on the variability of marginal tax rates affecting the after-tax return to saving. Third, most empirical studies find that the elasticity of substitution is positive and generally less than one, but estimates vary considerably over this range (Bernheim, 2002). Finally, even high values of the elasticity do not necessarily imply a positive interest rate elasticity of saving. Even though a high value of the elasticity makes it more likely that the substitution effect dominates the income effect, the Euler equation delivers information about the shape of the consumption profile, not about the level of consumption and saving.

A third generation of studies has approached the issue at hand studying the portfolio and saving effect of specific tax reforms. Table 1, drawn from Poterba (2001), reports information on saving incentives for major industrial nations' voluntary retirement plans. With the exception of France and Japan, these programs are widely available in industrialized countries. The specific tax provision and generosity of saving incentives vary considerably, but the basic features are common. Households can contribute up to a specific limit to retirement saving accounts (such as Individual Retirement Accounts and 401(k) plans in the US, Individual Saving Accounts in the United Kingdom, and life insurance plans in Italy), using pre-tax dollars. These plans have provided the ground for empirical research trying to assess to what extent contributions to tax deferred saving accounts represent "new saving", or merely a substitution between tax favored and other assets. The advantage of this approach is that it is based on clear experiments, and on rigorous econometric methods.

At the theoretical level, however, it is not clear whether tax deferred saving accounts should increase the overall level of saving, even in situations in which the interest effect on saving is

positive (that is, the substitution effect dominates the income and wealth effects), adding a further element of ambiguity in the picture.²

This point is made most clearly by Besley and Meghir (2001). Following their example, assume that individuals can invest in only two assets both of which have a gross rate of return r and one of which is tax-free up to a certain level of investment L . An individual can invest up to L in the tax-favored asset, yielding r . Any savings above L yield a net of tax return $r(1-\theta)$.

In the absence of uncertainty, the effect of the tax incentive on the allocation of wealth is clear: investors put as much wealth as they can in the tax-favored asset, up to the limit L . The effect on the level of saving, however, is ambiguous. If desired saving is less than L , all wealth is allocated in the tax-favored asset and, under the assumptions of Appendix A.1, an increase in r increases saving. If instead desired saving is higher than L , individuals would have saved more than L even in the absence of incentives. In such a situation, the effect is reversed. Besley and Meghir show that the effect of the tax incentive depends on the relation between investors' wealth and the limit L , and on the intertemporal elasticity of substitution. In practice, then, the same incentive can generate a wide range of heterogeneity of individual responses.

Engen, Gale and Scholz (1996) point out another feature of tax deferred saving accounts, i.e., that they are less liquid than conventional saving. The saving incentive might reduce saving of those who do not behave according to the intertemporal choice model, but have a fixed saving target. For these individuals, the incentive and the higher return on saving will make it easier to reach the target, because they must give up fewer resources for the same target. A further criticism of the approach based on the analysis of tax reform is that none of the studies is able to estimate the interest rate elasticity of saving and thus provide information valuable to policy makers. Finally, tax incentives reduce tax revenues and therefore public saving. In order to conclude that tax incentives increase capital accumulation one must therefore consider not only the effect of tax incentives on private saving, but also the revenue loss associated with the incentives. Most of the studies in this area, however, adopt a partial equilibrium framework.

² Behavioral theories suggest that people do not optimize in the neoclassical sense and fail to provide adequately for their retirement due of lack of self-control (Thaler and Shefrin, 1981; Thaler, 1990). Targeted saving instruments may therefore serve as focal point for inconstant people to actually accomplish their savings goals. For recent evidence on this point, see Madrian and Shea (2001).

As mentioned, the main question addressed by the literature is whether tax deferred saving accounts such as 401(k) and IRAs – introduced in the United States in 1978 and 1986, respectively – represent "new saving", or a substitution between tax favored and conventional assets. Despite these "clean" tax experiments, a consensus has yet to emerge. On the one hand, Poterba, Venti and Wise (1996) argue that IRA and 401(k) increase saving.³ Engen, Gale and Scholz (1996) conclude instead that they produce mainly a reallocation effect of household portfolios, and little effect on intertemporal choice.

If a scheme does have a total saving effect, then one would expect the saving of the participants to be higher than that of non-participants, as indeed it is on average. But participants are also on average wealthier and nearer to retirement than non-contributors. So perhaps the preferences of participants are different as well, for instance that the wealthy contribute to IRA because they have a higher taste for saving than non-contributors. In short, cross-sectional studies suffer from an identification problem caused by unobserved heterogeneity and self-selection issues. Panel data, tracking the behavior of investors over time, can help the researcher to control, at least to some extent, for fixed individual heterogeneity. In principle, one can establish if investors have chosen to save more or less after the introduction of a tax-advantaged scheme. But even in this case it is difficult to attribute the decision to increase saving to the introduction of the scheme. An investor might choose to save more for reasons that are totally unrelated to the existence of the scheme (for instance, because the investor is reaching retirement age, or because he would like to purchase a home).

To summarize, of the many studies that have analyzed the interest rate effect on saving, none has found convincing evidence of a systematic relation between the two variables, so that the emerging consensus is that rate-of-return effects on saving are at best small. Time series data suffer from aggregation problems. After the initial enthusiasm, researchers have realized how difficult it is to tackle the econometric and identification issues in structural Euler equations for consumption. The analysis of tax reform, and particularly of the incentives provided by IRAs and 401(k) in the US, has delivered conflicting and inconclusive evidence, despite the great number

³ They estimate that about half of the contributions to IRAs represent new saving, 30 percent is financed by the tax saving allowed by the same IRAs, and the remaining 20 percent is a pure portfolio effect.

of high-quality empirical investigations spurred by two major US tax reforms. Our reading of this literature, as summarized by Poterba, Venti and Wise (1996), Engen, Gale and Scholz (1996), Bernheim (2002) and Besley and Meghir (2001), is that there is broad consensus that (at least in the US) tax deferred saving accounts have induced massive portfolio shifts towards tax-favored assets, but much less consensus on whether saving incentives have actually increased saving.

2. Promoting mandatory saving

Besides creating a fiscal wedge between pre- and after-tax returns, governments affect household saving and borrowing in a variety of ways. As we shall see, the most important programs in middle-income countries promote saving through mandated contributions to pension funds and housing saving accounts. These contributions are mandatory, and crowd out almost automatically conventional saving. However, contributions are generally granted preferential treatment by the tax code, and might therefore be a far more effective way of promoting the overall level of saving than tax-deferred saving accounts based on voluntary contributions.

There are several reasons for setting up mandatory saving programs. First, policy makers often target domestic saving, on the assumption that increasing domestic saving promotes investment, job creation and growth. Another reason is that mandatory saving programs might be the only effective way of providing the elderly with adequate resources to be spent during retirement, particularly when people are myopic or do not have enough information to plan for relatively long horizons. Moreover, if saving for retirement were left only to the discretion of the individual, free-riding behavior might impose a high burden to the society as a whole. After all, the wide implementation of these programs and the fact that a considerable portion of household wealth is locked in mandatory saving programs indicates the social approval of schemes designed to ensure people with adequate reserves to be spent during retirement.

Apart from the effect on domestic saving and capital stock, a further motivation for promoting pension funds and other institutional investors is the desire to encourage so-called popular capitalism through mandatory or voluntary contributions to saving accounts earmarked for retirement. The development of the contractual saving industry is widely thought to have a favorable impact on the deepening and diversification of the financial system. Moreover,

individuals might have greater incentives to perform on the job when they have a direct stake in the performance of the economy through the holding of risky assets.⁴

This section describes the characteristics of these programs, particularly in Latin American and East Asian countries. Appendix A.2 shows, in the context of a simple model of the impact of mandated contributions on private and national saving, that the existence of tax concessions on mandatory savings can result in higher overall savings. We present empirical evidence based on cross-country data showing that reserves of mandatory pension systems and private pension fund assets do indeed increase national saving, as predicted by the model. The focus is mainly on pension funds, although several remarks apply to unfunded plans as well.

2.1 Portfolio effects of mandatory contributions

In the simple model outlined in Appendix A.2 mandatory contributions displace private accumulation one-for-one. In more realistic cases, this needs not be the case. A first important issue is how to measure mandatory saving and pension wealth. Then one needs to distinguish between the portfolio effect of mandatory assets and their effect on national saving. The first two issues are analyzed in this section, while in the next section we provide empirical evidence on the impact of mandatory retirement saving on national saving.

In general, individual pension assets are defined as the difference between the present discounted value of future pensions and the present discounted value of contributions. Clearly, these depend on legislation (the contribution rate and the pension award formula), expected inflation, expected retirement age, expected rates of return, and mortality. Computation of pension wealth is therefore difficult, for both defined benefits and defined contribution plans.

Individual expectations are usually hard to measure. In the case of social security wealth, the problem is exacerbated by the fact that expectations depend on long run phenomena (for instance, income growth and rates of return many years from now) and on the possibility of pension reforms changing individual retirement options and pension award formulae. For this reason pension wealth can be estimated only with a high degree of approximation.

