Volume Title: Social Security Pension Reform in Europe

Volume Author/Editor: Martin Feldstein and Horst Siebert, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-24108-4

Volume URL: http://www.nber.org/books/feld02-2

Conference Date: March 20-21, 2000

Publication Date: January 2002

Title: Pensions and Contemporary Socioeconomic Change

Author: Assar Lindbeck

URL: http://www.nber.org/chapters/c10668

1

Pensions and Contemporary Socioeconomic Change

Assar Lindbeck

Contemporary pension systems in developed countries reflect economic, social, and political conditions in the 1930s and the first decades after World War II. Recently, new socioeconomic conditions have created both rationales and political forces for revisions of existing pension systems. Changes in demography, real wage growth, and real interest rates are obvious examples. Increased heterogeneity and instability of the family, higher labor force participation by women, increased diversity of individual life cycles, greater international mobility of labor and capital, and ambitions to encourage individual responsibility also have important implications for pension systems. Moreover, some socioeconomic changes have been induced by the pension system itself via (endogenous) behavioral adjustments of individuals, with feedback effects on the pension system.

When discussing these issues, it is useful to set up a more elaborate classification of pension systems than the usual distinction between defined benefit (DB) and defined contribution (DC) systems. The choice of an appropriate taxonomy depends, of course, on the issues to be raised. One question on which this paper focuses concerns the consequences of socioeconomic changes for the intergenerational distribution of income and the sharing of income risk among generations. The distinction between pension systems with exogenous and endogenous contribution rates (tax rates) then becomes crucial. However, when one is analyzing socio-

Assar Lindbeck is professor of international economics at the Institute for International Economic Studies, Stockholm University, and an associate of the Research Institute of Industrial Economics (IUI), Stockholm.

The author is grateful for comments on a draft of the paper from Jon Dutrieux Andersen, Peter Diamond, Martin Feldstein, Laurence Kotlikoff, Mats Persson, Dennis Snower, Kjetil Storesletten, and David Sundén.

economic changes that are induced by the pension arrangements themselves, other distinguishing features of pension systems must be taken into account. These include the degree to which the systems are pay-as-you-go (PAYGO) and funded, respectively; whether the systems have strong links between contributions and benefits with individual accounts; and whether pension payments are lump sum, a fraction of previous individual earnings or contributions, or a fraction of current average earnings.

Against this background, six generic pension systems are classified in section 1.1. Each system can be varied considerably, both by incorporating elements from other systems and by introducing restrictions on contributions or benefits. Section 1.2 turns to the consequences, in the context of each system, of socioeconomic changes for the intergenerational distribution of income, risk sharing, and macroeconomic balance. Endogenous behavioral adjustments in response to welfare-state arrangements, in particular via disincentive effects on work and saving, are also introduced. Such effects are discussed in more detail in subsequent sections, which examine alternative pension reforms aimed at mitigating disincentives. A few of these reforms are "marginal" in the sense that the existing pension system is modified (section 1.3). Such reforms include both ad hoc policy measures and various automatic adjustment mechanisms. Two radical reforms are discussed in section 1.4, namely, a shift to either a quasi-actuarial system characterized by a strong link between contributions and benefits, or to a fully funded pension system with a capital-market rate of return on the contributions. Adjustments of various pension systems to increased heterogeneity of individuals and households are considered in section 1.5, and section 1.6 concludes.

1.1 Classification of Pension Systems

I begin by considering two pension systems with exogenous contribution rates and, hence, endogenous pension benefits: (1) a fixed-fee PAYGO system with budget balance and (2) a fully funded system with individual accounts and a capital-market return on the pension contributions. I then turn to four PAYGO systems with fixed benefit rules and hence endogenous contribution rates: (3) a lump-sum benefit system, (4) an earnings-based system, (5) a contribution-based system, and (6) a fixed (intergenerational) income-ratio system. I use the following notations:

τ = payroll tax rate
y = average labor income
N = number of employed individuals (workers)
R = number of retired individuals
B = fixed (lump-sum) pension benefit per person
$G_t = (y_t \cdot N_t)/(y_{t-1} \cdot N_{t-1})$ = rate of growth factor for labor income (tax base)

i = real interest rate on financial markets
$I = 1 + i$ = real interest-rate factor
w^j = real wage rate of individual j
h^j = hours of work of individual j

I assume two overlapping generations, each living for two periods. For some purposes, however, it is important to divide each of these periods into several subperiods ("years"). The following schematic description of revenues and expenditures of various pension systems should be self-explanatory. The revenues of the pension system are denoted below, and the expenditures above the horizontal lines.

1.1.1 Exogenous Contribution Rate

System No. 1: Fixed-Fee System

In this pension system, there is a *fixed* contribution rate τ_t in each period, although the rate may vary from period to period. Because the system is PAYGO, aggregate pension benefits in period t are determined by the revenues of the system in the same period, $\tau_t y_t N_t$. Hence, the budget is balanced by definition.

	$(t-1)$	(t)	$(t+1)$
Expenditures		$\tau_t y_t N_t$	
Revenues	$\tau_{t-1} y_{t-1} N_{t-1}$		$\tau_{t+1} y_{t+1} N_{t+1}$

Each pensioner in period t receives

$$\frac{\tau_t y_t N_t}{R_t}. \tag{1}$$

The implicit return factor is

$$\frac{\tau_t y_t N_t}{\tau_{t-1} y_{t-1} R_t}. \tag{2}$$

This factor is G_t if $R_t = N_{t-1}$ and $\tau_t = \tau_{t-1}$.

