IMF Working Paper

WP/98/35

INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

Should Public Pensions be Funded?

Prepared by Richard Hemming[1]

March 1998

Abstract

This paper outlines some of the arguments for and against the funding of public pensions, with a view to establishing whether there is an economic basis for judging funding to be superior to pay-as-you-go (PAYG). It is argued that funding does not have a clear advantage, and the case for a shift from PAYG to funding is thus an uneasy one. There is nonetheless growing advocacy of funded public pensions as part of an ideal pension system, which raises more general issues about the role of the public sector in pension provision.

JEL Classification Numbers: H55, H60, J10

Keywords: Public pensions, funding, pay-as-you-go, aging populations

Author's E-Mail Address: rhemming@imf.org

---

[1]The author is grateful to Sheetal Chand, Luis Cubeddu, Philip Gerson, Sanjeev Gupta, Peter Heller, Martin Kaufman, George Mackenzie, Stephen Mathews, Alex Mourmouras, and Murray Petrie for their comments on an earlier draft.

Contents

SUMMARY

This paper outlines some of the arguments for and against the funding of public pensions, with a view to establishing whether there is an economic basis for judging it to be superior to pay-as-you-go (PAYG). In particular, the paper explains that while funding is the norm in the private sector, the justifications for this—related to the possible bankruptcy and the availability of tax advantages—do not carry over to the public sector. Funding public pensions therefore has to be defended by other advantages. If funding is a less expensive option than PAYG, if it results in greater intergenerational fairness, if it can better handle demographic and economic risk, if it can more clearly signal future pension costs, or if it is associated with higher saving, then a case could be made for funding.

The paper concludes that if funding has an edge over PAYG, it is not an overwhelming one. While funding may have a modest cost advantage over PAYG and have superior characteristics from the standpoint of intergenerational redistribution, its alleged superiority in handling demographic and economic risk, as well as signaling future pension costs, is difficult to justify. As for the widely made claim that funding will be associated with higher saving than PAYG, theoretical arguments tend to be consistent with this view, but convincing empirical support is missing. Nevertheless, the momentum for shifting from PAYG to funding remains. If there is to be a shift from PAYG to funding, the paper then suggests that there may also be a case for shifting from a public to private pension provision. In this connection, the paper highlights the approach to reform adopted in the United Kingdom, which offers a serious alternative to Chilean-type pension reform.

I. INTRODUCTION

Much of the work which highlighted the financial strain that pay-as-you-go (PAYG) public pension systems in industrial countries would inevitably face was done during the 1980s.[2] This work included cross-country studies of industrial countries undertaken by the OECD and the IMF, as well as individual country studies. Two sources of financial strain were identified in these studies. The first was generous pension benefits, the costs of which were not immediately obvious at the time they were awarded because they would be paid from some date in the future and, under PAYG, would not be reflected in higher contribution rates until that time. The second, more important source of financial strain was prospective population aging, which would reduce the number of workers relative to the number of pensioners and thereby raise the PAYG contribution rates required to cover any particular level of pension benefits. With projected contribution rates in most industrial countries looking set to reach unsustainably high levels around the end of the first quarter of the twenty-first century, the required policy response was almost unanimously judged to be a preemptive scaling back of pension benefits, and to varying degrees this is what has happened in those countries that have faced up to the financial problems of their public pension systems. During the 1980s, relatively little attention was paid to the possibility of changing the way in which public pensions were financed, and specifically to switching from PAYG to funding.

Move on to the mid-1990s and all the talk is about a switch to funding. *What has happened to explain the emphasis now placed on funding?* There has certainly been no significant intellectual debate in the interim that has produced a widely accepted conclusion that funding is inherently superior to PAYG. Nor has much fault been found in the approach some industrial countries have taken to scaling back pensions. Indeed, where there has been the political will to make quite large adjustments to pensions (e.g., as in the United Kingdom), it has been shown that PAYG pension finances can be placed on a sustainable path (Chand and Jaeger, 1997). If there is a single explanation for the attention now being paid to funding public pensions, it is most likely to be the success of pension reform in Chile, where some have claimed that the changeover to a funded system in 1981 has not only put in place a lower-cost, more secure pension system, but also that it has spurred the country's subsequent impressive savings, investment and growth performance. With this success in mind, funded systems are now being implemented or considered for implementation in other countries in Latin America (Argentina, Colombia, Mexico, Peru), as well as in some countries of Eastern Europe (Hungary, Poland), and of the former Soviet Union (Kazakhstan, Russian Federation, Ukraine). The option of shifting to funded social security in the United States is also attracting some attention (Feldstein, 1997).

---

[2]Unless otherwise indicated, the term "public pensions" refers to national social security or social insurance pensions, as distinct from pensions for civil servants and other public sector employees.

The main purpose of this paper is to outline some of the arguments for and against the funding of public pensions, with a view to establishing whether there is an economic basis for judging it to be superior to PAYG. In particular, the paper explains that while funding is the norm in the private sector, the justification for this—related to the possible bankruptcy and the availability of tax advantages—do not carry over to the public sector. Funding public pensions has therefore to be defended by reference to other advantages. If funding is a lower cost financing option than PAYG, if it results in greater intergenerational fairness, if it can better handle demographic and economic risk, if it can more clearly signal future pension costs and if it is associated with higher saving (or if at least most of these things are true), then a case could be made for funding. However, it is argued that funding does not have a clear advantage on these grounds, and the case for a shift from PAYG to funding is thus an uneasy one. There is nonetheless growing advocacy of funded public pensions as part of an ideal pension system. This raises general issues about the role of the public sector in pension provision. In particular, it can be argued that if there is a preference for switching from PAYG to funding, there may also be a case for shifting from public to private pension provision.

II. BACKGROUND

The structure of public pensions

The typical public pension scheme provides for a pension which is a fixed percentage of salary (sometimes average salary, but more often final or near final salary) for each year of service. This is a **defined-benefit** (DB) scheme, because pensions are predetermined and contributions follow from the chosen financing mechanism. Since PAYG financing is the norm, contributions paid by workers are set at a level sufficient to cover contemporaneous pension expenditure. Most industrial countries and many developing countries have a PAYG-DB public pension scheme. There are, however, other options. Funded-DB pensions are common in the private sector. Such schemes are usually employer based. An alternative to a DB scheme is a **defined-contribution** (DC) scheme, where contributions are predetermined and pensions reflect the pension fund accumulated at retirement. PAYG-DC schemes are rare, but funded-DC schemes are becoming more common. They supplement funded-DB pensions in some countries. But most notably, the pension system in Chile operates on this basis and the World Bank staff advocates funded-DC pensions.

The World Bank approach to reform

The World Bank is primarily responsible for advice from the Bretton Woods institutions on the structure of public pension schemes. The views of the Bank staff on pension reform are summarized in World Bank (1994), where a **three-pillar pension system** is recommended. This system has the following structure:

Pillar 1	Pillar 2	Pillar 3
Mandatory	Mandatory	Voluntary
Public	Public/Private*	Private
PAYG	PAYG/Funded*	Funded
Anti-poverty*/ Redistribution to elderly	Forced saving	Personal saving
Defined benefit	Defined benefit/ Defined contribution*	Defined benefit/ Defined contribution
Contributory/Tax financed*	Contributory	Contributory
Universal/Means tested*	n.a.	n.a.

Source: World Bank (1994).

*World Bank staff preference/recommendation.

Pillars 1 and 3 are for the most part uncontroversial. The consensus is that Pillar 1 should provide a safety net for the elderly, and should be the responsibility of the public sector. Pillar 3 should comprise private retirement savings options, with public involvement limited to regulation. The distinction between Pillars 1 and 3 clearly reflects the principal relative advantages of public and private provision. The public sector provides the safety net for pensioners because it has the power to tax and transfer, and has the ability to index pensions—which is a critical requirement at low incomes—because it is paying for them out of contribution income that is indexed to earnings. The private sector is in a position to provide a flexible range of pension arrangements in response to widely varying individual needs and preferences. Pillar 2 is more controversial. The Bank staff favors a funded-DC second tier, with partial privatization through private management of public pension funds.

There may appear to be merit in this approach given that the PAYG-DB combination has been associated with projected future public pension crises. The experience of the United Kingdom (Box 1) illustrates the problem well. The State Earnings Related Pension Scheme (SERPS) introduced in 1978 was unsustainable because of generous pension provisions, the costs of which would emerge only far into the future, and because after a period of favorable demographic developments which would mask the underlying costs of SERPS, the population

would begin to age quite rapidly. However, the United Kingdom experience also illustrates that unsustainable public pension finances can be addressed through bold parametric reform. Changing the earnings base for pensions, reducing the replacement rate, making inheritability provisions (i.e., widows' and widowers' pensions) less generous, and increasing pension age have returned pension finances more or less to sustainability. Parametric reform has to varying degrees also been implemented elsewhere (including in the United States, Japan and much of Europe). But public pension finances nevertheless remain unsustainable in many countries, and it would appear that the political limits to the extent that PAYG-DB schemes can be scaled back are fast approaching, and in some countries may have already been reached. *So how might switching to a funded-DC scheme help?*

Before addressing this question, it should be noted that the debate about the structure of Pillar 2 is concerned not only with the choice between PAYG and funding, but also with the choice between DB and DC schemes. It is also concerned with the role of the private sector in overall pension provision. The relative merits of DB and DC schemes and the role of the private sector are taken up later.