⁴ For instance, Moskowitz and Vissing-Jorgensen (2001) find that in the United States households with private equity ownership invest on average almost two thirds of their private holdings in a single company in which they have an active management interest.

Since Feldstein's (1974) seminal contribution, the empirical literature has tried to pin down the *wealth replacement effect* by regressing private assets on pension wealth. With individual-level data, a widely adopted specification is:

$$a = f(t) + \alpha y^p + \beta X + \sigma PW + \varepsilon$$

where a is private wealth, $f(t)$ an age polynomial, y^p permanent income, X a set of demographics and PW the present discounted value of pension benefits. Permanent income can be estimated using the method proposed by King and Dicks-Mireaux (1982). The parameter σ measures the *wealth replacement effect*, which should equal -1 in case of complete crowding out.

Most empirical studies find some, but less than full offset of pension wealth on private wealth or saving, that is, negative values of σ but higher than -1 , suggesting a degree of substitution between the two sources of wealth that is substantially lower than predicted by the theory (Mackenzie et al, 1997). There are many potential explanations for this finding. Since there is no space to discuss all of them in detail, here we limit ourselves to a broad summary.

Gale (1998) shows that the parameter σ might be a downward biased estimate of the displacement effect. The bias is induced by the use of a measure of disposable income that is net of pension contributions, rather than the appropriate measure, which instead treats contributions as mandatory savings. Gale also shows that the bias is likely to be higher for the young. Once the correction is implemented, his estimate of σ (based on US Survey of Consumer Finances data) ranges from -0.52 to -0.77 .

There are other theoretical reasons that can explain a low estimate of σ . Pension wealth is illiquid, and cannot be used as a collateral. If the consumer is liquidity constrained, an increase in pension wealth is not necessarily followed by an increase in current consumption.

Precautionary saving can have similar effects. An increase in private wealth offset by a decline in pension wealth can reduce uncertainty and thus increase current consumption. Also in this case, the offset is less than complete. A related issue is that consumers are uncertain about the overall solvency of the social security system and the prospect of future pension reforms. If

this is the case, they may revise their social security wealth expectations downward and save more in the current period.

Another factor that may have a bearing on the wealth replacement effect is the extent of financial education of the household. Many households have short-run horizons, either because of liquidity constraints or myopia. They will therefore prefer one dollar of financial wealth rather than one dollar of pension wealth. Indeed, Gale shows that the displacement effect is stronger for individuals who contribute to IRAs and for college graduate.

We have neglected so far the possibility that consumers respond to an increase in pension wealth by retiring earlier (a fact that cannot be captured in the simple two-period model of Appendix A.2). But according to the life cycle hypothesis saving and wealth increase with the length of retirement. Feldstein (1976) shows that this *induced retirement effect* can potentially invert the sign of the relationship between private and pension wealth (the estimate of σ could be smaller in absolute value or even turn positive).⁵

2.2 The effect of mandatory saving on national saving

Tax incentives for pension funds exist in virtually all countries. Most tax codes allow contributions to pension funds to be made out of pre-tax income, or to attract a tax rebate. Investment income of pension funds is often allowed to accumulate free of tax. Many countries even allow some part of the benefits to be paid out tax-free or at a concessionary tax rate.

A regime in which contributions and returns are exempt is a classical example of an expenditure tax, treating saving as any other form of consumption. On the other hand, a regime in which contributions are taxed and benefits are exempt corresponds to a regime in which accruals to both earnings and saving are taxed. In practice, the various tax regimes can have different effects, depending on the marginal tax rate during the working span and the marginal tax rate at retirement.

Whitehouse (2000) provides a description of the tax treatment of pensions in the OECD countries. With the exception of Australia, Iceland, Japan and France, pension contributions are

⁵ Feldstein notices that such effect tends to be particularly relevant just after the introduction of a pay-as-you-go system, when contributions bear little relation to annuities and workers revise their expectations concerning the age of retirement.

made out of pre-tax income or attract a tax rebate. There is always a limit on deductibility of contributions. In the majority of OECD countries income accruing in the pension fund accumulates tax free, but there are exceptions. Australia, Denmark, and Sweden tax, partially or totally, the real return of the fund. On the other hand, all countries except New Zealand tax withdrawals, although at different degrees. For instance, some countries allow withdrawal of a tax-free lump sum, while others apply tax penalties to early withdrawals.

Outside the OECD, the tax treatment of pension funds follows similar principles: contributions and returns are usually exempt, while benefits are taxed. Table 2 describes the main features of the tax treatment of mandatory contributions to pension funds for a selected group of Latin American and East Asian countries that have recently reformed their pension systems. In Argentina, Chile, Colombia, Costa Rica, Mexico and Uruguay contributions and investment income are exempt, while benefits are taxed. In Latin America the exception is Peru, where contributions and benefits are taxed but investment income is exempt.

The situation is more heterogeneous in East Asia, where all countries listed in Table 2 feature exempt contributions. In Malaysia, the Philippines and Thailand also pension benefits are tax-free, while investment income is taxed in the Philippines, Thailand and partly in Indonesia. Malaysia and Singapore operate a national, public managed, provident fund system, while Indonesia has a private management structure.

Figure 1 plots histograms of the GDP share of the sum of reserves of mandatory pension systems and private pension fund assets in selected countries of Latin America, Asia and Africa. Chile, Malaysia, Singapore and South Africa stand out, with a GDP share of 50 percent or higher. Pension fund assets are positively associated with the ratio of national saving to GDP, as shown in Figure 2. One possible interpretation of the positive correlation is that the tax provisions attached to mandatory saving programs are associated with higher national saving, as in Section 2.1.

Since the positive relation between pension fund assets and national saving might be driven by other variables, we turn to regression analysis and estimate the following reduced form for national saving:

$$\frac{S}{Y} = \alpha_0 + \alpha_1 \rho + \alpha_2 \frac{S_g}{Y} + \alpha_3 DEP + \alpha_4 \frac{PFA}{Y} + \varepsilon$$

where Y denotes GDP, S national saving, ρ the growth rate of GDP, S_g government saving, DEP the dependency ratio (defined as the ratio of those aged less than 15 or more than 65 and total population), and PFA the sum of reserves of mandatory pension systems and private pension fund assets as a ratio to GDP.⁶ All variables are averaged over the 1985-1995 period. Data sources and variables definition are reported in Appendix B.

The purpose of the regression is to summarize the main determinants of national saving and, in particular, the correlation between tax-favored pension fund assets and national saving, once other variables affecting national saving are controlled for.⁷

The reason for using national saving as the dependent variable is that national saving is measured as national income less total (private plus public) consumption, a measure that does not rely on the definition of mandatory saving. On the other hand, private saving definitions are largely arbitrary depending, among other things, on the way mandatory contributions and pension withdrawals are treated. Furthermore, national saving is independent from inflation, while conventional definitions of private saving require a measure of private sector income, which is affected by the loss incurred from the depreciation of nominal assets due to inflation.

Several studies have estimated versions of this equation with time series data on individual countries, international cross-sections, or panels of countries (cf. Modigliani, 1993, Masson et al. 1998). According to the life-cycle model, saving should be positively related to the growth rate of income, and negatively affected by the dependency ratio ($\alpha_1 > 0$ and $\alpha_3 < 0$). Models with finite horizons also suggest that national saving increases with government saving ($\alpha_2 > 0$). On the other

⁶ Using the stock of pension fund assets in a flow (saving) regression might be criticized on the ground that the stock reflects not only the generosity of the mandatory scheme but also its maturity. Nevertheless, introducing stock variables in aggregate saving or consumption regressions is a well-established practice in applied economics. For instance, in tests of the life-cycle hypothesis it is quite common to regress saving on wealth, and many tests of the Ricardian equivalence proposition rely on regressions of private consumption on the stock of public debt.

⁷ The purpose of the regressions is descriptive, so we do not attempt to account for the possible bias induced by the endogeneity of some of the right-hand side variables (e.g., GDP growth), the role of omitted variables (such as corporate savings), and time aggregation issues. See Loayza, Servén and Schmidt-Hebel (2000) for a discussion of these and related issues.

hand, according to the Ricardian equivalence proposition, public and private saving are perfect substitutes, so that an increase in government saving should not affect national savings ($\alpha_2=0$).

The proposed specification can be used to assess the impact of mandatory and contractual saving on the national saving rate. The discussion in Section 2.1 highlights that in the absence of tax incentives pension fund assets are a substitute for private accumulation and should not affect national saving ($\alpha_4=0$). If instead contributions are favored by the tax code there should be a positive effect on national saving ($\alpha_4>0$).