System No. 2: Actuarially Fair, Fully Funded System

As in the fixed-fee system, the contribution rate τ is exogenous in each period and the pension benefit is endogenous. The return on the individual's forced saving is determined by the return in capital markets, i. There is intertemporal budget balance for each cohort.

$$, \frac{}{\tau_{t-1} y_{t-1} N_{t-1}}, \frac{I\tau_{t-1} y_{t-1} N_{t-1}}{}, \quad , \frac{}{\tau_{y} y_{t} N_{t}}, \frac{I\tau_{t} y_{t} N_{t}}{},$$

As is well known, a compulsory, fully funded pension system will influence the consumption of the individual only if he or she is liquidity constrained or unwilling to borrow or to reduce saving, and hence unable to offset government-induced reallocations of his or her cash flow. The return factor is IN_{t-1}/R_t.

1.1.2 Endogenous Contribution Rate

System No. 3: Lump-Sum Benefit System

This pension system provides the individual with an exogenously given *basic pension,* while the contribution rate τ is endogenously determined in each period to ensure balance in the budget of the pension system.

$$, \frac{}{\tau_{t-1} y_{t-1} N_{t-1}}, \frac{B \cdot R_t}{}, \quad , \frac{}{\tau_{y} y_{t} N_{t}}, \frac{B \cdot R_{t+1}}{},$$

The balanced budget requirement is

$$BR_t = \tau_t y_t N_t.$$

The implicit return factor[1] is

$$\frac{\frac{B}{y_{t-1}}}{\tau_{t-1}} = \frac{\tau_t y_t N_t}{R_t \tau_{t-1} y_{t-1}}. \tag{3}$$

This factor is G_t if $R_t = N_{t-1}$ and $\tau_t = \tau_{t-1}$. B/y_{t-1} is the replacement rate, which is inversely proportional to the individual's previous income.

$$\text{Endogenous } \tau = \frac{B}{y_t} \cdot \frac{R_t}{N_t}, \tag{4}$$

where B/y_t = the intergenerational income ratio and R_t/N_t the dependency ratio.

1. The return is the same as in the fixed-fee system in equation (2) if the benefit is the same ($B = \tau_t y_t N_t / R_t$).

System No. 4: Earnings-Based System

In this system, the pension of an individual is determined as a fixed fraction (replacement rate) α of his or her previous earnings.

$$, \frac{}{\tau_{t-1} y_{t-1} N_{t-1}}, \frac{\alpha y_{t-1} R_t}{}, \quad , \frac{}{\tau_t y_t N_t}, \frac{\alpha y_t R_{t+1}}{},$$

The balanced budget requirement is

$$\alpha y_{t-1} R_{t=} \tau_t y_t N_t .$$

The implicit return factor is[2]

$$\frac{\alpha y_{t-1}}{\tau_{t-1} y_{t-1}} = \frac{\alpha}{\tau_{t-1}} . \tag{5}$$

This factor is G_t if $R_t = N_{t-1}$ and $\tau_t = \tau_{t-1}$.

$$\text{Endogenous } \tau_t = \frac{\alpha y_{t-1} R_t}{y_t N_t}. \tag{6}$$

System No. 5: Contribution-Based System

The pension in this system is a fixed fraction, γ, of contributions previously paid by the individual. Such a system is sometimes called a *notional defined contribution* (NDC) system.

$$, \frac{}{\tau_{t-1} y_{t-1} N_{t-1}}, \frac{\gamma \tau_{t-1} y_{t-1} R_t}{}, \quad , \frac{}{\tau_t y_t N_t}, \frac{\gamma \tau \cdot w_t \cdot R_{t+1}}{},$$

The balanced budget requirement is

$$\gamma \tau_{t-1} y_{t-1} R_t = \tau_t y_t N_t .$$

The implicit return factor is

2. The return is the same as in a lump-sum benefit system if $\alpha = B/y_{t-1}$.

$$\gamma = \frac{\tau_t y_t N_t}{\tau_{t-1} y_{t-1} R_t}. \tag{7}$$

This factor is G_t if $R_t = N_{t-1}$ and $\tau_t = \tau_{t-1}$.

$$\text{Endogenous } \tau_t = \gamma \tau_{t-1} \left(\frac{y_{t-1} R_t}{y_t N_t} \right). \tag{8}$$

System No. 6: Fixed Intergenerational Income-Ratio System

In this system, the pension of an individual is a fixed fraction, μ, of the average earnings of *contemporary* workers (i.e., the system is based on an intergenerational income distribution target).

$$\ldots, \frac{}{\tau_{t-1} y_{t-1} N_{t-1}}, \frac{\mu y_t R_t}{}, \ldots$$

$$\ldots, \frac{}{\tau_t y_t N_t}, \frac{\mu y_{t+1} R_{t+1}}{}, \ldots$$

The balanced budget requirement is

$$\mu y_t R_t = \tau_t y_t N_t.$$

The implicit return factor is

$$\frac{\mu y_t}{\tau_{t-1} - y_{t-1}}. \tag{9}$$

This factor is G_t if $R_t = N_{t-1}$ and $\tau_t = \tau_{t-1}$.