III. Arguments for Funding

Funding is the norm in the private sector, and private funds are substantial in many countries (Australia, Canada, the Netherlands, Switzerland, the United Kingdom, and the United States). Funded pensions are backed by accumulated assets. If a firm (or a financial institution) runs a DC pension scheme, the assets of the pension fund will by definition cover the pension liability. If a firm runs a DB pension scheme, then at a minimum the assets of the pension fund should be sufficient to cover the pension liability that has been accrued according to the rules of the scheme. Regulatory regimes usually establish this as a minimum solvency standard which guarantees that pension obligations can be honored if a pension fund is closed, as would happen when the parent firm goes bankrupt. In fact, the assets of the pension fund of a DB scheme will usually exceed the accrued pension liability because it is the normal practice to try to keep the pension contribution rate stable. To this end, a comparison is made between the present value of future pension payments and the present value of the pension fund plus future contribution income, making assumptions about future membership growth, earnings, etc. If the contribution rate is adequate to ensure that the former is no greater than the latter, the pension fund will generally exceed the accrued pension liability.[3] However, this is not a solvency test, as becomes clear when it is noted that a PAYG scheme can pass this test by virtue of the fact that future contributions will by definition be set to equal future pension expenditure.

---

[3]The intuition here is that pension is accrued as salary increases and service is extended. With the pension contribution fixed, contribution income increases only with salary. It is therefore necessary to "pre-fund" future service and, with a final salary scheme, future salary growth. A formal proof is given in Appendix I.

Why do private firms fund their pensions? A firm could record a pension liability as an obligation of the firm, in which case pensioners' claims would be against the assets of the firm rather than the assets of the pension fund. While this is the practice in certain European countries (e.g., Austria, Finland, Germany, Sweden), it is more common to distance pension claims from the fortunes of the parent firm. Setting up a separate pension fund advances the claim of the firm's current and future pensioners vis-à-vis the claims of other creditors in the event that a firm goes bankrupt. Another argument for funding is that firms are normally granted tax advantages in respect of their pension funds, usually if certain regulatory conditions are fulfilled. The typical concessions are that pension saving, as distinct from most other forms of saving, is taxed only once by allowing individuals a tax deduction for pension contributions, relieving pension fund investment income of tax, and taxing pension payments as income. These concessions together imply the taxation of pension saving according to the expenditure tax principle.

Beyond these two arguments, there is little to justify a firm's decision to fund its pension scheme. While both of these arguments might have some force where public sector firms are concerned, especially those firms that are likely candidates for privatization and should therefore be required to function fully like private firms, they have little relevance to the government and most other public sector entities. The government will not go bankrupt and does not pay taxes. And if the government stands behind public sector entities, bankruptcy should not be a concern in this case either. Indeed, funding may actually reduce the security of pension claims in the public sector which were previously backed by the assets of the government. In addition, there are no obvious arguments which suggest that public sector entities should be seeking tax saving opportunities.

So does funding offer any advantages to the public sector that would not be relevant to the private sector? From an economic perspective, five possible advantages stand out.

- Funding may be a lower cost form of financing than PAYG, in the sense that a given pension benefit can be provided with a lower contribution rate under funding.
- Funding may be fairer from the standpoint of intergenerational redistribution than PAYG.
- Funding may be better than PAYG at signaling future pension costs, and therefore impose greater discipline on pension policy formulation.
- Funding may be more capable of handling demographic and economic risk than PAYG.
- Funding may be associated with higher saving (and a larger capital stock) than PAYG.

These possible advantages are taken up in turn.

Pension cost comparisons

If both pension contributions and pension benefits are based upon average earnings, then at any time the PAYG contribution rate is determined from the standard identity

$$byP = ayW \tag{1}$$

where b is the pension replacement rate, a is the PAYG contribution rate, y is average earnings, P is the number of pensioners and W is the number of workers. The left-hand side of equation (1) is pension payments and the right-hand side is pension contributions. The PAYG contribution rate is given by

$$a = b/(W/P) \tag{2}$$

where W/P is the dependency ratio, that is the number of workers for each pensioner. Under funding the analogous expression for pension payments to equation (1) is

$$byP = fyW + rF - \Delta F \tag{3}$$

where f is the funding contribution rate, r is the nominal interest rate, F is the accumulated pension fund and Δ is the first difference operator. The first term on the right-hand side of equation (3) is pension contributions and the second term is interest income. However, not all of this fund income is available to meet current pension payments because part has to be added to the pension fund to reflect increasing future pension liabilities. If population grows at a steady-state rate n (which implies that W/P is constant), nominal earnings grow at a steady-state rate g, and the pension scheme is mature in the sense that full pensions have been earned by all pensioners so that the average pension also grows at a steady-state rate g, then

$$\Delta F = (g + n)F \tag{4}$$

and pension liabilities increase with earnings and population growth. From equations (3) and (4)

$$f = (byP - rF + (g + n)F)/yW \tag{5}$$

and then from equations (1) and (5)

$$f = a - (r - g - n)F/yW. \tag{6}$$

Equation (6) says that in steady state the funding contribution rate is less than/equal to/greater than the PAYG rate contribution as the interest rate is greater than/equal to/less than the sum of the rate of earnings growth and the rate of population growth. The rates of interest and earnings growth could be expressed in nominal or real terms (assuming the same price deflator). Equation (6) boils down to a comparison of the rate of return under

funding—the interest rate—with that under PAYG—the rate of earnings growth (or productivity growth) plus the rate of population growth.

Economic analysis provides some guide as to the relative magnitudes of these variables. In steady state, the economy will grow in line with population and productivity. The question then is the relative magnitude of the real interest rate and the growth rate. While the real interest rate can be below the growth rate temporarily, this cannot be a long-run feature of the economy. If it were, debt would build up in response to the resulting incentive to borrow, and the real interest rate would be forced above the growth rate. Thus the normal expectation should be that the real interest rate will exceed the growth rate (Fischer and Easterly, 1990).[4] Empirical evidence points to this indeed being the case, although it has not always been so. Rapid population growth has in the past provided high implicit rates of return for PAYG schemes, but funding may have exhibited a modest cost advantage in OECD countries during the 1970s and 1980s.[5]

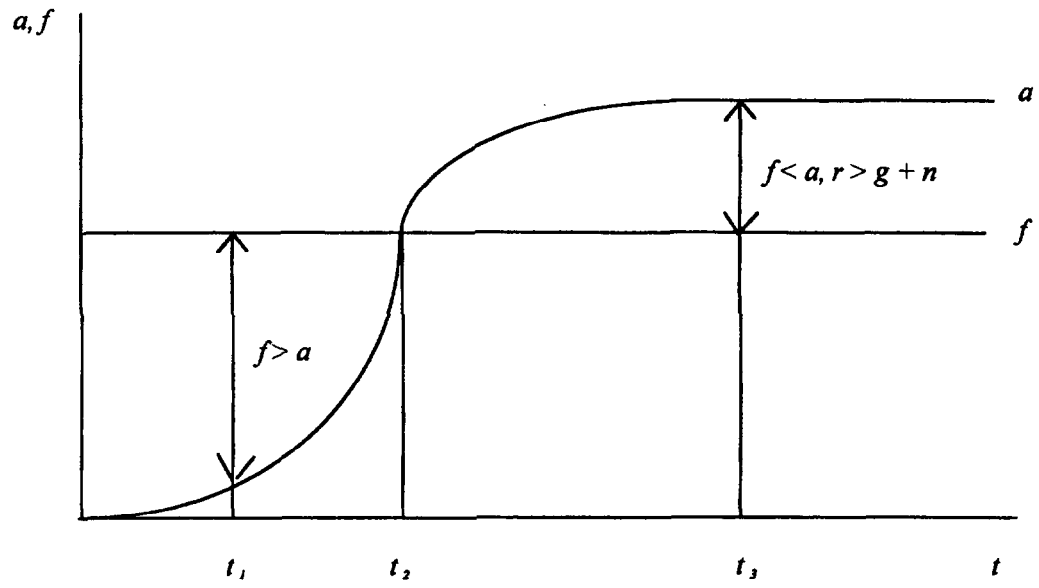
How do funding and PAYG contribution rates behave prior to steady state being reached? Chart 1 describes one possibility. If the funding contribution is set so as to remain constant over time, and the parameters of the underlying actuarial calculations do not change, the funding contribution rate would be a constant f. If pension rights build up gradually, then the funding rate will exceed the PAYG rate for much of the period during which the scheme is immature, as at t_1 in Chart 1. However, the gap between the funding and PAYG contribution rates will close as pension rights are built up and, with $r>g+n$, at some point before full pensions are paid, t_2 in Chart 1, the PAYG rate will increase to above the funding rate. Once steady state is reached, t_3 in Chart 1, the PAYG rate will exceed the funding rate by a constant amount.