Table 3 reports the regression results. The first regression relies on a cross-section of 60 countries for which we could find complete records. The GDP growth rate and the government saving rate are associated with higher national saving, while an increase in the dependency ratio reduces national saving. All coefficients are statistically different from zero at the 1 percent level. These findings are in agreement with previous studies and provide strong evidence for the life-cycle model. The effect of pension fund assets is positive and statically different from zero in the LDC countries.⁸

To check the robustness of our results, we performed a sensitivity analysis allowing for changes in the estimation method, the definition of government saving, the sample used, and the omission of other variables potentially affecting national saving. The second specification re-estimates equation (1) using a robust method to control for the impact of influential values.⁹ The third and fourth regressions rely on a definition of inflation-adjusted government saving which is available for a subset of the countries in our sample.

The last two regressions report OLS and robust estimates based on the 38 LDC countries in our sample. In no case is the general pattern of results affected. In particular, the coefficient of pension fund assets ranges from 0.14 to 0.18 percent, and is statistically different from zero at the 1 percent level in all specifications, providing support for the proposition that tax-favored pension contributions raise national saving, at least in LDC countries. In the sample of LDC

⁸ Bailliu and Reisen (1997) also find that mandatory funded pensions promote national saving in developing economies. Their findings are consistent with a model based on mandatory contributions and credit constraints faced by low income workers.

⁹ The robust estimation method performs an initial OLS regression, calculates the Cook's distance, eliminates the gross outliers for which the Cook's distance exceeds 1, and then performs iterations based on Huber weights followed by iterations based on a biweight function (a routine programmed in the STATA econometric software).

countries the first quartile of the distribution of pension fund assets is 1.6 percent, and in the third quartile is 11.2 percent. Our estimates indicate that the thought experiment of increasing pension fund assets from the first to the third quartile is associated with an increase in national saving by 1.3 to 1.7 percentage points of GDP.

We also include in the baseline specifications a number of additional variables that could potentially affect the national saving rate: the real interest rate (measured as the difference between the nominal interest rate on government bills and the actual inflation rate), per capita income, the Gini coefficient of income inequality, the GDP ratio of social security expenditures (taken from Palacios and Pallarès-Miralles, 2000), and continental dummies. The coefficients of these variables are not statistically different from zero.

3. Fostering accumulation of housing

When governments incentive retirement saving, they change household portfolio allocations, but not necessarily the intertemporal allocation of consumption. If instead the tax code targets specific goods, such as housing, education or health, it changes not only the margins of intertemporal choice, but also consumption allocations between different goods. This section reviews government intervention in the promotion of saving targeted to housing, while Section 4 examines tax incentives to save for education, health and other merit goods.

Programs whose aim is to foster the accumulation of housing take various forms, ranging from direct government investment, subsidies and contributions to households or firms, and indirect support for housing accumulation through tax incentives. One rationale for government intervention in this area is the notion that housing is an investment good, hence tax-deductible capital costs are in principle offset by imputed rental values. In practice the offset is modest, as the market value on which imputed rents are computed is underestimated (Duebel, 2000). So the main reason is to shift the portfolio allocation of wealth towards goods to which society assigns an important weight in alleviating poverty and in raising living conditions, much like targeting retirement saving is a remedy to household myopia and potential free-riding problems.

This chapter aims at a broad description of tax incentives to save and to borrow, so we do not discuss direct government intervention in the housing market, but focus on instruments

designed to raise household saving for housing finance: mandatory contributions to specially designed housing funds, contractual saving for housing, subsidies to financial intermediaries providing housing funds and, in Section 5, mortgage interest rate relief schemes.

In some industrialized countries (notably Austria, Germany, and France), housing finance has traditionally relied on contractual saving (Impavido, Musalem and Tressel, 2002). According to these contracts, households save an agreed amount over an extended period at pre-specified terms. At the end of this period, households are eligible for a loan to purchase or renovate an owner-occupied house. The saving schemes are characterized by fixed, below-market rates on savings and subsequent loans. The advantages of contract saving for housing are threefold. First, they provide adequate information to potential borrowers. Second, they make available funds for down payment. Finally, they offer protection against volatile financial markets (Lee and Renaud, 1995). The government has a relevant role in these programs, by providing saving premiums and tax benefits.

The rationale for these programs is that they allow poor households to access mortgage loans for home purchase that would be otherwise unavailable. This might be even more important in less developed countries, where many households lack the income to qualify for a loan and/or financial institutions tend to screen out these households because mortgages require regular payments over the long run and income stability, conditions that are unlikely to be met by poor households. Limited competition among financial institutions amplifies these market failures.

In the German Bauspar scheme, the principle is one of reciprocity. Contractual deposits are mobilized by specialized institutions and only available to make loans to participants. Savers fulfilling the terms of the contract receive a government interest premium proportional to the amount saved (up to a maximum).

The French system is traditionally more integrated with capital markets and contractual saving for housing works similarly to an account with subsidized return. In contrast to the German model, savers can keep their saving in the housing fund without obtaining the loan if they find the deposit yield attractive. Deposit institutions can use the deposits to finance housing loans or purchase bonds in the secondary mortgage market. As in Germany, French savers enjoy a government interest premium on contractual saving over the banks' deposit rate. Lee and Renaud (1995) provide a thorough discussion of pros and cons of contractual saving schemes for

housing, and conclude that the success of these programs critically depends on financial and price stability, two conditions that are seldom met in LDC countries.

Housing banks enjoy a wide range of subsidies, including direct tax-based funding, direct deposits with tax or regulation preferred status or government guarantees, exemption from income taxation, stamp duties and lien registration costs. They play a prominent role in several developing countries, such as Korea, Thailand, Brazil, Argentina, Venezuela, Jordan, India and Indonesia (Duebel, 2000).

But the most striking programs to foster the accumulation of housing are mandatory contributions to housing funds, widespread in several Latin American and Eastern Asian countries. Table 4 reports the main features of these programs. They differ quite widely in the amount of contributions, eligibility and loan characteristics. Contributions to housing funds are usually based on payroll tax, with one notable exception: in Argentina, contributions are no longer from income payroll tax but from the fuel consumption tax.

Many of these programs were not originally earmarked towards housing, but have evolved to allow contributors to withdraw funds for home purchase. For instance, in Brazil the FGTS (*Fundo de Garantia de Tempo de Serviço*) was established in 1967 as a severance pay fund in the case of termination without just cause. It requires employers to deposit a (tax-deductible) 8.3 percent of the worker's pay in a restricted saving account in this Fund, managed by the National Housing Bank, in the names of their employees. The account earns interest of 3 percent per year in addition to a monthly adjustment to compensate for inflation.¹⁰ Employees may withdraw the balances in these bank accounts if they have been dismissed without just cause, if the firm is liquidated, at retirement, or to purchase a personal residence under a government-approved housing financing scheme. In case of dismissal without just cause the employer has been obliged to pay to the employee an additional amount equivalent to 40 percent of the accumulated balance in the employee's FGTS bank account.¹¹

¹⁰ In the early 1970s the Brazilian government introduced also a housing saving account that was exempt from income tax and indexed to inflation.

¹¹ At the time of writing, the Brazilian Parliament is discussing reducing the contribution rate to FGTS from the present 8.3 percent to a 2 percent level. Moreover, in case of lay-offs the employer will not have to give severance pay or pay the 40 percent penalty to the FGTS.

Mandatory saving is sometimes targeted to both retirement and housing. Table 5 lists some selected examples around the world. In Malaysia, for instance, accumulated Employees Provident Funds can be used to serve retirement purposes (60 percent), home purchase (30 percent), and even medical expenses (10 percent). Similar provisions, subject to limits, exist in Colombia and other Asian countries.

The stated targets of most mandatory savings programs for housing are low-income households. However, experts have lamented that most of the social/public housing projects have in practice favored middle-income rather than poor households. In Venezuela only 8 percent of households contributing to the *Ahorro Habitacional* fund have actually received a housing unit (under the *Ley of Politica Habitacional*). In Mexico, INFONAVIT has assisted little more than 11 percent of households contributing to the fund. In Peru, the FONAVI fund has been in effect no more than an additional payroll tax imposed on employers.¹² Experts have also noted that mandatory contributions to housing funds tend distort credit markets and inhibit their development.

4. Targeting merit goods: education, health, and life protection

Virtually all industrialized countries provide some form of tax incentives for saving toward education, tax deductibility of educational expenses, health and life insurance premiums, and out-of-pocket medical expenses. Education, health, and life protection can be regarded as merit goods and, in the case of education and health, long-term growth enhancing factors. These programs are absent or of negligible importance in less developed countries. Table 6 describes the features of some of these programs and tax provisions for selected countries.

A striking addition to the wide range of tax concessions and other government interventions already influencing the college tuition motive for saving in the United States (cf. Feldstein, 1995, Souleles, 2000), is the Education IRA, introduced by the Taxpayer Relief Act of 1997. Under

¹² In the late 1990s the Fujimori government transformed the housing fund into an "Emergency Solidarity Tax" and, after January 2000, the new government phased out the mandatory contribution scheme because of its unpopularity.

this scheme an annual, non-deductible contribution of up to \$500 per year per child (tapered for high-income households), may be invested until the child reaches age 18. Withdrawals to pay for college expenses for the child are tax-free.