$$\text{Endogenous } \tau_t = \frac{\mu \cdot R_t}{N_t^3}.^3 \tag{10}$$

To summarize, in a fixed-fee PAYGO system, the (endogenous) pension benefit to a representative pensioner must fall in proportion to a drop in average earnings of contemporary workers (y_t) and in the number of workers (N_t) relative to the number of pensioners (R_t); see equation (1). In lump-sum benefit, earnings-based, and contribution-based systems, the (endogenous) contribution rate must be raised in proportion to similar changes in the same variables; see equations (4), (6), and (8). In a fixed income-ratio system, the (endogenous) contribution rate must be raised in proportion to a fall in the number of workers relative to the number of

3. An alternative version of this pension system could be a fixed after-tax income ratio between generations, with the pension set to $\mu(1 - \tau_t)y_t$. The implicit return factor is now $\mu(1 - \tau_t)y_t/(\tau_{t-1}y_{t-1})$, but with a balanced budget the return will be identical to the case in the text: $\tau_t N_t y_t/(\tau_{t-1} R_t y_{t-1}) = G_t$ if $R_t = N_{t-1}$ and $\tau_t = \tau_{t-1}$. The endogenous τ_t required for a balanced budget is now $\mu(1 - \tau_t)R_t/N_t$.

retirees; see equation (10). In actuarially fair systems, neither the contribution rate nor the pension benefit is *directly* related to the number of pensioners or the aggregate earnings of workers.

Observe that the well-known result that the rate of return in a PAYGO pension system equals the growth rate of the wage sum ($G_t - 1$) holds only if $\tau_t = \tau_{t-1}$ and $R_t = N_{t-1}$. The intuition is obvious. So long as the contribution rate is raised over time ($\tau_t > \tau_{t-1}$), the return for contemporary pensioners is higher than $G_t - 1$; see equations above for the return factor. If some individuals die before retirement age (so that $R_t < N_{t-1}$), those who live long enough to receive pensions will get a higher return $G_t - 1$ on previously paid contributions.[4]

To highlight the incentive structure for individuals in different pension systems, it is useful to write aggregate contributions as $\tau_{t-1}y_{t-1}N_{t-1} = \Sigma\tau_{t-1}w^j_{t-1}h^j_{t-1}$. Suppose that the individual increases the number of hours he or she works, h^j_{t-1}, or raises his or her wage, w^j_{t-1}, by his or her own effort (including training). Both the individual's contributions and his or her pension benefits will then increase in the same proportion in a contribution-based system with individual (notional) accounts (i.e., an NDC system). I will call such a system *quasi-actuarial,* because there is a close link between the contributions paid earlier by the individual and the benefit that he or she subsequently receives. (The term *quasi* refers to the fact that, in general, the return differs from the return in financial markets.) In fixed-fee, fixed income-ratio, and lump-sum benefit systems, the individual pension depends only on *aggregate* contributions and earnings, not on the individual's own contributions or earnings. Thus, when the individual changes the number of hours he or she works (h^j_{t-1}) or influences his or her wage (w^j_{t-1}), there is no effect whatsoever on the individual's own pension.

The distinction between earnings-based and contribution-based systems is not brought out in the two-period framework above. To highlight this distinction, we must partition the period of work into a number of subperiods (at least two). In this case, only if the contribution rate τ is constant over time will the implicit return be the same in both systems (assuming the calibration $\alpha = \gamma\tau_{t-1}$[5]).

4. Both pension systems with exogenous contribution rates (systems no. 1 and 2) and contribution-based system (system no. 5) with endogenous contribution rates, could possibly be called defined contribution (DC) systems. The remaining systems discussed above would then be called defined benefit (DB) systems. Some authors, however, reserve the term *DC system* for actuarially fair, fully funded systems with individual accounts, while identifying a DB system as one in which pensions are tied to previous earnings (with lump-sum pensions regarded as a special case). The latter terminology is used, for instance, by Diamond (2001) and Thomson (1998).

5. Assume that the individual works in two periods and is retired in a third period. Retired individuals are then supported by two subsequent generations: one engaged in its second period of work and the other in its first period of work. Earnings of workers in periods $t - 2$, $t - 1$, and t are y_{t-2}, y_{t-1}, and y_t, respectively. The oldest generation, which starts work in period $t - 2$, consists of N_{t-2} workers; the two subsequent generations, which start work in

1.2 Effects of Socioeconomic Changes

Let us begin by looking at the effects of four types of socioeconomic change on the distribution of income between pensioners and workers, and hence on the risk-sharing properties of different pension systems: (1) a reduction in the number of workers (N_t); (2) lower average labor income (y_t) or a slower rate of increase in labor income (y_t/y_{t-1}); (3) a greater number of retired individuals (R_t); and (4) lower interest rates (i).

I begin with the direct impact on the income of workers and pensioners, that is, the ceteris paribus effect on income of a change in a socioeconomic variable, with given rules concerning benefits and fees, and with constant values for the other variables. Because the exposition is not based on a formal general equilibrium model, indirect effects (e.g., on product prices, wages, and asset prices) are treated heuristically.[6] A useful starting point then is to examine the consequences of various disturbances for the macroeconomic balance between aggregate demand and supply of output and financial assets. In this way, we are reminded of the fact that the macroeconomic costs of providing pensions for the elderly consist of the elderly's increased consumption, which reduces resources available for younger generations.

1.2.1 Reduced Number of Workers

An actual or expected fall in the number of workers (reduced N_t) for a prolonged period is one important factor behind recent concerns about the viability of existing pension systems. On a high level of abstraction the consequences are rather similar, regardless of whether such a decline is the result of emigration or of a fall (in the past) in the birth rate.