---

[4]There are finite-horizon models—Samuelson, Diamond, and Blanchard have produced variants—which suggest that the growth rate can exceed the interest rate in steady state, although this is not dynamically efficient. If reality reflected these models, PAYG would be preferable to funding.

[5]In the G7 countries plus Denmark, the Netherlands, and Switzerland, real earnings growth in aggregate averaged about 2 percent during 1971–90 while the average real rate of return on a 50–50 portfolio of equities and government bonds was above 4 percent (Issue Brief 2, World Bank, 1994). However, the real rate of return on government bonds was only slightly above 1 percent, so portfolio choice—and in particular the risk that the public sector would be prepared to take in funding pensions—is critical to such an assessment.

Chart 1. PAYG and Funding Contribution Rates Compared



Intergenerational redistribution

A sustainable PAYG scheme has underlying it a social contract between successive generations, according to which each generation of workers pays for the pensions of the preceding generation on the understanding that its pensions will be paid for by the next generation of workers. The terms of this contract can be advantageous to successive generations if the rate of return under PAYG (i.e., $g+n$ in the equations above) is positive. Moreover, if the rate of return under PAYG exceeds the real interest rate, successive generations will be better off under PAYG than under funding.[6] Equally, the terms of the social contract can be disadvantageous to successive generations, especially when population growth slows and the population ages. There is also a tendency for the earlier generations to benefit from a new PAYG scheme at the expense of subsequent generations. Indeed, one of the advantages of such a scheme is that it can pay reasonable pensions at an early stage to those who have contributed little or nothing. In addition, there have been instances where initial pensions have been set at a higher level than could be sustained as a scheme matures. By the same token, later generations of active members will pay for higher pensions than they will receive. And in the event that a PAYG scheme has to close, the last generation of contributors will be left with nobody to pay the pensions it is entitled to under the social contract.

---

[6]This is sometimes referred to as the social insurance paradox.

The large and quite arbitrary variations in rates of return across generations under PAYG give rise to concerns about intergenerational redistribution. However, the claim that funding is fairer in this connection has to be regarded cautiously. Because funding implies that "you pay for your own pension," the anomalous treatment of the first and last generations under PAYG is avoided. Beyond this, however, there is no obvious superiority from a fairness standpoint to the funding contract—which requires a pension to be paid from accumulated savings—over the PAYG contract—which requires a pension to be paid from current contributions. Moreover, rates of return under funding can experience large and quite arbitrary variation. It also has to be borne in mind that the decision to shift from PAYG to funding itself implies that there is a cost to the transition generation that has to continue to pay for pensions under PAYG while also providing for its own funded pensions.[7]

Demographic and economic risk

In the case of demographic risk, the argument is that a pension claim backed by assets is likely to be more secure than one backed by a social contract. A future generation of workers can refuse to pay the high contributions required under PAYG but it cannot take away pensioners' assets. But the reality is that pension burden on a future generation of workers is determined by the pensions that have to be paid and not by the way in which they are financed. If a future generation judges that pensioners are making too large a claim on its output, then it will not want to honor that claim no matter how it is financed. If it is through PAYG, then as is widely argued, it will not pay the pension contributions required to meet pension claims. If it is through funding, then as is less often recognized, the value of the assets held by pensioners will fall as increasing numbers of pensioners attempt to sell assets to relatively fewer workers.[8] Thus both PAYG and funding are exposed to demographic risk, and in both cases this risk will ultimately be born by pensioners. However, to the extent that this burden is more explicit with PAYG—and there is an obvious sense in which this is so—then the potential for intergenerational conflict may be greater than with funding.

With PAYG, demographic risk and economic risk are closely related. Specifically, if productivity growth slows, the burden on future workers will rise in exactly the same way as if there are fewer of them. But funding is clearly subject to the same risk. If productivity growth slows, then the same forces that prevent the real interest rate falling below the growth rate in the long run will also prevent it remaining too far above the growth rate. If it does, then the

---

[7]It might be argued that concern about intergenerational fairness should properly be addressed in a more comprehensive way, through "generational accounting" which looks at the burden of fiscal policy more generally on successive generations.

[8]There has been some mention in this regard of an "asset meltdown." This is not likely to happen. Asset values will adjust gradually as national and global financial markets respond in a measured way to country-specific and worldwide population aging which is well understood and quite predictable.

debt dynamics are made less favorable and the fiscal contraction required to restore sustainability will exert downward pressure on the real interest rate and bring it closer into line with the growth rate. There is, however, an aspect of economic risk that is widely and quite forcefully claimed to affect PAYG and funded schemes in different ways. This relates to the impact of inflation.

A digression on pensions and inflation

The ability to finance indexed pensions from indexed contributions is an obvious advantage of PAYG pension schemes. While funded-DB pensions could also be specified in real terms, indexation is usually discretionary. *Why are funded pensions rarely indexed?* One rather imprecise claim made in this connection is that inflation makes pension funding difficult. This claim might appeal to common sense but it does not survive critical assessment. Certainly funding under high expected inflation is not intrinsically difficult. If it were, then there should be the same difficulty funding an unindexed pension with zero inflation. It follows that zero inflation would also make pension funding difficult. Not surprisingly, this claim is rarely ever made. The concern should be with unexpected inflation, in which case it might be reasonable to claim that providing indexation is difficult in the absence of indexed assets to hedge indexed liabilities. This is true, although it is possible to construct quasi-indexed investment portfolios from formally unindexed assets. Such portfolios are usually heavily dominated by treasury bills, which have historically been characterized by a relatively low variance of real returns because short-term nominal interest rates and inflation are highly correlated. However, real rates of return on such portfolios can be very low, and sometimes negative.[9] Thus the present value of an indexed liability is higher than the present value of the equivalent unindexed liability, and the correspondingly larger pension fund needed to cover it will require a higher contribution rate.

It is because of low real rates of return on indexed assets that pension funds do not invest heavily in such assets when they are available, or in quasi-indexed assets, despite it being common that starting pension levels are related to final salary and this is an indexed obligation. Indeed, such an obligation would typically not even be discounted at a real rate of return. Instead, it would be translated into a nominal obligation by assuming some rate of earnings growth, and would then be discounted at an appropriate nominal rate of return. A nominal liability should be discounted at the rate of return on safe nominal assets, normally government bonds and cash (to cover gaps in the maturity structure of bonds). At the same time, pension fund portfolios are dominated by more conventional but unindexed inflation hedges such as equity and real estate, with the returns on this portfolio determining the ability of the pension fund to provide postretirement indexation. The pension fund is thus sacrificing security of real return in the hope of achieving a higher but uncertain return. Indeed, the

---

[9]Note that indexed assets do not guarantee a nonnegative real rate of return. The only requirement of an indexed asset is that the real rate of return is independent of the inflation rate.

pension fund would likely not change its investment strategy even if it had fully indexed obligations and there was a complete market in indexed securities, instead choosing to take investment risk with a view to reducing the cost of pension provision, including the cost of indexation.

Is this what members of pension schemes would choose to do themselves? Since pensioners are least able to protect themselves against inflation, indexation should be valuable to them. It is therefore reasonable to expect that there would be a willingness to trade an unindexed pension for one that is initially lower but the purchasing power of which is guaranteed. This is consistent with the view that the young have net monetary liabilities (generally mortgages) and therefore place less value on indexation than the old, who have net monetary assets. Thus pension schemes should perhaps provide less preretirement indexation and more postretirement indexation. However, it is not clear that there should be full post-retirement indexation. This will depend in part upon individual preferences. It will also depend upon the costs of indexation, and perceptions as to who bears inflation risk (pensioners, employers, the government). These are complex issues, to which the present arrangements may represent a market outcome. But complexity might equally be a source of confusion. This being the case, the choice between different combinations of starting pension and indexation is one that should be posed more explicitly than it has in the pension reform debate so far. A possible switch from PAYG to funding should bring this choice to the fore.

Signaling future pension costs

Pension rights have to be accumulated under a funded pension scheme in the sense that a pension is paid only to those who have contributed to the scheme. However, once a funded scheme is set up and pension rights begin to be accrued, the costs of pension provision are made immediately obvious because contribution rates should reflect accrued rights. By contrast, under PAYG promises to pay pensions at some date in the future have no immediate financial implications. The signaling function of the two financing mechanisms is therefore different. Funding provides clear information about future pension costs while PAYG can be quite misleading. But this does not necessarily imply that if the superiority of funding in this regard is to be exploited then a pension fund actually has to be built up. **Notional funding** would allow for contributions to be charged as if a pension is funded by investing in some notional asset portfolio, with the excess of contributions over pension payments accruing to the government as general revenue.