In most European countries schools are public and higher education funded by general taxation with limited tuition fee expenses, and accordingly a lower need to save to meet this capital outlay. Nevertheless, in some countries private education expenses receive some limited tax advantage (as in Germany and Italy).

The tax code also influences the demand for health insurance. Major health expenses are tax deductible in a handful of countries, particularly where the government-provided healthcare system is absent or deemed to be of poor quality. In the US, out-of-pocket medical expenditures above a threshold (currently 7.5 percent of adjusted gross income) can be deducted from adjusted gross income; but this excluded health insurance premiums paid by employees. In Italy both private health insurance premiums and a limited amount of out-of-pocket medical expenses are tax deductible. Among developing countries, Argentina, India and Taiwan offer tax deductibility of private long-term health insurance subject to some limits.

Finally, several countries' tax systems contain provisions to incentive life insurance contributions.¹³ Many life insurance contracts are structured to embody a significant element of saving with only a modest insurance component. Typically, the tax advantages are granted only if the investors commit to long-term contracts, which can be seen as a substitute for retirement saving.¹⁴ Tax deductibility tends to be operative on the financial component of the contract, rather than on the pure insurance component – though Canada provides an exception in this respect.

In the United States accumulated reserves in life insurance contracts are relatively unimportant because returns tend to be lower than the pretax return on the assets that back the policies because of administrative costs. In Italy, life insurance premiums were partly tax-deductible between 1987 and 2000, but the tax system did not discriminate between the saving and the insurance component. The 2000 tax reform maintains incentives only for the financial

¹³ See Poterba (1994) for an overview of saving through insurance contracts in G7 countries.

¹⁴ For instance, in Italy, France and Japan tax deductibility of premiums is available only for contracts 5 years or longer.

component.¹⁵ In developing countries (such as Argentina, India, Singapore and Taiwan) tax systems feature partial tax deductibility of contributions to life insurance policies.¹⁶

From a public policy perspective it would be interesting to know how the schemes discussed above compare with non-financial based incentives that achieve the same broad goals; for instance, comparing the effectiveness of tax incentives for education with direct subsidies, or tax deductibility of health-related expenses with deductibility of health insurance premiums. Which types of scheme are most effective in enhancing education or improving health standards; which are prone to abuse; and what are the redistributive impact and macroeconomic consequences of the different incentive regimes. So far the evidence is scant, particularly in developing countries, preventing clear-cut policy advice in this area.

5. Incentives to borrow

In many developed countries tax incentives to save co-exist with tax incentives to borrow in the form of tax deductibility of interest payments. Such allowances may have important implications for the structure of household portfolios and for the overall level of saving. For instance, in almost all EU countries and in the US a portion of mortgage interest rate payments is tax deductible (Maclennan, Muellbauer and Stephens, 1998). On the other hand, few countries offer tax incentives for consumer credit and educational loans (see also Section 4 for details on education).

Table 7, drawn from Poterba (2001), summarizes the type of borrowing incentives for house purchase and consumer credit that exist in nine major OECD countries. Due to the low level of development of credit markets, such programs are seldom present in less developed countries.

¹⁵ Jappelli and Pistaferri (2002) find that there is little responsiveness of contributors' decision to invest to changes in the return of the policy induced by changes in the tax deductibility of the premiums.

¹⁶ Many countries tax bequests. Among developing countries, Brazil, Chile and Singapore do; India, Indonesia and Mexico don't; Argentina levies a transfer fee on the beneficiary. Critics of the estate tax claim that it has an adverse effect on investment and saving, as it raises the cost of capital and it makes it harder for family businesses to survive the deaths of their founders.

Only one of the nine nations, the Netherlands, currently allows tax deduction for consumer credit, subject to a limit (in Sweden tax deductibility of consumer credit was phased out in 1991). Households can deduct mortgage interest payments in five out of nine nations. In the United Kingdom the tax deduction has been phased out in April 2000 (see below). In Japan taxpayers are not allowed to deduct mortgage interest payments, but enjoy a special tax credit for first-time home purchase, subject to a time limit. Three countries, the United States, the Netherlands, and France, allow relatively unrestricted deductions for mortgage interest, and a fourth, Italy, allows mortgage interest deductions for first-time homeowners only. In the United States, households cannot deduct interest on more than \$1,000,000 of mortgage debt, and in practice this constraint rarely binds. In light of this cross-sectional heterogeneity in tax rules, one should expect households to allocate a greater share of their portfolios to housing assets in the U.S., France, and the Netherlands, and to rely more on mortgage debt in these countries, than in other nations.

Tax deductibility of loan payments reduces the after-tax interest rate paid on the loan. Theoretically, for net borrowers the effect and substitution effects discussed in Appendix A.1 go in the same direction: an increase in the interest rate increases interest payments (the income effect) as well as the relative price of current consumption with respect to future consumption (the substitution effect). For both reasons, borrowing and current consumption decline. Thus, on theoretical grounds the removal of tax incentives to borrow should be accompanied by a fall in debt (i.e., an increase in saving). Yet, tax incentives to borrowing have been the subject of much less investigations than incentives to save. Ideally, such investigation should be carried out at the microeconomic level, exploiting the variability induced by tax reforms that change incentives to borrow for different household groups.

A good example in this respect is the UK MIRAS (*Mortgage Interest Relief at Source*) experiment. Before then, there were two sources of potential cross-sectional variability. Mortgagers received tax relief on the interest on the first £30,000 of a mortgage; the tax relief was increasing with the marginal tax rate. Moreover, until 1988 the £30,000 limit applied on single mortgagers rather than the property, i.e. unmarried people could each receive relief on loans up to £30,000, including more than one on the same property. In 1988 the government eliminated such distortion. According to Hills (1990) this tax change, advertised five months in advance, was a contributory factor to the overheating of the UK housing market in 1988.

The model in Appendix A.3 shows that quantity constraints on borrowing generally distort the intertemporal consumption profile. In practice, policy makers might still want to discourage household borrowing, because they might target saving and investment at the expenses of consumption. The experience of several developed countries is consistent with argument. For instance, in South Korea and Taiwan selective credit ceilings have been placed on mortgage loans with the explicit aim of fostering industrial investment.¹⁷

Conclusions

We began this survey with the consideration that there are good reasons for encouraging household saving. First of all, there is considerable evidence that even in closed economies or economies with imperfect capital mobility, higher saving leads to more productive investment and ultimately wider economic development. A second compelling argument for promoting pension funds and the life insurance industry is that the contractual savings industry can have a favorable impact on the diversity and efficiency of the financial system, contributing to the establishment of so-called popular capitalism, enhancing the incentives to perform of individuals with a direct stake in the holding of risky financial assets.

While the arguments in favor of promoting saving are widely accepted and theoretically compelling, there is less consensus on the ways to achieve this goal and on the interpretation of the empirical evidence. A first issue is whether governments should rely on tax incentives to retirement saving –but leave the ultimate decision to the individual consumers– or on mandatory retirement programs.

Tax incentives to save can be justified on the ground that they do not distort the intertemporal choice between consumption and saving: a regime in which contributions and

¹⁷ This is witnessed by country studies. Park (1991) argues: "One advantage of the repressive financial system in Korea, and to a lesser degree in Taiwan, may have been its ability to supply long-term finance. [...] Without government intervention the profit-oriented behavior of the commercial banks would have resulted in the dearth of long-term finance" (p. 41).

returns are tax-exempt treats saving as any other form of consumption. However, in practice this is not the case, as shown in Section 2, because in most countries the tax code does not achieve neutrality. And there is considerable empirical debate as to the effectiveness of tax incentives in promoting saving: most studies conclude that tax incentives affect the allocation of household portfolios, but the effect on the amount saved is less clear-cut. Tax incentives raise also serious distributional issues, particularly in developing countries, as only individuals in the upper tail of the income distribution have the resources and the financial information required to take advantage of the incentives. Finally, tax incentives have a cost in terms of revenue losses. To the extent that losses are shared more equally than gains, tax incentives to save might affect adversely the distribution of resources in the economy. For these reasons, promoting voluntary saving might not be the right instrument in achieving the goals outlined above.

On the other hand, mandatory saving programs avoid the free-riding problems that would arise if individuals were free to choose the amount of saving; they force even myopic individuals to set aside resources to be spent during retirement. If the policy goal is to increase investment and growth and promote popular capitalism, mandatory saving programs are more likely to succeed than voluntary saving schemes, even at the cost of distorting the intertemporal allocation of resources that households would choose otherwise.