Under fixed-fee pension systems, pensioners must bear the entire (direct) burden of adjusting to such a change because the aggregate amount of pension benefits is constrained by the exogenously given contribution rate times the tax base. Disposable income of individual workers is unaffected. The benefit received by the average pensioner, $(\tau_t y_t N_t)/R_t$, and the implicit rate of return on previous contributions, $(N_t/R_t)(y_t/y_{t-1})$, are both reduced in proportion to the fall in N_t. It is therefore reasonable to assume that the aggregate consumption of pensioners will fall in (about) the same proportion. Because there is no reason that individual workers would change their consumption, the aggregate consumption of workers would also be expected to fall in that proportion. If aggregate output hap-

periods $t-1$ and t, respectively, consist of N_{t-1} and N_t workers. In an earnings-based system, the implicit return factor is now $\alpha(y_{t-2}+y_{t-1})/(\tau_{t-2}y_{t-2}+\tau_{t-1}y_{t-1})$, whereas in a contribution-based system it is γ. If $\tau_{t-2}=\tau_{t-1}=\tau_t$, the return is the same in both systems if $\alpha=\gamma\tau_{t-1}$. The same condition ensures that the endogenous contribution rate is the same in both systems.

6. For formal general equilibrium analysis of pension systems, see Diamond (1977) and Bohn (1999).

pens to decrease by the same percent as employment, there would be no disturbance to the macroeconomic balance.

In all of the other PAYGO systems mentioned above, workers have to bear the entire (direct) burden of adjustment since fewer workers have to finance the same (fixed or predetermined) aggregate pension payments as before. Neglecting conceivable consequences for aggregate labor supply (i.e., assuming the income and substitution effects on labor supply approximately cancel), τ_t must be raised in proportion to the fall in the number of active individuals in order to balance the pension budget; see equations (4), (6), (8), and (10).[7] Workers' *aggregate* consumption tends to decrease as a result of both the fall in the number of workers and the reduction in after-tax income of each individual worker. Thus, if aggregate output (again) happens to decline in proportion to the reduction in the number of workers, then aggregate demand is likely to fall more than aggregate supply. If so, there will be macroeconomic scope for reduced taxes or increased government spending (or both).

Clearly, there is no (direct) risk sharing in any of the PAYGO systems listed above in response to a fall in the number of workers.

The consequences for various pension systems are about the same if employment falls as a result of increased structural unemployment. In this case, however, the government would be in a worse financial position due to higher expenditures for unemployment benefits. It is also worth noting that a rise in structural unemployment may to some extent be caused by the pension system itself because payroll taxes tend to raise labor costs for workers who are exposed to minimum wages (via legislation or collective bargaining).

In the context of an actuarially fair (fully funded) pension system, by contrast, the income of both individual pensioners and individual workers will be unaffected. After a fall in N_t, both have sufficient income to continue consuming as much as before—as long as indirect effects are neglected. There may be indirect effects, however. When pensioners begin unloading financial assets, there are fewer potential buyers of these assets than before due to the fall in the cohort size of workers. As a result, asset prices would fall and interest rates rise, except in the special case of a small open economy with capital markets that are completely integrated internationally.[8] By this indirect route, even under an actuarially fair pension system, pensioners may suffer from a fall in the number of workers. This argument assumes, of course, that asset holders do not rationally anticipate future changes in the demand for and supply of assets in connection with future demographic change. Moreover, because workers may also

7. The derivative of $\ln \tau_t$ with respect to $\ln N_t$ is -1.

8. If the same demographic change occurred simultaneously in other countries, pensioners would also be exposed to lower asset prices in small open economies with fully integrated international capital markets.

hold financial assets, some risk sharing with workers will take place via this indirect route (i.e., via falling asset prices).

Except for the case of a very large decline in asset prices when pensioners unload their securities, aggregate demand is likely to fall less than aggregate output in a society with an actuarially fair, funded pension system. If so, there would be excess domestic demand for goods and services, with increased inflation or deterioration of the current account of the balance of payments, or both. If pensions are not fully indexed to inflation (and they usually are not in fully funded systems), retirees will have to accept further downward adjustment of their per capita consumption. Pensioners may also be harmed by government attempts to combat the current account deficit with policy measures designed to reduce domestic aggregate demand. After all, the size of the current account of the balance of payment is often a policy target of the government—for good or bad reasons.

Determining the proportion of the reduction in consumption of workers and pensioners would require a quantitative general equilibrium model, which is outside the scope of this paper. In any event, a main point here is that even under an actuarially fair pension system, pensions may not be fully protected against the consequences of a drop in the number of workers—due to the eventuality of falling asset prices, to a deterioration in the current account of the balance of payments, and (without price indexation of asset return) to higher inflation.[9]

1.2.2 Reduced Labor Income Growth

The slowdown in the rate of growth of average labor income (a fall in y_t/y_{t-1}) since the early 1970s is another factor underlying today's concern about pension systems. This development might not be entirely regarded as an exogenous shock from the point of view of the pension system. To some extent, the slowdown may have been induced by labor market distortions due to marginal tax wedges associated with payroll taxes, resulting in negative substitution effects on both hours of work h^j and real wages w^j (the latter because of disincentives on investment in human capital and on work intensity).