In that notional funding sends correct signals about pension costs, it should limit the extravagant pension promises that PAYG often encourage. At the same time, the administrative costs and other complications that might arise with the large-scale acquisition of private sector assets by the public sector are avoided. Notional funding also avoids the distortion to relative public sector and private sector prices that results when one sector finances pensions on a PAYG basis while the other funds its pensions. So for public agencies

which compete with the private sector, but where privatization is not a realistic possibility, it would appear to be a particularly attractive option.[10]

The superior signaling characteristics of funding, and notional funding, have been recognized in the debate about pension reform, where the financial problems of public pension schemes are widely seen to be not only a result of population aging but also to do with the capacity under PAYG to make promises to commit future public expenditure without any careful assessment of the ability to pay for it in the future. PAYG public pension schemes therefore admit politically advantageous but fiscally irresponsible behavior. But while funding and notional funding are possible responses to this, the regular monitoring of contribution rate gaps—that is the difference between future pension payments and contribution income—plays the same signaling role. This is now done in many countries.

A digression on unfunded PAYG pension liability

One now popular interpretation of the problem with PAYG schemes is that they give rise to an unfunded PAYG pension liability. Two possibilities immediately derive from the earlier discussion of solvency. This liability can be measured in a number of ways. First, it could simply be measured relative to the accrued pension liability under the provisions of the PAYG scheme. This indicates the gap between the pension liability and assets if the government or a public sector entity were to go bankrupt. While there is an obvious sense in which there is an unfunded liability in this case, since there is no pension fund, the possibility of bankruptcy in the public sector has been discounted. However, if a shift from PAYG to funding was being contemplated, the PAYG liability that has to be honored is relevant to a decision on this. Second, it could be assumed that the scheme would continue and that the contribution rate would remain at its present level. The unfunded liability would then be the difference between the present value of future pension payments and the present value of future contribution income. The size of this unfunded liability would indicate the extent to which future contribution rates have to be increased to meet future pension payments. A third possibility might reflect the argument that a **sustainable** PAYG scheme cannot by definition result in an unfunded liability, since the nature of the PAYG contract is that future contributions will be set to cover future pension payments. It is only if a PAYG scheme is not sustainable, in the sense that contribution rates must rise to unacceptably high levels, that there is a meaningful sense in which there is an unfunded liability, which would reflect the difference between future pensions and future taxes set at their maximum acceptable level.

One use to which measures of unfunded PAYG liabilities defined in the second of these ways have been put is to add them to public debt stocks with a view to assessing fiscal sustainability. However, the legitimacy of this has been questioned. For example, Franco (1995) argues that an unfunded PAYG liability is quite distinct from public debt in that the

---

[10]Despite these advantages, notional funding is not widely practiced. The United Kingdom public sector makes some use of notional funding. Public pensions in Sweden are also partially funded on a notional basis.

pension contract is not a formal one, public pensions are compulsory, pension rights are not tradeable, and an unfunded PAYG liability is difficult to measure with any precision.[11] But even if the practice is appropriate, when sustainability requires the elimination of unfunded PAYG liabilities over the longer term, as for example in Chand and Jaeger (1997), estimates of projected future contribution rate gaps provide the crucial indicator, which is the increase in contribution rates required to restore sustainability. The unfunded PAYG liability is simply the present value of these gaps, which suggests that measuring the unfunded PAYG liability has little additional information content in this context.[12]

There is also a question as to whether, if there can be an unfunded PAYG pension liability, there are also other unfunded liabilities that arise when future public expenditure is committed in the same way. Some people see this is quite reasonable where health care is concerned, for example; recipients of future pensions will in many cases be entitled to free health care which is every bit as unfunded a commitment as that to pay their pensions. But this is not a notion that has been pushed much further, despite a commonly shared expectation that many other spending programs will continue forever. The logical conclusion would be that a large part of public expenditure gives rise to an unfunded liability, in which case a concept which is clearly important in the private sector would lose much of its meaning. For this and the other reasons discussed above, treating pensions differently to other types of expenditure, and in particular emphasizing unfunded PAYG liabilities, lacks compelling justification.[13]

Pensions and saving

If funding is associated with a higher level of saving than PAYG, the higher investment and growth that results would be perhaps its most compelling advantage. In particular, it would offer genuine relief from the pressures created by an aging population, since with higher future income and wealth, asset prices will hold up better as the retired liquidate their holdings. The link between pensions and saving is a much investigated topic about which there remains a good deal of uncertainty. Mackenzie, Gerson, and Cuevas (1997) review work which reveals that neither economic theory nor empirical research yields strong conclusions about the impact of public and private pensions on saving. While they do address the difference between funding and PAYG in this regard, the focus is on the shift from one regime to another, and in particular on the response of saving during the transition from PAYG to

---

[11]The available studies report markedly different estimates of unfunded PAYG liabilities. Different estimates in Kuné (1996) vary by a factor of up to five for a single country, reflecting variations in the underlying assumptions.

[12]It could be argued that contribution rate gaps provide more information since these reflect the **equilibrium** contribution rates required to balance a PAYG scheme on a year-to-year basis. An unfunded PAYG liability only provides an indication as to the **sustainable** contribution rate, which is the constant contribution rate required to balance a scheme over the longer term.

[13]Brittan (1993) also argues this point quite forcibly.

funding. However, in examining the relative merits of these alternative approaches to financing public pensions, the question to ask is: *What would happen to saving if a PAYG scheme was funded instead?*

The pension cost comparisons discussed above provide a basis for answering this question. When a pension scheme is immature, the funding contribution rate will exceed the PAYG contribution rate as shown in Chart 1. Two possibilities should be distinguished. If individuals are perfectly rational, they will correctly perceive that the PAYG contribution rate will rise in the future, and will eventually rise above the funding rate assuming that the real interest rate exceeds the growth rate. All other things being equal, they will fully offset higher public pension saving under funding by lower private saving, and total saving will be the same under both funding and PAYG. Alternatively, if individuals believe that the funding contribution rate will forever exceed the PAYG rate, they will respond to permanently lower disposable income under funding by reducing private saving. But this is not sufficient to offset additions to the pension fund, as shown in Appendix II, and total saving will be higher under funding than under PAYG. Thus to the extent that individuals are misled about the implications for future contribution rates of lower PAYG rates with an immature scheme, funding will be associated with higher total saving than PAYG.

As the PAYG contribution rate rises toward its steady-state level, the saving behavior of irrational individuals will tend toward that of rational individuals (because the assumption about an unchanged PAYG contribution rate becomes increasingly more realistic), with the distinction disappearing in steady state. In steady state, the funding contribution rate will be less than the PAYG contribution rate in the normal circumstance where the real interest rate exceeds the growth rate. This being the case, disposable income and private saving will be higher under funding, while the pension fund grows in line with earnings and population growth in steady state. Total saving is therefore higher under funding. This is also shown in Appendix II, as is the result that total saving is higher under funding in the build up to steady state when the PAYG contribution rate rises above the funding rate. The implications for the capital stock follow directly. With an immature scheme, the public sector accumulation of assets under funding will only be partly offset by reduced private sector asset holdings, and the capital stock will be larger. As steady state is reached, public sector accumulation of assets will diminish as additions to the pension fund diminish, but the steady-state capital stock remains larger under funding.

The preceding discussion focuses on the direct effects of funding relative to PAYG. But funding may also have an impact on capital markets. Clearly, if a public pension fund is invested in government securities, then from the standpoint of the consolidated public sector—that is the government plus the public pension fund—funding and PAYG are indistinguishable.[14] But if the government purchases real assets for the public pension fund,

---

[14]Hence the practice in the United States of investing social security surpluses in treasury bonds and then meeting future pension payments in part from the Trust Fund accumulated in

(continued...)

there is a difference. Such purchases will in the first instance crowd out private sector demand for real assets. The private sector can respond by increasing its demand for government securities, and the government might take advantage of its ability to sell more securities—thus running a larger deficit—at unchanged monetary growth and interest rates. The private sector can also increase its demand for corporate debt, and the corporate sector might respond by raising its gearing at unchanged interest rates. In the longer term, increased investment—based on higher government and corporate borrowing, which in part could derive from higher saving associated with funding—can lead to a larger supply of real assets. These possible responses have implications for the structure of asset demand and supply and for fiscal and monetary policy. The ultimate consequences for the economy—including for saving and the capital stock—are difficult to predict.[15]

Saving behavior can also be influenced by pension-related factors not considered above. For example, recognition effects (where the existence of public pensions leads to a recognition of a need for pension saving) and induced retirement effects (where pensions induce early retirement, which increases the saving required to finance a longer retirement period) may be important. But these factors are mainly a function of pension provision per se and the level of public pensions, and are not related to the way in which public pensions are financed. It is only to the extent that other such factors might be a reflection of differences between funding and PAYG that they might influence the above results.