Besides retirement saving, there is a wide range of instruments that governments apply to promote saving for specific goods (housing, education and health). The widest area of intervention is housing, where the most striking instruments are mandatory contributions to provident funds designed to accumulate resources for a down payment against home purchase. Several countries also encourage saving for education and medical expenditures, while still others encourage (or discourage) borrowing. At the moment, the interplay between these different saving instruments, their distortionary impact on household portfolios and, ultimately, their effectiveness in achieving sectoral and macroeconomic goals have been subject to much less empirical studies. A priori, one can expect considerable portfolio effects from these programs, but in the absence of detailed studies it is difficult to evaluate their overall effectiveness. For instance, mandatory saving programs for housing clearly raise the share of wealth allocated to housing. However, the effectiveness in raising the overall homeownership and saving rates can be

undermined by displacement effects on other forms of wealth, bureaucratic costs in managing the provident funds, government revenue costs and the associated distributional impacts.

There is ample ground for detailed studies on these and related issues, but at the moment the evidence is scant, particularly in developing countries, preventing clear-cut policy advice in this area. The studies would require microeconomic surveys to sort out individuals affected and not affected by the tax incentives, and detailed data on the composition of household portfolios to track the response of the individual wealth components to the presence of incentives to housing, health, education and borrowing.

While the discussion above applies to developed and developing countries alike, we would like to conclude singling out two issues that are likely to be of particular importance in developing countries. The evidence for developing countries indicates that *pension coverage* is far from complete. Extending pension coverage, and the associated tax benefits, might be far more important than introducing sophisticated saving incentives. Besides affecting national saving, pension coverage can have a number of other effects, for instance in raising the attachment of workers to firms and labor productivity. Needless to say, financial transaction costs are high in many developing countries.¹⁸ These costs are compounded by judicial and bureaucratic costs, which in many countries represent a hidden tax on business and financial transactions (Djankov et al. 2002). This implies that the return and incentive to save can be increased by making the environment more competitive and efficient without resorting to explicit tax instruments.

¹⁸ One example are migrants' remittances, an important source of saving for developing countries. IADB (2002) presents evidence that a typical Latin-American migrant in the US remits 15 percent of her wages; however, transfer costs (which include transfer fee, exchange rate commission, check cashing fees, and other charges at the point of receipt) absorb about 15 percent of any sum transferred.

Appendix A: Analytical framework for assessing the impact of tax incentives on saving

This Appendix sets out a simple model of saving and examines the impact of tax incentives.

A.1. Two period-model of saving

To provide a background to some of the issues analyzed in Section 2, it is useful to consider the effect of changes in the after-tax return to saving in the simplest intertemporal choice model. Consider the standard two-period consumption model, where the individual maximizes utility

$$\max u(c_1, c_2)$$

subject to an intertemporal budget constraint:

$$c_1 + \frac{c_2}{1+r(1-\theta)} = a_1 + y_1 + \frac{y_2}{1+r(1-\theta)} = a_1 + h_1$$

where c_1 and c_2 denote, respectively, first and second period consumption, a_1 indicates beginning-of-period wealth, and h_1 human capital, i.e., the present discounted value of current and future (after-tax) income. The individual receives $r(1-\theta)$ on resources carried on from the first period to the second, where r is the real rate of interest and θ the tax rate on asset income.

The standard assumption is that the utility function is concave, and that the marginal utility of consumption is positive and decreasing, that is $\partial u(\cdot)/\partial c_j > 0$, $\partial^2 u(\cdot)/\partial c_j^2 < 0$, for $j=1,2$. The first order condition of the maximization problem is:

$$\frac{\partial u(\cdot)/\partial c_1}{\partial u(\cdot)/\partial c_2} = 1 + r(1-\theta)$$

If first-period consumption is reduced by one unit, second period consumption increases by $1+r(1-\theta)$. Thus, $1+r(1-\theta)$ represents the price of first-period consumption in terms of second-period consumption. Using the intertemporal budget constraint, the optimization problem delivers two demand functions:

$$\begin{aligned}c_1^* &= f[r(1-\theta), a_0 + h_0] \\c_2^* &= g[r(1-\theta), a_0 + h_0]\end{aligned}$$

Given the assumptions about the utility function, an increase in total wealth raises both c_1^* and c_2^* . The after-tax real interest rate has three effects on first-period consumption. If $c_1^* < a_1 + y_1$, that is, if the individual is a net saver in the first period, an increase in the after-tax return increases asset income received in the second period, raising both c_1^* and c_2^* (the income effect). The same increase in $r(1-\theta)$ raises the price of first-period consumption, increasing c_2^* at the expense of c_1^* (the substitution effect). Finally, an increase in $r(1-\theta)$ reduces human capital and consumption in both periods (the wealth effect). While the substitution effect and the wealth effect reduce c_1^* , the income effect tends to raise it. The overall impact of the interest rate on first period consumption and saving is therefore ambiguous.

On the other hand, if $c_1^* > a_1 + y_1$, that is, the individual is a net borrower in the first period, the income effect also tends to reduce c_1^* , because the borrower would have to pay higher interest in the second period. Thus, an increase in the interest rate for a net borrower always reduces first period consumption (increases saving). The effect of a change in the return to saving therefore depends on the distribution of the endowments over the life cycle. And even when the effect can be signed, the strength of the effect depends on the concavity of the utility function, i.e. on the intertemporal elasticity of substitution. As indicated in Section 2, the effect is ambiguous not only theoretically, but also empirically.

A.2. The tax treatment of mandatory contributions

In this Appendix we study the effect of deductibility of mandated contributions on the composition of household wealth and on the overall level of saving. We consider a standard overlapping generations model, where households maximize utility and are subject to a general income tax rate τ and to a mandatory contribution to a fully funded pension fund μ . In the first period income taxes and mandated contributions are a fixed proportion of wages. In the second period, capital income and pension benefits are taxed at the same general income tax rate τ . We analyze two cases. In a first scenario, pension contributions are levied on first-period income and are not tax deductible. In the second scenario, contributions are fully tax-deductible.¹⁹ We assume throughout that the contribution rate does not exceed the propensity to save that would prevail in the absence of pensions.

The effect of mandated pension contributions on national saving arises from the tax treatment of contributions, and does not require that saving responds positively to changes in interest rates. In fact, we consider the log-utility case in which income and substitution effects cancel each other out. Since second period income is zero by assumption, there is no wealth effect. Consumers solve the problem:

$$\max \ln c_{t,t} + \beta \ln c_{t,t+1}$$

In the first scenario, with a mandated pension fund yielding the same return as private savings, the budget constraints in the two periods are:

$$\begin{aligned} c_t^y + s_t^p &= w_t(1 - \tau - \mu) \\ c_{t+1}^o &= \left[(1 + r_{t+1})s_t^p + (1 + r_{t+1})w_t\mu \right] (1 - \tau) = (1 + r_{t+1})(1 - \tau) \left[s_t^p + w_t\mu \right] \end{aligned}$$

The intertemporal budget constraint is:

¹⁹ We do not examine a situation in which contributions are not tax deductible but benefits are tax exempt, because it is rarely observed in practice.

$$c_t^y + \frac{c_{t+1}^o}{(1+r_{t+1})(1-\tau)} = w_t(1-\tau)$$

In the absence of population and income growth national saving is the sum of mandated and private (or discretionary) saving, s_t^m and s_t^p respectively:

$$s_t(nd) = s_t^p + s_t^m = \frac{\beta}{1+\beta} w_t(1-\tau)$$

Mandated savings is $s_t^m = \mu w_t$ and private saving is $s_t^p = \left[\frac{\beta(1-\tau)}{1+\beta} - \mu \right] w_t$.

The first point to note in the expression for national saving is the negative effect of τ on after-tax wages and therefore saving. The interest rate channel is not operative here, because we assume log utility and that second-period income equals zero.

The second point to note is that a change in μ does not affect $s_t(nd)$: national saving would be the same even in the absence of forced saving. On the other hand, an increase in mandatory savings (s_t^m) reduces private savings (s_t^p) one-for-one (a *wealth replacement effect*). This poses important definitional issues when measuring and comparing saving across countries that differ in the extent of mandatory programs. In particular, mandatory contributions to pension funds, either paid by employees or employers, should be counted as part of income and therefore household saving. On the other hand, the pension paid in the second period, $[(1+r_{t+1})w_t\mu](1-\tau)$, should not be considered as part of income, because it is matched by an equal reduction in pension wealth. Thus, first period saving is $s_t(nd)$ and second period dissaving is just $-c_{t+1}$.

In our simple closed-economy framework, national saving translates into investment, thereby increasing the capital stock. In fact, appending a capital market equilibrium condition and assuming that the production function is Cobb-Douglas, $y=Ak^\alpha$, one obtains a closed form solution for the steady-state capital stock:

$$k(nd) = \left[\frac{\beta(1-\tau)(1-\alpha)A}{1+\beta} \right]^{\frac{1}{1-\alpha}}$$

As with the national saving, the steady-state capital stock is decreasing in τ and unaffected by the contribution rate μ .