In the context of a PAYGO pension system, the direct distributional effects are rather similar to those in the case of a fall in the number of workers; y and N enter in the same way in most PAYGO systems. One important difference, however, is that *individual* workers are now directly exposed to reduced earnings. This holds regardless of whether the fall in earnings is the result of lower wages, w^j, or of shorter hours of work, h^j (for instance, via work sharing).

Both a fixed-fee system and a fixed income-ratio system incorporate (automatic) risk-sharing devices between workers and pensioners in the case

9. Such mechanisms are discussed in Barr (1999).

of shocks in wages and hours of work, as opposed to the earlier-discussed case of a change in the number of workers.[10] In fixed-fee systems, a fall in workers' average disposable income by $\Delta y(1 - \tau_t)$ is accompanied by a fall in the average pension by $\tau_t \Delta y(N_t/R_t)$. Thus, income risk is shared between pensioners and workers in the proportion $[\tau_t/(1 - \tau_t)] \cdot (N_t/R_t)$. In the case of a fixed income-ratio system, a fall in average labor income is shared between representative agents in the two groups in the proportion μ. The consequences for macroeconomic balance are quite complex and depend partly on whether the fall in the real wage is related to a drop in productivity (and hence of output), or to a redistribution of income between labor and capital.

Again, the consequences are more complicated in an actuarially fair system. Because there is no direct impact on pensioners, individual workers must bear the entire direct burden of a fall in real wages. Meanwhile, the reduction in wage rates implies that workers have fewer resources available to buy unloaded assets from pensioners. Thus, asset prices may decline in this case as well, thereby reducing pensioners' resources for consumption—with the earlier reservation in the case of a small open economy with perfect capital mobility, or with rational expectations. If so, some of the wage risk for workers is translated into asset risk for pensioners. As in the case of PAYGO systems, it is a complicated matter to determine the consequences for macroeconomic balance and inflation.

The slowdown in real-wage growth from the mid-1970s in most developed countries may very well be reversed in the future, for instance, as a consequence of the emerging information and communications technology (ICT) revolution. This would strengthen the financial viability of existing PAYGO pension systems. However, the ratio between pensions and the wages of coexistent workers would then fall in the context of lump-sum benefit, earnings-based, contribution-based, and actuarially fair pension systems—with the possibility of distributional conflicts as a result.

1.2.3 Increased Number of Pensioners

Recent and predicted future increases in the number of retirees is a third important factor behind today's concern about pension systems. The consequences depend on how this change comes about, for instance, via immigration of elderly people, the aging of a particularly large cohort (such as the baby boomers), early retirement, or higher longevity after retirement.

In the first case—immigration of elderly individuals—the crucial issue is how immigrants are treated relative to native-born citizens.[11] The conse-

10. Merton (1983) was a pioneer in showing that PAYGO pension systems may pool labor and capital income risks between the young and the old.

11. If treated in the same way, immigrants would be entitled to a domestic pension under three of the generic pension schemes listed: fixed-fee, lump-sum benefit, and fixed income-ratio systems. In fixed-fee systems, domestic pensioners would have to accept a fall in their

quences are more clear-cut if the number of retired individuals increases as the result of the aging of a particularly large cohort, which may be described as a parallel increase in N_{t-1} and R_t with N_t unchanged. In fixed-fee systems, per capita pensions will fall in proportion to the rise in R_t (equation [1]), whereas contribution rates would have to be raised in the same proportion in lump-sum benefit, earning-based, contribution-based, and fixed income-ratio systems (equations [4], [6], and [8]). Again, there is no automatic risk-sharing mechanism. Assuming no differences in marginal propensities to consume, problems of macroeconomic balance would not be induced (except for labor supply effects of higher marginal tax rates).

If a rise in the number of pensioners is instead caused by an increase in the frequency of early retirement, the outcome would be a simultaneous rise in R_t and a fall in N_t. In reality, this type of change is often induced by the incentive structure of the pension system itself, including generous rules for early retirement. In the context of a fixed-fee system, pensions would have to be reduced in proportion to the fall in the ratio N_t/R_t, while in lump-sum benefit, earnings-based, contribution-based, and fixed intergenerational income-ratio systems, the tax rate would have to be raised in proportion to the rise in the ratio R_t/N_t.

In the context of an actuarially fair pension system, there will be no direct impact on the income flows. When a large number of pensioners sell assets to workers, however, the former may face falling asset prices in the same way as in the case of a reduced number of workers. This would imply that pensioners will be hit indirectly in fully funded systems as well—except with fully rational expectations or in a small open economy with fully internationalized capital markets.

The situation becomes more complicated if the number of pensioners instead increases because of greater longevity after retirement, so that R_t increases relative to both N_{t-1} and N_t. In fixed-fee systems, pensioners would have to accept a reduction in yearly pensions in proportion to higher longevity. More precisely, there will be a reduction in yearly pensions by the change in the factor N_{t-1}/R_t. By contrast, under lump-sum benefit, earnings-based, contribution-based, and fixed intergenerational income-ratio systems, τ_t would have to be raised in proportion to the increase in the ratio R_t/N_t, provided that each pensioner is guaranteed the

---

per capita pension by the factor N_{t-1}/R_t, whereas in lump-sum benefit and fixed intertemporal income-ratio pension systems, payroll taxes would have to be raised by that factor. Thus, there are no automatic mechanisms for risk sharing between workers and pensioners in any of these systems when the number of pensioners increases due to the immigration of elderly people. Problems of macroeconomic balance will not arise as long as the marginal propensity to consume is the same for all groups concerned. Income flows in the context of other pension systems—earnings-based, contribution-based, and actuarially fair—would be unaffected. Under these three systems, elderly immigrants would (in the real world) be financed either by relatives or by social welfare payments. The latter, of course, would require a general tax increase.

same annual pension as before. Again, there is no risk sharing between generations.