* * *

The preceding discussion suggests that if funding has an edge over PAYG in terms of the possible advantages examined above, it is not an overwhelming one. While funding may have a modest cost advantage over PAYG and have superior characteristics from the standpoint of intergenerational redistribution, its alleged superiority in handling demographic and economic risk, as well as signaling future pension costs, is difficult to justify. As regards the widely made claim that funding will be associated with higher saving than PAYG—which would support a faster capital accumulation and growth, thus easing demographic pressures—theoretical arguments tend (with some qualification) to be consistent with this view. However, convincing empirical support is missing. Nevertheless, despite the absence of a strong case for funding, the momentum for shifting from PAYG to funding remains. *What are the implications for pension reform?*

---

[14](...continued)
the process is a means of smoothing the social security tax rate over time. The interest paid on the treasury bonds will reduce social security tax rates marginally over the long term compared to PAYG rates, but at the expense of higher federal tax rates, lower federal spending and/or a larger federal budget deficit.

[15]See Leidy (1997) for a discussion of the impact of investing United States social security Trust Fund assets in private securities.

IV. Funding and Pension Reform

As noted above, in Pillar 2 of the World Bank three-pillar pension system, funding goes hand-in-hand with a switch from defined-benefit to defined-contribution pensions and limited privatization of public pensions.

Defined benefit vs. defined contribution schemes

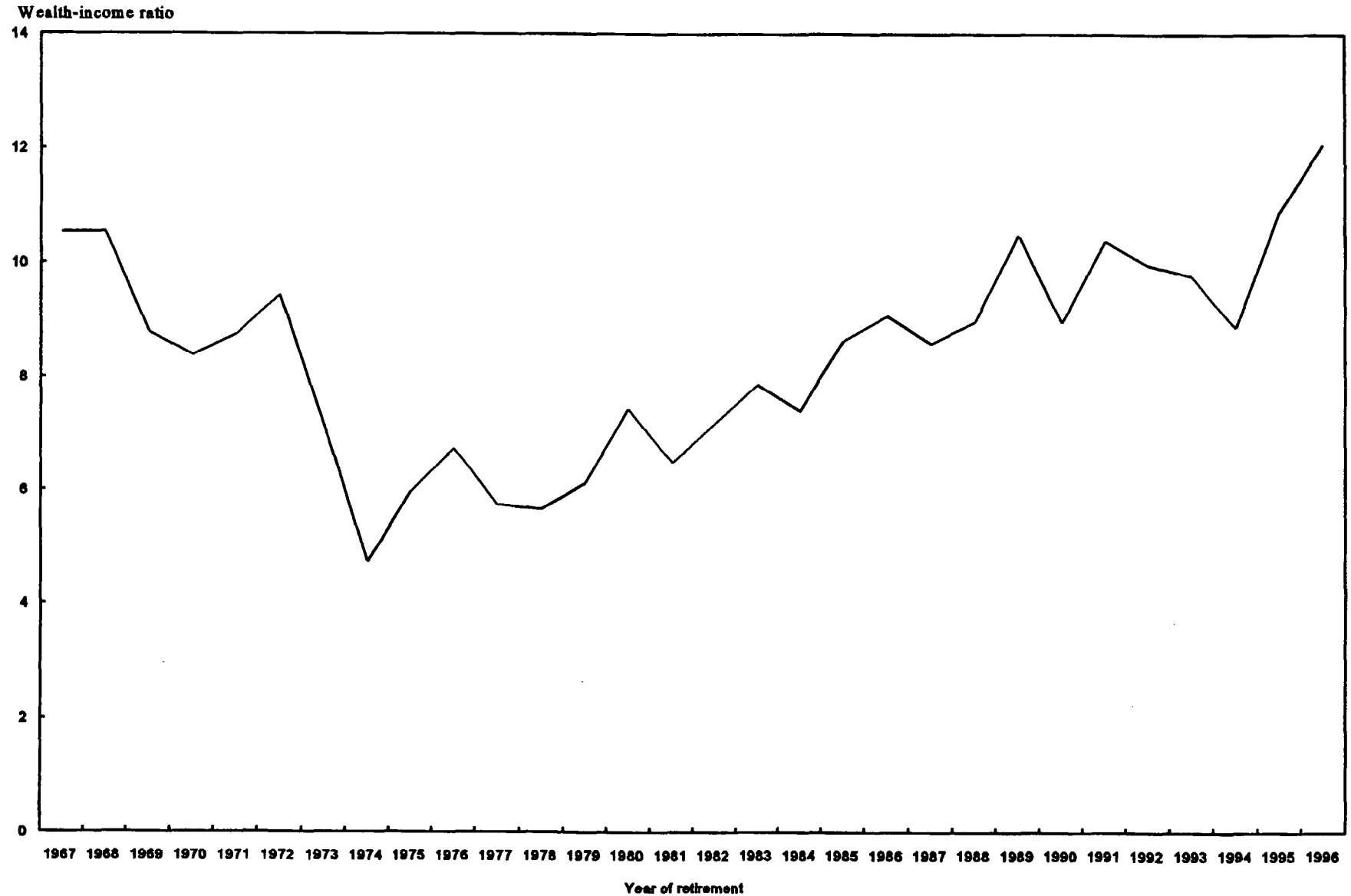
Two sets of issues arise in choosing between DB and DC pension schemes. These relate to the distribution of income risk between workers and pensioners, and to work incentives. DB schemes provide a higher level of income certainty during retirement. Thus in PAYG-DB schemes the income risk is borne by the workers who must pay the contributions required to finance DB pensions and in funded-DB schemes income risk is borne by the government or employers (or whoever else sponsors such schemes). However, indexation is critical to this assessment. This is because funded-DB pensions in the private sector and much of the public sector are usually specified in nominal terms without a firm commitment to indexation, and this allows a DB starting pension to be partially transformed into a DC pension later during retirement by linking indexation to investment performance. The result is that preretirement income risk is borne by the government or employers, but then it is partly shifted to pensioners during retirement. With a DC scheme, pensioners bear the income risk in its entirety.

The fact that DC schemes expose pension "savers" to investment risk is seen by most critics of such schemes as their principal drawback. There would appear good reason to be concerned. Chart 2 traces the annual wealth-income ratio at retirement implied by a 40-year investment of 10 percent of income in the stocks reflected in the Dow-Jones composite index. Accumulation begun in 1927 would yield a wealth-income ratio above 10:1 in 1967. Accumulation begun in 1955 would yield a similar ratio in 1995. The wealth-income ratio would be lower in each of the intervening years, and it would also vary quite sharply. For example, in 1972 the wealth-income ratio would be almost 10:1, but it would fall to its lowest level, nearly 4:1, in 1974. While accumulation over the long term dampens some of the year-to-year variation in the wealth-income ratio compared to annual variation in the Dow-Jones index, the variation shown in Chart 1 would have a significant impact on pension replacement rates for a given savings rate.[16] A DB scheme can spread this risk more broadly, mainly to workers (through higher contribution rates), but also to the wider population (through increased general taxation).

---

[16]Results of a study by the Brookings Institution staff (reported by Henry Aaron at an IMF Economic Forum on "Aging Populations and Public Pension Schemes: Averting the Crisis"), show that when account is taken of the decline in pensions relative to incomes during retirement, the variation in replacement rates can be even larger than suggested here. For a defined-contribution scheme started in 1870, replacement rates would have varied in the range 30–100 percent between 1910 and the present day.

Chart 2. United States: Illustrative Pension Wealth-Income Ratios, 1967-96[1]



Source: Staff calculations.

1/ Based up on a 40-year cumulative investment in the stocks underlying the Dow-Jones composite index.

Of course, a DC scheme could reduce the risk facing individual contributors associated with investing in stocks by diversifying into bonds as retirement age approaches. Moreover, DC schemes in a particular country could reduce the risk associated with investing in domestic assets by diversifying internationally (e.g., by investing in a global mutual fund). But investment risk would remain, and in extreme circumstances accumulated pension saving in a DC scheme could be significantly reduced by a sharp downturn in domestic and/or international stock prices. In such an event, however, the government may have to bear this risk anyway. As Heller (1998) suggests in the context of the Asian crisis, where public provident funds have been hit hard by collapsing stock markets, this would likely give rise to a "conjectural liability" of government reflecting the compulsory nature of these funds and pervasive government influence over them.