Consider now a situation in which contributions to mandatory pension funds are tax-exempt, so that the income tax is computed on income net of the contribution. As we shall see, this is the standard case in most industrialized and developing countries. The budget constraints in the two periods are:

$$\begin{aligned} c_t^y + s_t^p &= (w_t - \mu w_t)(1-\tau) = w_t(1-\tau)(1-\mu) \\ c_{t+1}^o &= (1+r_{t+1})(1-\tau)(s_t^p + w_t\mu) \end{aligned}$$

and the resulting intertemporal budget constraint is:

$$c_t + \frac{c_{t+1}^o}{(1+r_{t+1})(1-\tau)} = w_t[(1-\tau) + \tau\mu]$$

National saving is then:

$$s_t(d) = \frac{\beta}{1+\beta} w_t[(1-\tau) + \tau\mu]$$

By comparing the two expressions for national saving one sees that saving is higher in the economy where contributions are tax deductible:

$$s_t(d) - s_t(nd) = \frac{\beta}{1+\beta} \mu \tau w_t$$

The difference in national saving depends on the contribution rate and on the tax rate. For reasonable values of μ and τ , saving can be substantially higher in an economy with tax-deductible contributions. By appending a capital market equilibrium condition one can also derive the steady-state capital stock:

$$k(d) = \left[\frac{\beta[(1-\tau) + \tau\mu](1-\alpha)A}{1+\beta} \right]^{\frac{1}{1-\alpha}}$$

which is clearly higher in the economy with tax-deductible contributions.

Often only a fraction of the workforce contributes to pension funds. Denoting this fraction by λ , national saving is a weighted average of the saving of contributors and non-contributors. While the fraction does not affect national saving in the economy with no deductions, when contributions are tax-deductible national saving increases with pension fund coverage:

$$s_t = \frac{\beta}{1+\beta} \{w_t(1-\tau)(1-\lambda) + w_t[(1-\tau) + \tau\mu]\lambda\}$$

One can extend this simple framework in several directions. In endogenous growth models (for instance, models where output is a linear function of the capital stock), the growth rate of the capital stock and of national income, rather than the levels of the two variables, increases with pension coverage and with the mandatory contribution rate.

We have implicitly assumed that the tax rate finances government consumption that is simply wasted. But in more realistic setups government expenditure might impact the productivity of the private sector. If the government budget is balanced, one can show that in an economy with tax-deductible contributions the required tax rate is lower than in an economy without deductions. Equivalently, that for given tax rate, the capital stock is higher in the economy with deductions. However, during the transition to a tax-favored regime, even though the tax treatment of mandatory contributions promotes pension saving, it might defer government revenues. Finally, we have considered only dynamic efficient economies. In dynamically

inefficient situations eliminating tax deductions is one way to approach the golden rule of capital accumulation.

A.3. The effect on national saving of tax incentives for borrowing

To see the implications on national saving of changes in incentives to borrow, consider a simple overlapping generations model with two types of individuals: a fraction λ with endowments in the first period and nothing in the second (net savers), and a fraction $(1-\lambda)$ with endowments only in the second period (net borrowers). Assume for simplicity that the proportion of the two types in the population is exogenous. Net borrowers borrow from net savers in the first period, and repay their debt in the second period. This framework requires only minimal change in assumptions and notation with respect to the model in Appendix A.2.

Net borrowers face an interest rate on borrowing given by $(1+r_b)=(1+r)(1+\phi-\theta)$, where ϕ is the cost of financial intermediation (assumed exogenous) and θ is the tax incentives (say, deductibility of consumer credit or mortgage interest); for simplicity, we assume that ϕ is wasted during the intermediation process. Net savers face an interest rate on lending equal to r . Assume also that $r_b > r$ (that is, $\phi > \theta$). First period saving of the "net savers" is:

$$s_t^s = \frac{\beta}{1+\beta} w_t$$

First period saving of "net borrowers" is negative:

$$s_t^b = -\frac{1}{1+\beta} \frac{w_{t+1}}{(1+r)(1+\phi-\theta)}$$

Clearly, raising the incentive θ will reduce the interest rate on borrowing, increase debt and therefore reduce saving. Note that $u_1 = \beta(1+r_i)u_2$ where for a net borrower r_i is the lending rate and for a net saver it is the lending rate; thus, the Euler equation implies that individual consumption growth is higher for net borrowers than for net savers.

Aggregate wealth in period t is the sum of the saving of the savers, and the dissaving of the borrowers:

$$\lambda N_t s_t^l + (1 - \lambda) N_t s_t^b = \frac{\beta}{1 + \beta} w_t \lambda N_t - \frac{1}{1 + \beta} \frac{w_{t+1} (1 - \lambda) N_t}{(1 + r)(1 + \phi - \tau)}$$

An increase in θ increases borrowing and first period consumption of net borrowers and therefore lowers aggregate saving. Thus, aggregate wealth falls with θ . Note also that reducing the cost of financial intermediation ϕ will increase first period borrowing and reduce saving.

The capital market equilibrium condition is $K_{t+1} = \lambda N_t s_t^l + (1 - \lambda) N_t s_t^b$. Suppose that population is stationary. With Cobb-Douglas production function, the marginal product of labor is $w = A(1 - \alpha)k^\alpha$ and the marginal product of capital is $(1 + r) = \alpha A k^{\alpha - 1}$. The steady-state capital stock is:

$$k = \left[\frac{\lambda \gamma (1 - \alpha) A}{1 + \frac{(1 - \lambda) \gamma (1 - \alpha)}{\alpha (1 + \phi - \theta)}} \right]^{\frac{1}{1 - \alpha}}$$

where $\gamma = [\beta / (1 + \beta)]$. The capital stock also falls with θ .

While this model shows that incentives to borrow generally depress saving, the growth effect of tax incentives to borrow is less clear-cut, particularly in models with endogenous growth. The model takes for granted that there are two types of individuals in the economy. But suppose that individuals with no endowment in the first period would like to borrow to finance human capital investment. In turn, this might prompt a higher wage rate in the second period. Then, introducing tax incentives to borrow will tend to foster human capital accumulation and, in models in which human capital is an engine for growth, the steady-state growth rate (De Gregorio, 1996).

Appendix B: Data used in the estimation

Data used in the regressions for national saving can be downloaded from <ftp://monarch/worldbank.org/pub/prddr/outbox>. National Saving is defined inclusive of all external transfers. Public sector data refer to central government. The definition of the public sector is that of consolidated central government, i.e. budgetary central government plus extra-budgetary central government plus social security agencies. This definition thus excludes local and regional governments. A detailed description of the data set can be found in Schmidt-Hebbel and Servén (1999). The original database includes 150 countries and spans the years 1960 to 1995. For each country, we take the 1985-1995 average. Each series consists of an Excel file; the files we have used are given in the table below. Data for pension fund assets and public expenditure on pensions are drawn from Palacios and Pallarès-Miralles (2000).

Variable	File
Gross national saving as a share of GDP	FORMU333.XLS
Government saving as a share of GDP	FORMU342.XLS
GDP at current prices	FORMU16.XLS
GDP at 1987 prices	FORMU17.XLS
Total population	CONST263.XLS
Population younger than 15	CONST264.XLS
Population older than 65	CONST265.XLS
Dependency ratio	$(\text{CONST264.XLS} + \text{CONST265.XLS}) / \text{CONST263.XLS}$
Pension fund assets as a share of GDP	Sum of reserves of mandatory pension systems and private pension fund assets as a share of GDP. Source: Palacios and Pallarès-Miralles (2000).
Public expenditure on pensions as a share of GDP	Includes all government expenditures on cash transfers to the elderly, the disabled, and survivors and the administrative costs of these programs. Source: Palacios and Pallarès-Miralles (2000).

Countries used in estimation for national saving

Argentina, Australia, Austria, Belgium, Belize, Bolivia, Brazil, Canada, Chad, Chile, Colombia, Costa Rica, Denmark, Ecuador, Egypt, El Salvador, Ethiopia, Finland, France, Gambia, Germany, Ghana, Greece, Honduras, India, Indonesia, Ireland, Italy, Jamaica, Jan, Jordan, Kenya, Luxembourg, Malaysia, Mauritius, Mexico, Morocco, Namibia, Nepal, Netherlands, Norway, Paraguay, Peru, Philippines, Portugal, South Africa, Senegal, Singapore, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Tanzania, Tunisia, UK, USA, Uganda, Uruguay, Zambia.