In principle, the situation is the same in the case of an actuarially fair system as in a fixed-fee system, if information about longevity is obtained exactly when a fixed annuity is determined (at the time of retirement); the annuity must be reduced in proportion to greater longevity. However, if such information is not obtained until *after* the annuity has been determined, the pension provider must cover the higher costs, while the annual income of pensioners is unchanged. In reality, however, information about higher (expected) longevity is usually available *before* retirement, during the course of working life. The insurance provider is then able to propose higher contributions, and workers are likely to accept such proposals. It has been argued that similar adjustments are difficult to achieve under PAYGO systems, because the link between what an individual pays and what he or she receives later on is usually rather weak. Because the fee in such a system functions as a tax wedge, higher fees may also be resisted by those who are anxious to avoid additional work distortions (Persson 1998).

1.2.4 Lower Real Interest Rates

The rise in real interest rates in recent decades, as compared to the 1950s and 1960s, is an important factor behind the increased popularity of actuarially fair, fully funded systems. Having already discussed shocks that create problems mainly for PAYGO systems, I now examine an interest shock that creates problems for actuarially fair, fully funded systems (i.e., a fall in real interest rates). A fall that takes place after retirement will either create financial difficulties for the pension provider (if the annuity is fixed) or force retirees to accept lower pensions (if the annuity is variable in the sense that it is gradually adjusted to realized asset returns also after retirement). In the first case, pension providers may try to shift the consequences of interest rate shock onto subsequent cohorts of pensioners.

At the individual-pensioner level, an obvious difference between a fixed and a variable annuity is that in the latter case the individual must accept higher income risk during the period of retirement. The reason, of course, is that with a variable annuity, the drawing down of previously accumulated pension capital takes place only gradually during the retirement period. The advantage to the individual is that he or she then has a further opportunity to enjoy the return on assets, such as shares, after having retired. A variable annuity also fulfills the role of reducing fluctuations in the relation (ratio) between replacement rates for consecutive cohorts of pensioners, because the capital value of the annuity will depend less on the prevailing financial-market situation at the time of retirement. This gives rise to a genuine trade-off problem. Although a fixed annuity provides greater income insurance in connection with uncertainty about longevity, a variable annuity furnishes relative income insurance in connection with uncertainty about asset prices at the time of retirement. The individ-

ual may alternatively opt for "revolving" annuitization for a number of years before retirement, or for a gradual shift (also before retirement) to less risky assets. This means, however, that the individual would miss out on the opportunity to enjoy the return on high-yielding assets after retirement on the basis of accumulated pension capital.

So far I have considered changes in real interest rates only at or after retirement. If real interest rates fell during the individual's working life and were expected to remain low for quite a while, he or she would probably agree to pay higher yearly contributions to a fully funded system in order to boost the future pension.

Even though there are no direct effects (as long as there are no buffer funds), PAYGO pension systems are not immune to changes in real interest rates. Both contribution rates and pension benefits may be influenced indirectly (general equilibrium effects). The most obvious indirect effect is that lower (higher) real interest rates would increase (decrease) future real wage rates by boosting (retarding) the real capital stock. However, it is also important to consider changes in factor prices that are induced by the pension system itself, an issue to be dealt with in subsequent sections.

1.3 Marginal Reforms

1.3.1 Ad Hoc Adjustment

Under all the stylized pension systems discussed earlier, well-specified rules guarantee budget balance—intertemporal balance in fully funded systems and balance in PAYGO systems, in the latter case via adjustments in either fees or pensions. In reality, however, adjustments in conformity with such rules often require explicit political decisions in the case of PAYGO systems. As a result, such adjustment may take considerable time, partly because of conflicts about the distribution of income. In the meantime, financial imbalances of a PAYGO pension system easily emerge after exogenous shocks. This is likely to initiate demand for ad hoc changes in contributions or benefits (i.e., changes outside the original rule system). In extreme cases, a PAYGO pension system may even break down, in the sense that large and rising deficits finally necessitate abrupt, unplanned cancellations of earlier promised entitlements.

For example, after a fall in the number of workers (N) or in average real earnings (y), workers may resist higher fees in lump-sum benefit, earnings-based, and contribution-based systems, and in fixed income-ratio systems after a fall in the number of workers. It is therefore tempting to speculate that workers may want to force contemporary pensioners to share the burden of adjustment in such cases. Indeed, doubts are often expressed in the political debate as to whether a majority of voters will grant promised pension entitlements to the elderly after such disturbances. If explicit changes

in the rules for pension benefits (B, α, γ, or μ, above) are not politically feasible, obvious alternatives are higher taxes on pension income or partial punctuation of price indexation of pensions—illustrations of the role of "framing" in politics.

Because pensioners constitute only a minority among voters, it is perhaps less likely that workers could be forced to share the burden of adjustment (via an increase in τ) when the burden would otherwise fall on pensioners. (This occurs, for example, in the case of a fall in the number of workers in fixed-fee systems and in the case of reduced real interest rates in actuarially fair systems, unless a fixed annuity has been set.) Policy actions for this purpose may be released, however, if pensioners are an important swing group in the political arena, and if their voting behavior is particularly sensitive to the pension benefits offered. Pensioners may also find political support for their position among workers close to retirement.