Second, DB schemes have been claimed to exhibit desirable labor market incentive effects because final (or near-final) salary schemes defer that part of compensation which is reflected in accruing pension rights until late in an individual's working life. Workers therefore have an incentive to work hard—and not risk being fired—right up to retirement (Lazear, 1985). But a contrasting and more widely held view is that because the link between contributions and pensions is neither direct nor apparent in a DB scheme, contributions may be viewed as more akin to taxes, thus implying a disincentive to work. Final salary DB schemes may also increase labor immobility because changing jobs has significant costs in terms of foregone pension rights. Furthermore, DB schemes can be abused to the extent that pay can be deferred to later years in a manner unrelated to productivity with a view to boosting final salary pensions. By the same token, evasion of contributions can also be a concern. DC schemes need not share these latter problems insofar as they have a strong benefit link, although such a link may be broken if the rate of return earned by funded schemes is artificially held well below market rates (e.g., through the government influencing portfolio choice). Moreover, DC pensions are fully portable from job to job, and therefore no impediment to labor mobility.

Partial privatization

The arguments for private management of public pension funds are clear. If pension funds are to be invested in private assets, private management will ensure that investment is based on economic criteria. If, in addition, there is competition between privately managed funds, investment returns will be maximized, subject to regulatory restrictions on risk tasking. However, overregulation of privately managed funds must be avoided as this will limit the capacity of the funds to invest optimally. The recent experience in Chile (Box 2) suggests to some observers that the private pension funds (AFPs) are overregulated (see "A Model Shows its Age" in *The Economist,* September 13, 1997). After many years of earning high returns, the recent investment performance of the AFPs has been quite weak. It is argued that regulation has been part of the cause, because it has limited competition among funds, restricted the scope for portfolio diversification and contributed to high administrative costs.

The Chilean experience does illustrate, however, how the creation of privately managed pension funds can contribute significantly to financial market development.[17]

In contrast, if private assets are under the control of the public sector, they are exposed to political risk. In particular, investment decisions might be directly influenced by socio-political considerations. In the limit, pension fund assets could be flagrantly misappropriated. The public control of private assets also raises issues about corporate governance. It would make little sense for governments to divest themselves of public enterprises and then to accumulate sizable shareholdings in private firms. But if the arguments point to public pension funds being privately managed, the difference between Pillars 2 and 3 gets very blurred. *Indeed, is there a rationale for a separate Pillar 2?*

The role of public pension provision

The alternative to Pillar 2 is to leave pension provision over and above Pillar 1 entirely to the private sector. This option highlights what is truly the defining characteristic of Pillar 2, compulsion. Pillar 2 is a mandatory, forced saving program, the usual justification for which is that myopic individuals would undertake inadequate voluntary pension saving—individuals tend to recognize too late that they have not saved enough to preserve their consumption during retirement. The case for government intervention to force myopic individuals to save more is based on paternalism, which is an uneasy motivation for government intervention and a subject about which well-informed people can hold quite different views. The argument for forced saving is distinct from one that says pension saving opportunities are limited, for example because indexed securities are not available. This would justify public intervention, but not necessarily public provision of indexed pensions. Having the government issue indexed securities would be a sufficient response. While it could also be argued that inadequate individual saving involves externalities, because aggregate saving will be too low as a result, forced saving need not necessarily lead to optimal saving. Voluntary saving/borrowing can be adjusted by better-off individuals to offset the impact of forced saving, but less well-off individuals will be constrained in this regard and likely will save more.

Another argument for compulsion in pension provision is that voluntary pension schemes may be affected by adverse selection, which would result in schemes that have little information about the distribution of longevity risk insuring mainly bad risks (and ultimately running the risk of collapse). In principle, private pension schemes can identify and price major differences in longevity risk, and in particular the longer life expectancy of women than men, although they have yet to reflect this fully in practice. Instead, private markets tend to rely more on bundling products designed to handle inversely correlated risks (i.e., pensions

---

[17]Another important lesson from Chile, related to the transition from PAYG to funding, is that to avoid the double burden on the transition generation, the government has to bear some of the transition costs. This was manageable in Chile because the government budget was in significant surplus prior to the reform.

and term life insurance). Moreover, once pension funds begin to price longevity risk more carefully, cream skimming becomes a potential problem to the extent that private pension schemes seek to insure only good risks. This would be a particular concern for women, who might find that they cannot join a scheme on the same terms as men or, where discriminatory annuity pricing on a gender basis is disallowed, that they are excluded from coverage (if not explicitly, because of more general gender discrimination legislation, then implicitly, e.g., by excluding occupations dominated by women).

In a paternalistic world, Pillar 2 has clear justification, and the issues discussed above—funding vs. PAYG, DB vs. DC, partial privatization—are relevant to its design. Pillar 2 could be a public PAYG-DB scheme, as long as pension benefits are set at levels consistent with long-term sustainability. But if the arguments for a funded-DC, partially private scheme are judged to be compelling, the World Bank staff's approach to reform, and the Chilean model in particular, provides a reasonable basis on which to proceed. However, the Chilean system may be showing some signs of strain, although it is not clear that its problems threaten long-term sustainability. What appear to be mainly shortcomings with the regulatory regime are fixable. But it is clear that the expectations created during the early years, and especially those deriving from high investment returns, need to be scaled back. Moreover, some of the stronger claims made of the system, and in particular the beneficial impact on saving that has been emphasized, need to be moderated.

In a more individualistic world, Pillar 2 has less of a justification. The emphasis of pension reform should then be on establishing an adequate safety net for the elderly and developing broad-based, flexible private sector schemes. If Pillar 2 already exists, its importance should diminish. Its residual role would appear to be as an insurer of last resort for those who cannot buy private pensions on actuarially fair terms. Pension reform in the United Kingdom is heading distinctly in this direction. SERPS has already been scaled back significantly, while personal pensions now have wide coverage. The Labour Government's plan to promote "stakeholder pensions" envisages a further expansion of personal pensions which would to a large extent replace SERPS entitlements. In the end, SERPS would be retained only for those without a private alternative. For the reasons given above, this will likely result in it covering women rather than men (Disney, 1996).

While the Chilean pension reform is a bold one, what has been happening in the United Kingdom is certainly remarkable. Pension provision has been privatized significantly, but in a way by stealth in response to a public PAYG scheme that was set to expand out of hand in a highly visible way. Many individuals now have a large say in the size and type of pension they get, while those excluded from private provision can still save for a pension. In the process, the public sector is responding to market failure but at the same time limiting its involvement in pension provision and not creating an unsustainable future burden on public finances. While there is no recommendation from this that the United Kingdom approach should be replicated in other countries seeking to reform their public pension systems, the general strategy of limiting public pension provision and expanding private provision (i.e., by focusing on Pillars 1

and 3) should be seen as a serious alternative to a dominant Pillar 2, be it structured along Chilean lines or otherwise.

Issues also arise concerning the design of Pillar 1. The key question is whether Pillar 1 pensions should be universal—that is paid to all who satisfy qualification requirements to retire—or means tested. If there is a compulsory Pillar 2, means testing, and general revenue financing, would seem appropriate. Pillar 1 pensions would be for those who have built up insufficient pension rights under Pillars 2 and 3 to ensure an adequate standard of living during retirement. This would be the case where earnings have been low or where there are gaps in an employment record (due to unemployment, for married women and for other care givers). In the absence of a compulsory Pillar 2, a universal, contributory Pillar 1 would seem appropriate, since it would address the possibility of extreme myopia leaving those who could save with no means of financial support during retirement. At the same time, it avoids the moral hazard problem associated with a means-tested Pillar 1. This problem arises because means-tested pensions, unless they are set at a low level, may encourage people who have a choice—when Pillar 2 is voluntary or nonexistent—not to save for retirement. However, universal pensions are expensive and, to be affordable, they too may have to be relatively modest.[18]

Country priorities

Finally, while the general issues discussed above are relevant to any country seeking to reform its public pension system, it is recognized that different countries do not share the same problems and choices.

- **Industrial economies** with manageable public PAYG schemes and significant private sectors (like the United States) certainly have the option of making a shift from public to private provision, as in the United Kingdom, a priority of pension reform. However, those industrial countries with unsustainably large public PAYG schemes (like Germany) face the more pressing problem of restoring the financial viability of these schemes. Greater reliance on Pillar 3 pensions or a funded Pillar 2 cannot solve this problem, although it could be a feature of longer-term pension reform.

- **Transformation economies** with collapsed public PAYG schemes have to attach immediate priority in ensuring that the pension system fulfils the basic safety net function of Pillar 1. However this does not preclude paying early attention (as in the Russian Federation) to whether there should eventually be more reliance on Pillar 3

[18]Basic pensions fulfill the Pillar 1 role in the United Kingdom. There has been a concern that, because basic pensions are indexed to prices, they will continue to decline relative to earnings as in recent years and will thus fail to provide an adequate minimum. However, a further scaling back of SERPS should provide the scope to maintain basic pensions as an effective anti-poverty program.

pensions or a funded Pillar 2 rather than rebuilding a Pillar 2 PAYG pension scheme, and addressing transition issues that may arise. Where PAYG schemes have not collapsed, but are unsustainable, the priorities are the same as in industrial countries in similar circumstances.