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Table 1
Saving Incentives in Voluntary Retirement Funds in Major Industrial Nations

Country	Retirement Saving Accounts?	Contribution Limit	Contributions Deductible?	Special Notes
Canada	Yes	\$9400 (\$15,500 Canadian), Indexed	Yes	Limits on foreign stock; carry forward unused contributions
France	No	—	—	
Germany	Yes	<i>Vermögensbildungsgesetz</i> Limit \$2200	Yes	Investment in "long term funds"; other programs to accumulate housing down payments
Italy	Yes	2% of wages or \$1414	Yes	
Japan	No	—	—	Universal <i>maruyū</i> postal saving accounts were phased out in 1986
Netherlands	Yes	1700 Guilders, or approximately \$850 per year for employee saving scheme	Yes	"Employee saving scheme" and "Premium saving scheme"; four year vesting period before withdrawal
United Kingdom	Yes	Personal pensions, contributions of 17.5 - 40 percent of earnings; Individual Saving Accounts (ISAs), limit of £5000/year contribution starting in 2000	Yes	ISAs face restrictions on investment choices; total contribution limits were higher in years before 2000
United States	Yes	\$2000 for Individual Retirement Accounts, \$10,500 for 401(k) plans	Yes	Other variants include Roth IRAs and 403(b) Plans

Source: Poterba (2001).

Table 2
Tax Treatment of Mandatory Retirement Funds in Latin America and East Asia

Latin America	Year implemented	Contributions	Investment income	Benefits
Argentina	1994	Exempt	Exempt	Taxed
Bolivia	1997	n.a.	n.a.	n.a.
Chile	1981	Exempt	Exempt	Taxed
Colombia	1994	Exempt	Exempt	Exempt up to a ceiling
Costa Rica		Exempt	Exempt	Taxed
El Salvador	1998	n.a.	n.a.	n.a.
Mexico	1997	Exempt	Exempt	Taxed
Peru	1993	Taxed	Exempt	Taxed
Uruguay	1996	Up to 20% of earnings are exempt	Exempt	Taxed
East-Asia				
Brunei		Exempt	Exempt	Exempt
Indonesia	1997	Exempt	Funds bank deposits and returns on listed local securities are exempt. Returns on open-ended mutual funds, unlisted securities and property are taxed.	Taxed
Malaysia	1991	Exempt	Exempt	Exempt
Philippines	1998	Employees' contributions are taxed. Employers' contributions are exempt to tax for qualified occupational plans.	Taxed	Exempt
Singapore		Exempt	Exempt	Exempt
Thailand	1998	Exempt	Exempt	Exempt

Source: Whitehouse (2000), Holzman et al. (2000).

Table 3
National Saving Regressions

The table reports national saving regressions using a sample of 22 OECD countries and 38 developing countries. The third and fourth regressions use the inflation-adjusted definition of government saving. The last two regressions are based on a sample of 38 developing countries. T-statistics are reported in parenthesis.

Variable	Total sample		Total sample, inflation adjusted government saving		LDC sample	
	OLS	Robust regression	OLS	Robust regression	OLS	Robust regression
GDP growth	1.389 (2.44)	1.470 (2.66)	2.232 (4.61)	2.298 (5.07)	1.478 (2.05)	1.562 (2.26)
Dependency ratio	-0.520 (-2.92)	-0.497 (-2.87)	-0.566 (-3.00)	-0.669 (-3.79)	-0.493 (-2.29)	-0.502 (-2.43)
Government saving / GDP	0.453 (2.06)	0.582 (2.73)	0.239 (1.66)	0.249 (1.85)	0.195 (0.65)	0.339 (1.18)
Pension Fund Assets / GDP	-0.005 (-0.16)	-0.026 (-0.80)	-0.041 (-1.16)	-0.049 (-1.51)		
(Pension Fund Assets / GDP)× LDC	0.167 (2.54)	0.179 (2.79)	0.143 (2.31)	0.173 (3.00)	0.168 (2.67)	0.156 (2.58)
LDC dummy	-4.333 (-1.47)	-4.724 (-1.65)	-3.852 (-1.40)	-2.625 (-1.02)		
Constant term	36.666 (5.33)	36.231 (5.42)	35.733 (4.98)	38.878 (5.79)	31.443 (2.91)	31.976 (3.08)
Number of countries	60	60	48	48	38	38

Source: See Appendix B.

Table 4
Mandatory Housing Funds

Country	Program	Main features
Argentina	FONAVI	Prior to 1991 mandatory contributions are 5 percent of the wage tax. Since 1991, 40 percent of the fuel consumption tax. To qualify for a loan, household monthly income must range between \$500 and \$1,000. The household assigns then 25 percent of income to monthly repayment installments. Terms are up to 25 years.
Bolivia	FONVIS (phased out in 1998)	The program featured public sector salary deductions earmarked for social housing improvement and construction. The current system is based on tax incentives for long-term saving.
Brazil	FGTS	The fund is made up of mandatory monthly deposits by employers into accounts held in the names of their employees at the Federal Savings Bank. The contribution rate is 8 percent. Loans with FGTS funds are targeted to low-income families, with monthly income of up to 12 minimum wages (approximately US\$933). Average loans amount to approximately R\$20,000 (US\$11,500).
Colombia	CAV	Mandatory contributions amount to one-month wages. Withdrawal is allowed to go back to school in case of quit or dismissal, and for home purchase.
Jamaica	National Housing Trust	Established in 1976. It is funded by statutory deductions from employers, employees and self-employed individuals. Contributors must earn more than the minimum wage. The contribution rate is 5 percent (2 percent from employees, 3 percent from employers). Self-employed contribute 3 percent. Funds are available for first home purchasing after a minimum of 3.5 years of contributions for a maximum amount of JA\$800,000 (per contributor).
Mexico	INFONAVIT	Mexican employers contribute 5 percent of their payroll to the fund, up to a maximum of 10 times the statutory minimum wage. The contributions accumulate into the national housing fund, used by INFONAVIT to award 30-year mortgage loans, with an average interest rate of 6 percent plus an adjustment for the annual increase in the minimum wage.
Peru	FONAVI (phased out in 2000)	Peruvian employers contribute 5 percent of total wages (salary plus bonuses) to the housing fund. The scheme (converted to an "Emergency solidarity tax") has been phased out in January 2000.
Philippines	PAG-IBIG Home Development Mutual Fund	Mandatory contributions are 1 percent for employees earning not more than 1.5 million pesos per month, 2 percent for those earning more than 1.5 million. All employers contribute 2 percent of the monthly compensation for all employees covered by the Social Security System and the Government Service Insurance System.
Venezuela	AHORRO HABITACIONAL	Mandatory contributions for public and private employees are 1 percent of wages for employees and 2 percent for employers. The self-employed can participate to the program on a voluntary basis with a contribution rate of 3 percent. Homeowners and individuals over 60 are exempt from the contribution.

Source: Duebel (2000).

Table 5
The Interaction Between Mandatory Pension Funds and Housing Finance

Country	Program	Main features
Colombia	CAV	Mandatory contributions equal to one-month wages are made to the CAV. If the pension fund exceeds 110 percent of minimum wages, it can be used for home purchase.
Malaysia	Employees Provident Fund (EPF)	Contributions to the EPF are apportioned into three accounts: 60 percent is for retirement, 30 percent for housing or pre-retirement plans (to be eligible for pre-retirement withdrawal the account holder must be over 50 years old), and 10 percent for medical expenses. The withdrawal can be used to buy or build a house, or to pay off a housing loan. A member is eligible to apply for withdrawal if he has not made any previous withdrawal to buy or build a house and has not attained the age of 55 at the time of application.
Philippines	Reserve funds of the social security system	Borrowing for housing against a share of the accumulated pension fund is possible.
Singapore	Central Provident Fund (CPF)	Borrowing for housing against a share of the accumulated pension fund in CPF is possible. In fact, over half of withdrawals in recent years are for housing purposes.
Sri Lanka	Employees Provident Fund (EPF)	The EPF is the largest mandatory saving program in Sri Lanka. The contribution rate is 12 percent for employers and 8 percent for employees. Contributions are taxed (i.e. they are paid out of after-tax income), but income from accumulated funds and benefits are exempt. It is possible to withdraw funds from retirement accounts for purchasing a home.

Source: Whitehouse (2000), Holzman et al. (2000).

Table 6
Tax Incentives for Education, Health, and Life Protection

Education	Main features
United States	Education IRA, introduced in 1997. An annual, non-deductible contribution of up to \$500 per year, per child may be invested until the child reaches age 18. Withdrawals to pay for college expenses for the child are tax-free. Single taxpayers earning an adjusted gross income above \$95,000, (\$150,000 on a joint return) are not eligible.
United States	Tax deductibility of up to \$ 2,500 on qualified student loans; tax credits of up to \$ 1,500 of undergraduate education and up to \$ 1,000 for any post-high school education..
Germany	Tax deductibility of 30 percent of tuition fees of government-approved private schools.
Health	
United States	Major out-of-pocket health expenses deductible (excluding private health insurance premiums).
Italy	Major out-of-pocket health expenses deductible (including private health insurance premiums).
Argentina	Private long-term health insurance tax deductible, subject to limits.
Taiwan	Private long-term health insurance tax deductible.
Germany	Private long-term health insurance tax deductible, subject to limits.
India	Private long-term health insurance tax deductible up to a cap.
Japan	Private long-term health insurance tax deductible up to a cap.
Life protection	
United States	Investment income is not taxed but withdrawals and contributions are. Employer-provided group term policies up to \$ 50,000 not taxed.
Canada	Investment income and withdrawals are tax free if they provide only an insurance, rather than an investment element.
United Kingdom	Withdrawals are tax free, but returns are taxed. Tax relief on premiums phased out in 1984.
Germany	Contributions are tax-deductible subject to a cap; returns are not subject to tax.
Italy	Contributions are tax-deductible subject to a cap and a time limit for life insurance products specifically designed to supplement social security pensions; withdrawals are taxed.
Japan	Contributions are tax-deductible subject to a cap and a time limit; withdrawals are partially tax-exempt.
France	Contributions are tax-deductible subject to a cap and a time limit; withdrawals are taxed.
Argentina	Contributions are tax-deductible subject to a cap; returns are tax-free.
India	Contributions are tax deductible; returns are taxed.
Singapore	Contributions are tax-deductible subject to a cap; returns are taxed.
Taiwan	Contributions are tax-deductible subject to a cap; returns are taxed.