Even though the benefits of contemporary pensioners have recently been cut to a considerable extent in some countries, and fees have been raised for workers, empirical evidence suggests that political authorities have mainly opted for a "third alternative": cuts in pensions for *future* pensioners (McHale 1999). As an explanation, McHale has hypothesized that today's workers are afraid of becoming exposed to even greater cuts in their own pensions in the future unless they agree to some cuts immediately. Another explanation, however, could be that the political price is higher if the government cuts current disposable income by means of higher fees or lower pensions today, than if it decides to reduce pensions far into the future. After all, myopic behavior is not unheard of; indeed, reference to such behavior (often interpreted as time inconsistency) is one of the most common arguments for having compulsory pension systems in the first place.

When a pension system encounters problems because of a fall in the number of individuals of working age relative to the number of individuals above retirement age (the ratio N_t/R_t), immigration of young workers may be a solution. This presupposes, of course, that such immigration is not expected to result in serious tensions and conflicts in society.

1.3.2 Automatic Adjustment Mechanisms

To introduce new types of automatic adjustment mechanisms within existing pension systems is an alternative to ad hoc policy interventions for dealing with the distributional consequences of exogenous socioeconomic shocks. One way of achieving this consists of shifting to a fixed income-ratio system (system 6 in the classification above). However, such a reform cannot be combined with ambitions to maintain strong quasi-actuarial elements in the pension system, which exist in contribution-based systems with individual accounts (system 5 in the classification above). However, it would still be possible to make relative pensions among individual pen-

sioners proportional to each individual's accumulated earnings or contributions; thus, some relative quasi-actuarial element could still be achieved.

We may also want to modify redistributions of income among generations in the case of unexpected increases in longevity after retirement. Under lump-sum benefit, earnings-based, and contribution-based systems (i.e., systems 3–5), a technically simple way of avoiding placement of the entire burden of adjustment on wage earners is an automatic rule that makes annual pensions a declining function of remaining life expectancy after retirement. For example, when pension annuities in the new NDC-pension system in Sweden are determined, pension benefits will be inversely proportional to expected longevity after retirement. However, this means the entire burden of adjustment will be borne by the retirees—hardly a risk-sharing device, which has made Diamond (2001) question the wisdom of this element in the Swedish pension reform.[12]

Setting higher ages for both regular and earliest possible retirement is a natural response to a rise in the number of retirees as a result of improved health for individuals above today's retirement age. In terms of the notations above, the budget balance of the pension system then would be improved by a combination of higher N_t and lower R_t. (It may then also be important to implement stricter rules for disability and unemployment insurance, because these systems have in fact been used as alternative routes to early retirement even by individuals without serious health problems.[13]) Increased downward flexibility of relative wages for the elderly, as with a less steep age-wage profile, is one way to avoid sending a large fraction of the elderly toward unemployment if the retirement age were raised considerably. An alternative would be to reduce payroll taxes for the elderly. In most countries, union and government wage policies may be obstacles to both these solutions.

Because both health quality and preferences for work vary considerably among the elderly, one no doubt could make a strong case for a *flexible* retirement age. To avoid distorting work incentives, however, and to keep pension systems financially viable, there are also good arguments for combining such flexibility with actuarially fair adjustments of pensions under conditions of early retirement. Elderly individuals with health problems could then be referred to the sick-insurance system. It is curious that the

12. The new pension system in Sweden, however, does not include any automatic adjustment mechanisms if the remaining life expectancy of individuals of a given age rises during their retirement period. Such costs have to be covered by *ad hoc* adjustments via the braking mechanism mentioned in the text.

13. There are limits, of course, to what can be achieved by such a reform. Given current fees and benefit rules, the Organization for Economic Cooperation and Development (OECD) has calculated that the statutory retirement age would have to be raised, within a few decades, to no less than seventy-three to seventy-four years in many developed countries to keep pension systems financially viable. See Thomson (1998, 48, note 10) and OECD (1988).

designs of today's pension systems and labor market arrangements appear to turn higher longevity and better health among the elderly into serious social problems rather than into blessings. Such designs are hardly examples of good "social engineering."

A more crude way of making a pension system financially viable via automatic adjustment mechanisms, regardless of the type of disturbance, would be automatic reductions in benefits or increases in fees in response to an emerging or anticipated deficit in the pension budget.

1.4 Radical Reforms

1.4.1 Shifting to a Quasi-actuarial System (NDC System)

Lump-sum benefit systems and earnings-based systems (pension systems nos. 3 and 4) have served as the most common pension schemes during the second half of the twentieth century. Although the former are completely nonactuarial, there is some indirectly positive link between an individual's earlier contributions and his or her pension in earnings-based systems. The link is very weak in most countries, however, because pensions are often calculated on the basis of earnings during a limited number of years of work. It is not technically difficult to strengthen the link between benefits and previously paid contributions (also without prefunding). One obvious technique would be to increase the number of earning years used as a basis for the size of an individual's pensions.