- **Developing economies** face a variety of different circumstances. As in Chile, before the current pension system was introduced, some other Latin American countries (including Mexico) have unsustainable PAYG systems and, with the success in Chile as a model, have the option of making the same fundamental choices about the direction of pension reform. Others, like some Asian countries, have funded Pillar 2 pensions (e.g., the public provident fund in Malaysia). However, coverage tends to be limited and there is no safety net for the elderly. Instituting Pillar 1 pensions to replace weakening informal support arrangements may therefore be the highest priority. This is also likely to be the case in the many other developing economies without a public pension scheme. Further expansion of the pension system, independently of whether the emphasis is on Pillar 2 or 3, should then in part be geared to objectives and achievements as regards more general development of financial markets.

Box 1. United Kingdom

Pension expenditure through the National Insurance Fund comprises mainly flat-rate basic pensions, which are paid in full to those who have paid National Insurance Contributions (NICs) for 90 percent of their working life. The basic pension is indexed to price movements, and is roughly equivalent to about 15 percent of average male earnings. The remaining expenditure is primarily on pensions paid under the State Earnings Related Pension Scheme (SERPS) introduced in 1978. At that time, the principal features of SERPS were: (i) the payment of a pension equal to 25 percent of the best 20 years' qualifying earnings; (ii) indexation of pre-retirement earnings—to determine the best 20 years—and pensions; (iii) widows inherit their spouses SERPS entitlement; and (iv) an arrangement whereby occupational pension schemes could contract out of SERPS if they provided a guaranteed minimum pension (GMP). Qualifying earnings were those between a lower limit roughly equal to the basic pension and an upper limit about 7 ½ times that amount. The same limits applied to contributions. Only those earning above the lower limit paid NICs, and NICs were not charged on earnings above the upper limit. A GMP was equivalent to a SERPS pension, except that it is based on average lifetime earnings and there was no indexation after retirement. Pension age was 65 for men and 60 for women, as with the basic pension.

At the outset of SERPS, NICs were charged at a joint rate of 18.5 percent. However, retirement pensions alone could have been financed at a rate of 14.5 percent. Official estimates suggested that SERPS would lead to a 3–4 percentage point increase in the NIC by 2008. This figure, however, conveyed an optimistic impression of the long-run costs of SERPS. The population and labor force projections available at the time suggested that demographic developments would be favorable to pension financing during the 30 years following the introduction of SERPS. This would reduce the cost of providing basic pensions, and offset the emerging cost of SERPS. Moreover, after 30 years only two thirds of the final SERPS liability would have been accrued. Beyond 2008, the demography would worsen rapidly, increasing the cost of basic pensions, while SERPS rights would continue to increase. Hemming and Kay (1982) showed that by 2033—when the population structure was to be at its least favorable—the NIC rate would have risen by slightly more than 12 percentage points.

These projections raised two issues. The first issue related to the detail of SERPS. In particular, the best 20 years' rule, the provisions for widows, and the unequal pension age had little apparent justification, but contributed about half the additional cost of the scheme. The second issue related to the proper role of the state in pension provision. Given that about a half of all employees were members of an occupational pension scheme, was it appropriate for the state to introduce an elaborate earnings-related pension scheme? These issues were the subject of extensive investigation and debate during the 1980s.

The government of the time gave some thought to abolishing SERPS, and leaving the provision of earnings-related pensions entirely to an expanded private sector. However, the 1986 Social Security Act instead replaced the best 20 years' rule with an average lifetime earnings calculation, reduced the replacement rate from 25 to 20 percent, and limited the pension that a widow could inherit, all with effect from 1988. The upper limit on employer NICs had been removed in 1985.

Reworking the Hemming and Kay (1982) projections suggests that the 1986 package would reduce the 2033 NIC rate by about 4 percentage points, a third of their original estimate of the additional cost of SERPS. Official projections were for a similar reduction in the NIC rate, but this was claimed to cut the additional cost of SERPS by half. The difference in the projected cost of the original SERPS reflects mainly the assumptions made about indexation, to which the projections are very sensitive.

In addition to restructuring SERPS pensions, the 1986 Act also changed contracting-out provisions for occupational pension schemes. About one half of all employees—some 11 million—are members of occupational pension schemes. Coverage is better in the public sector (75 percent) than the private sector (40 percent). Occupational schemes pay defined benefit pensions related normally to years of service and final salary. Private sector schemes, and many of those in the commercial public sector, are funded, and as such benefit from relatively favorable tax treatment. Most occupational pension schemes are contracted out of SERPS.

Contracting out has been one of the most problematic aspects of SERPS. In return for providing a GMP, the NIC rate is lower for contracted out employees and employers. The NIC rebate was initially 7 percent, but was to fall gradually to 3 ¾ percent. Either the state or the private schemes could gain from the arrangement, depending upon how the rebate compared with the cost of providing a GMP. With effect from 1988, contracted out schemes were required to provide post-retirement indexation up to 3 percent a year. Contracting out has also been extended to defined contribution personal pension schemes run by financial institutions (with similar tax advantages as occupational schemes) and which meet a guaranteed minimum contribution (GMC) requirement. In particular, people opting for a personal pension, and who were not members of an occupational scheme, could have part of their NIC paid into their personal pension scheme.

The 1986 Social Security Act did much to address the concerns raised in the early 1980s about the costs of pension provision in general, and SERPS in particular. The 1995 Pensions Act went further, most notably by providing for a phased equalization of pension age for men and women at 65. Difficult policy decisions to reduce pensions have therefore already been taken. From the point of view of fiscal sustainability, current policies imply a burden of pension costs that is quite manageable. Moreover, recent policies have encouraged flexibility and freedom of choice through private provision, strengthened the regulation of private pension funds to prevent fraud (after the Maxwell affair) and misleading advertising (which led many people to switch from occupational to personal pensions when is was not in their interest to do so).

Box 2. Chile

Chile's social insurance system, created in 1924, was among the first in Latin America. By the end of the 1970s it had developed into a system, separate benefit systems across industries and occupations. This led to a sharp increase in the number of pensioners, low pensions but extravagant promises, high contribution rates because of evasion and rising government subsidies. The subsidy burden was 3 percent of GDP in 1980 and was projected to rise to 30 percent of GDP by 2000.

In 1981, Chile shifted from a public, pay-as-you-go, defined-benefit system to a private fully funded, defined-contribution system. Participation in the new system was optional for persons already contributing to the state system, but mandatory for new labor market entrants. The government's role was limited to financing the transition, supervising and regulating the private pension funds, and guaranteeing minimum benefits.

The reform honored the government's implicit pension liabilities. Those already retired and those who chose not to switch to the new scheme received their pensions under the rules of the old system. In addition, recognition bonds were issued to workers who moved from the old to the new system. These bonds more or less represented accumulated contributions to the old system and matured when the worker reached retirement having earned a real return of 4 percent. To avoid financing much of the transition with debt, in the years prior to the pension reform the government built up a fiscal surplus which reached to 5.4 percent of GDP in 1980. The annual fiscal cost of the transition averaged about 4 percent of GDP for the decade following the reform, but is expected to fall to about 1 percent of GDP by the year 2015.

Over 90 percent of the active labor force have an account under the new private pension scheme, although only 50 percent are active contributors. Workers contribute a fixed percentage of their gross salary (10 percent) into a savings account with an approved and regulated pension fund, referred to as an AFP (Administradora de Fondos de Pensiones). Participants are free to select any approved AFP and can switch after four months at no cost. Each AFP is required to provide participants with survivor and disability insurance. Workers must also pay a commission fee to cover the fund's insurance and administrative costs (which are of the order of 3–4 percent of a worker's gross salary). Upon retirement, contributors may choose between several combinations of programmed withdrawals and indexed annuities, the former being the preferred choice.

The government guarantees all participants a minimum pension. If a participant chooses a scheme of phased withdrawals, in guaranteeing a minimum pension the government implicitly assumes part of the workers' longevity risk. For retirees who choose to purchase an annuity, the government pays the difference between the minimum pension and the annuity. Finally, the government offers partial insurance against the insolvency of life insurance companies which provide annuities.

The government plays an important role in regulating the operations of pension fund managers. AFPs are required to ensure that the ex post difference between its return and the average real return of all funds is less than 2 percentage points. In case of a shortfall, AFPs withdraw funds from a guarantee fund (equal to 1 percent of the pension fund it manages), maintained for this purpose from returns that exceed the average by 2 percent which must be replenished within 15 days to avoid having its license revoked. AFPs must manage a single fund and charge a single commission structure to all affiliates. In addition, regulation limits the portfolio options of AFPs to partly avoid excessive risk taking behavior.