Table 7
Tax Treatment of Borrowing, Selected OECD Countries

Country	Is Mortgage Interest Deductible?	Tax Treatment of Consumer Borrowing
Canada	No	Not deductible
France	Yes	Not deductible
Germany	No	Not deductible
Italy	Only for first-time homebuyers	Not deductible
Japan	No, but new homebuyers enjoy tax credit for up to six years	Not deductible
Netherlands	Yes	Deductible subject to a cap
Sweden	Yes	Fully deductible until 1991. Not deductible afterwards.
United Kingdom	No (effective April 2000)	Not deductible
United States	Yes, subject to rarely-binding limit	Not deductible. Home equity loans up to \$100,000 tax deductible.

Source: Poterba (2001).

Figure 1
Pension Fund Assets in Developing Countries

Source: See Note to Table 3

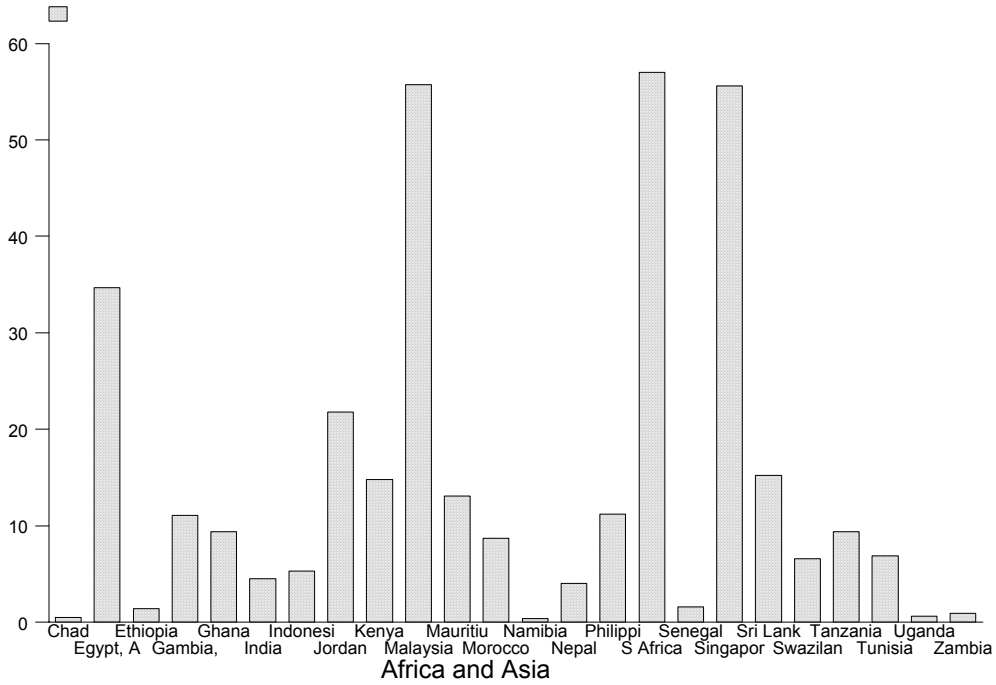
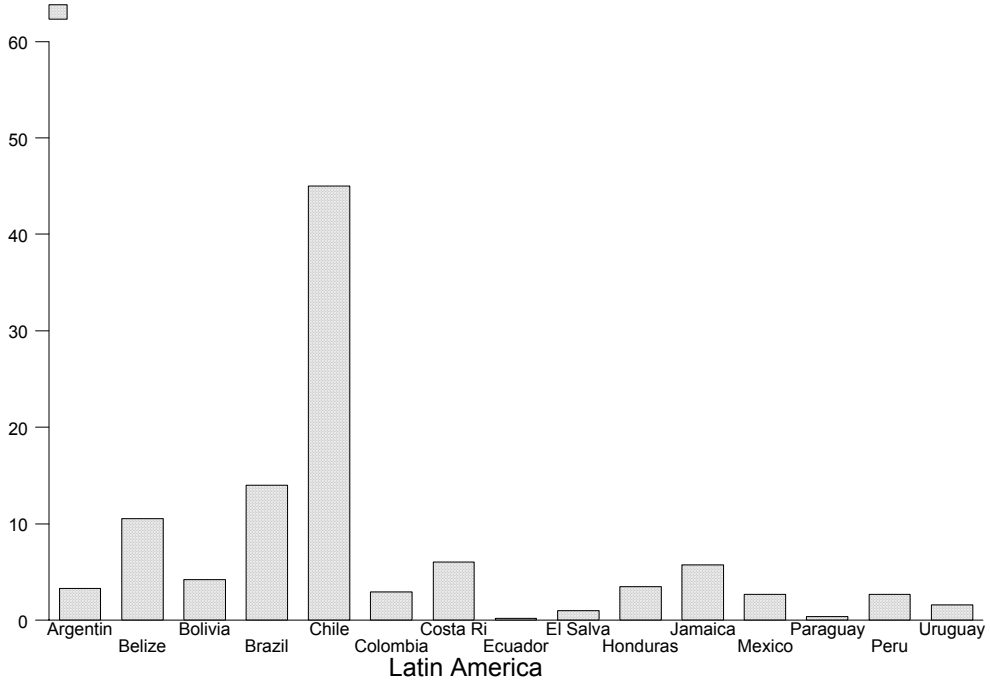
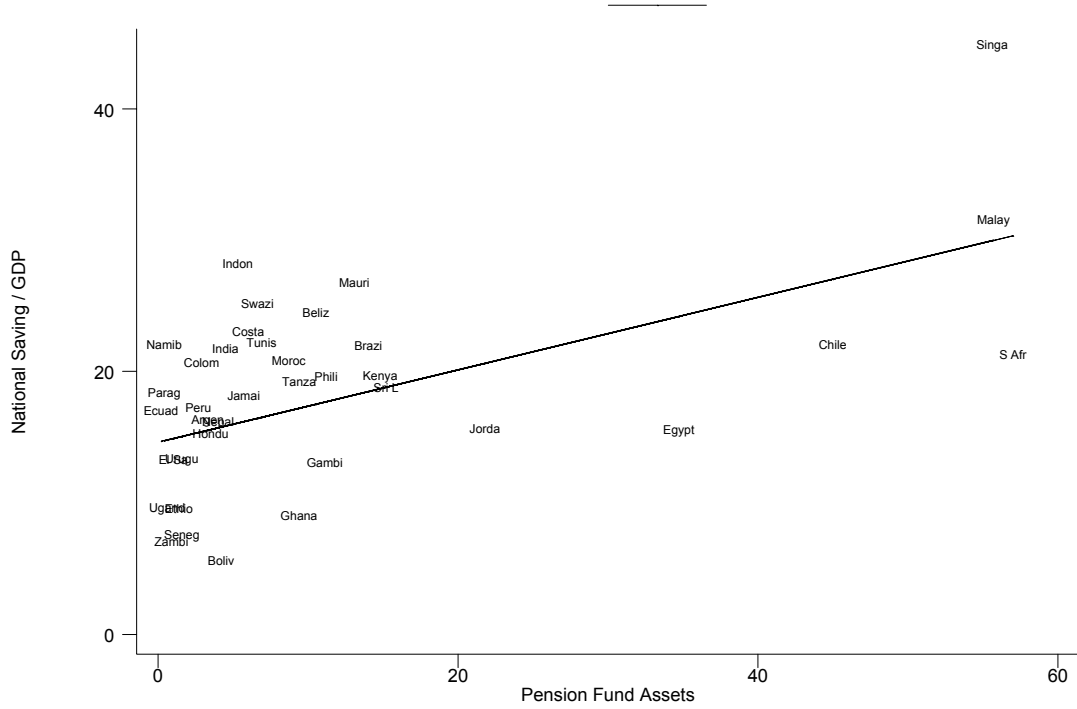


Figure 2
National Saving and Pension Fund Assets in Developing Countries



Source: See Note to Table 3