The gross return to pension fund assets averaged about 14 percent a year in real terms between 1981-94. However, as the Chilean economy matures, the historically high returns to capital were expected to fall to levels similar to those found in industrial countries. But in fact they have fallen recently to very low levels—pension returns were negative in 1995 and only 3.5 percent in 1996—to a significant degree reflecting limits on portfolio diversification which in the early days emphasized investment in government stocks and more recently have applied to foreign investment. The new private pension system has also been criticized for having high administrative costs. While there is some indication that administrative costs have dropped since 1981, they continue to exceed the costs of well-run PAYG public pension systems.

There is evidence Chilean pension reform has accelerated the rate of financial development and improved the efficiency of resource allocation, in part because it has reduced labor market distortions by establishing a closer link between pension contributions and benefits. However, there is no clear evidence of a positive effect on saving (Holtzmann, 1997). But since the transition has been partly financed through higher taxes on current generations, the stock of capital may increase in the long run. At the political level, the move to a private, fully funded system has isolated pension benefits from the risk of political interference, and sensitized workers to financial issues.

One of the most visible outcomes of the Chilean pension reform has been the high net returns to contributions. However, the prospects of lower pension returns, coupled with the excessively high administrative costs of running a private pension system, have motivated some reevaluation of the pension system. While the system's basic framework is unlikely to change, regulations that have limited competition among pension funds managers and portfolio diversification, as well as contributing to the system's high marketing costs, are being reviewed.

The purpose of this appendix is to show that if a constant funding contribution rate is set to ensure that the present value of pension payments from a defined-benefit pension scheme equals the present value of pension contributions, the pension fund will exceed accrued pension liability. With no loss of generality, it can be assumed that the pension scheme has a single representative individual as a member who contributes to the scheme for R years and then retires for $(L - R)$ years. If pension is accrued an annual rate p, is related to final salary y_R, and is fixed during retirement years, then the annual pension is pRy_R. The constant funding contribution rate f is set in year 0 so that

$$\int_0^R f y_0 e^{gt} e^{r(R-t)} dt = \int_R^L pRy_R e^{-r(t-R)} dt \qquad \text{(A.1)}$$

where y_0 is earnings in year 0, g is nominal salary growth over the work period and r is the nominal interest rate. Noting that $y_R = y_0 e^{gR}$, (A.1) can be rearranged to give

$$f = pRe^{gR} \int_R^L e^{-rt} dt \Big/ \int_0^R e^{-(r-g)t} dt \qquad \text{(A.2)}$$

After $S \leq R$ years of work, the accumulated pension fund is

$$F_S = \int_0^S f y_0 e^{gt} e^{r(S-t)} dt$$

$$= f y_0 e^{rS} \int_0^S e^{-(r-g)t} dt \qquad \text{(A.3)}$$

while the accrued pension liability is given by

$$A_S = \int_R^L pSy_S e^{-r(t-S)} dt$$

$$= pSy_0 e^{(r+g)S} \int_R^L e^{-rt} dt \qquad \text{(A.4)}$$

given that $y_S = y_0 e^{gS}$. Then from equations (A.2), (A.3), and (A.4),

$$F_S/A_S = (R/S) e^{g(R-S)} \int_0^S e^{-(r-g)t} dt / \int_0^R e^{-(r-g)t} dt \qquad \text{(A.5)}$$

$$> 1 \text{ if } g > 0,\ r > g$$

If pension is related to average salary y_R rather than final salary y_S, the annual pension is pRy. Repeating the steps above with $pRy = py_0 \int_0^R e^{gt} dt$ and $pSy = py_0 \int_0^S e^{gt} dt$ substituting for pRy_R and pSy_S respectively gives

$$F_S/A_S = \left(\int_0^R e^{gt} dt / \int_0^S e^{gt} dt\right)\left(\int_0^S e^{-(r-g)t} dt / \int_0^R e^{-(r-g)t} dt\right) \qquad \text{(A.6)}$$

$$> 1 \text{ if } g > 0,\ r > g$$

APPENDIX I

As indicated in the text, the normal expectation is that $r>g$ in the long term, noting that salary growth over the work period for a representative individual will also be the average salary growth for the scheme membership. This being the case, $g>0$ is a sufficient condition for $F_S>A_S$.

The purpose of this appendix is to show that total saving under funding, that is private saving plus additions to the pension fund, will normally exceed total saving under PAYG, which is just private saving. When a pension scheme is immature, as at t_1 in Chart 1, the funding contributor rate exceeds the PAYG contribution rate. If pension contributors assume that $f>a$ indefinitely, disposable income and private saving will be lower under funding. Using the notation in the text, disposable income will be lower by $(f-a)\,yW$, and with s denoting the marginal propensity to save, private saving will be lower by $s\,(f-a)\,yW$. From equations (1) and (3), the pension fund grows by $(f-a)yW + rF$, which is pension saving. It then follows that total saving is higher under funding if

$$(1 - s)(f-a)yW + rF>0 \qquad \text{(A.7)}$$

which is the case since $f>a$ and in normal circumstances $r>0$.

In steady state, which is reached at t_3 in Chart 1, $f<a$ for $r>g + n$ and disposable income and private saving will be higher under funding, the former by $(a-f)yW$ and the latter by $s(a-f)\,yW$. The pension fund grows by $(g+n)F$ in steady state, as in equation (4), with part of the interest income earned by the pension fund, $(r - g - n)F$, being used to cover the difference between contribution income and pension payments. Total saving is higher under funding if

$$s\,(a-f)yW + (g + n)F>0 \qquad \text{(A.8)}$$

which is the case since $f<a$ and in normal circumstances $g + n>0$. If $f>a$ in steady state because $r<g + n$, equation (A.8) becomes

$$(1 - s)(f - a)yW + (g + n)F>0. \qquad \text{(A.9)}$$

More general conditions for total saving to be higher under funding can be derived by substituting from equation (6) into equations (A.8) and (A.9). These conditions are

$$(1 - s)/s > - r/(g + n), \quad r>g + n \tag{A.10}$$

and

$$(2 - s)/(1 - s) > r/(g + n), \quad r<g + n \tag{A.11}$$

respectively, both of which hold in all but the most unusual circumstances.

Finally, note also that $f<a$ prior to steady state being reached, as between t_2 and t_3 in Chart 1. In this case, private saving is determined as in steady state. The pension fund, however, will retain more of its interest income since there is less of a gap between contribution income and pension payments to cover from the fund. Total saving will again be higher under funding than under PAYG.

References

Brittan, Samuel, 1993, "The Harmful Myth of Hidden State Debt," *Financial Times*, (December 13).

Chand, Sheetal K., and Albert Jaeger, 1997, *"Aging Populations and Public Pension Schemes,"* IMF Occasional Paper No. 147 (Washington: International Monetary Fund), December.

Disney, Richard, 1996, "Can We Afford to Grow Older? A Perspective on the Economics of Aging," (Cambridge, Massachusetts: MIT Press).

Feldstein, Martin, 1997, "Transition to a Fully Funded Pension System: Five Economic Issues," NBER Working Paper No. 6149 (Cambridge, Massachusetts: National Bureau of Economic Research).

Fischer, Stanley, and William Easterly, 1990, "The Economics of the Government Budget Constraint," *The World Bank Research Observer*, Vol. 5, No. 2 (July).

Franco, Daniele, 1995, "Pension Liabilities—Their Use and Misuse in the Assessment of Fiscal Policies," Economic Papers No. 110, Directorate-General for Economic and Financial Affairs (Brussels: European Commission).

Heller, Peter S., 1998, "Rethinking Public Pension Initiatives," mimeo (Washington: International Monetary Fund).

Hemming, Richard, and John A. Kay, 1982, "The Cost of the State Earnings Related Pension Scheme," *Economic Journal*, No. 92 (June).

Holtzmann, Robert, 1997, "Pension Reform, Financial Market Development and Economic Growth: Preliminary Evidence from Chile," *Staff Papers*, International Monetary Fund, Vol. 44, No. 2 (June).

Kuné, Jan B., 1996, "The Hidden Liabilities: Meaning and Consequences," paper presented at the CPB Seminar Series, The Hague (November).

Lazear, Edward P., 1985, "Incentive Effects of Pensions," in D. Wise (ed.), Pensions, Labor and Individual Choice, University of Chicago Press for National Bureau of Economic Research.

Leidy, Michael, 1997, "Investing U.S. Social Security Trust Fund Assets in Private Securities," IMF Working Paper 97/112 (September).

Mackenzie, George A., Philip Gerson, and Alfredo Cuevas, 1997, *"Pension Regimes and Saving,"* IMF Occasional Paper No. 153 (Washington: International Monetary Fund).

World Bank, 1994, "Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth," *Policy Research Paper* (New York: Oxford University Press).