The most straightforward way, however, would be to shift to a notional defined contribution (NDC) system with individual accounts (a pension system of type 5 with the average *and* marginal return $\gamma = G_t$ for the individual when $R_t = N_{t-1}$ and $\tau_t = \tau_{t-1}$). Buchanan (1968) may have made the first proposal along these lines. A basic argument for this reform involves reducing the implicit marginal tax wedge on work, hence raising the return on work. Because economic efficiency will then increase in the labor market, a Pareto improvement is possible in principle. There would also be less risk of undermining the financial viability of the pension system via an induced reduction in the number of employed workers (N) or a reduction in earnings per worker (y) due to a fall in hours of work or labor productivity. Under realistic assumptions, about 40 percent of the tax wedge implicit in the pension system may be removed by a shift from a completely nonactuarial to a quasi-actuarial, contribution-based pension system with individual accounts.[14] A prerequisite for favorable effects on

14. Assume that an individual starts working at the age of twenty, retires at sixty-four, and lives for another twenty years thereafter. On average, a worker pays his or her contribution at age forty-two, and receives his or her pension at age seventy-four. Thus, as an approximation, we may say that thirty-two years (74 − 42) elapse between the payment of the contribution and the enjoyment of the benefit. Let the contribution rate (τ) be 20 percent, so that if

work incentives, of course, is that an individual understands the connection between his or her own contributions (payroll taxes) and the subsequent pension benefits.

It is virtually impossible, however, to create a fully actuarially fair PAYGO system (i.e., a system without tax wedges) in a dynamically efficient economy (i.e., an economy in which the real interest rate is higher than the growth rate). If a PAYGO pension system would pay a higher return than the growth rate of the tax base, the system would wind up with an ever-rising deficit. In a dynamically *inefficient* economy, by contrast, it can be shown that an actuarially fair PAYGO system would automatically accumulate a fund of the same size as in a fully funded system (Hassler and Lindbeck 1997). However, there is then no point in choosing an actuarially fair system in the first place because the return on paid contributions would be higher in a traditional PAYGO system, in which it is equal to the growth rate of aggregate earnings.

Is it possible, or even desirable, to make a PAYGO system actuarially fair *only on the margin,* while maintaining a balanced budget by setting the average return equal to the growth rate of the economy? Intuition suggests that efficiency would be improved if the marginal return on pensions were set in such a way that the individual's marginal work decisions are indifferent between paying pension fees and investing on the capital market. The point would be that many economic distortions are associated with marginal rather than average tax wedges. It turns out to be technically possible to create such a system (Auerbach and Kotlikoff 1987; Hassler and Lindbeck 1997); owing to intragenerational distributional considerations, however, such a system is politically difficult to implement, because it requires a lump-sum tax (a "poll tax") in order to balance the pension budget.[15]

The financial viability of a PAYGO pension system, of course, requires that pensions are tied to the growth rate of aggregate earnings, hence the product $y_t N_t$, rather than to the growth rate of average earnings, y_t. When

an individual earns \$500 more (due to more hours of work or higher work intensity), he or she pays \$100 in pension contributions. In a quasi-actuarial PAYGO system in which the return is 2 percent (the growth of the tax base), this contribution will be worth \$188 after thirty-two years. If the real rate of return in financial markets is 5 percent and this is used as a discount rate, the capital value of the \$188 at average working age is \$40 ($188/[1.05]^{32}$). This means that the marginal tax wedge on work is 12 percent ($[100 - 40]/500$). Thus, a shift from a completely nonactuarial to a quasi-actuarial system will reduce the tax wedge from 20 percent to 12 percent in this case. See Lindbeck and Persson (2000, 7). The marginal tax wedge would disappear in an actuarially fair system only if such a system were introduced from scratch, and thus without the need to honor pension claims of previous PAYGO pensioners. However, the mandatory nature of such a system may, by itself, distort individual behavior if borrowing is constrained in the capital market.

15. Moreover, for a given tax rate τ, it can be shown that the welfare gain of the increased efficiency of work would wind up entirely with the older generation. If the objective is to let all generations enjoy a welfare gain, however, the pension fee may be reduced (Hassler and Lindbeck 1997).

the new pension reform in Sweden in the late 1990s promised a rate of return on paid contributions equal to the rate of growth of average wage earnings, the system threatened to be unstable in the case of slow employment growth. It was therefore necessary to introduce a braking mechanism on pension benefits that will be automatically released in the case of slower employment growth.

1.4.2 Shifting to an Actuarially Fair, Fully Funded System

I have pointed out the efficiency gain of shifting from a PAYGO pension system with a weak (or nonexistent) link between contributions and benefits for the individual to a PAYGO system with a stronger link, for instance a quasi-actuarial system with individual accounts (system no. 5). A similar efficiency gain may, of course, be achieved by a shift to a fully funded pension system (system no. 2), because the marginal tax wedge falls in this case as well.

Yet, what is the gain, if any, of a shift from a quasi-actuarial pension system (with a strong link between contributions and benefits) to a fully funded system with a market rate of return? Neglecting (to begin with) conceivable behavior adjustments of individuals, it is easy to show that the capital value of the gross income gain for individuals participating in the pension system is the same as the implicit debt to the PAYGO pensioners. Thus, there is no aggregate income gain of such a shift because someone must serve this implicit debt (Feldstein 1995; Sinn 1999). Starting out with a quasi-actuarial pension system, a shift to a fully funded system will not result in a Pareto improvement in the labor market—assuming no distortion of the capital stock to begin with (Kotlikoff 1998; Fenge 1995; Lindbeck and Persson 2000). This conclusion assumes that all income streams are discounted by the market interest rate (which is not completely self-evident, because we compare incomes of different generations rather than incomes during different periods for a given individual).

There will, of course, be redistributions among generations. The signs and sizes of these redistributions depend crucially on how the claims of the old PAYGO pensioners are met. If the PAYGO pensioners are bailed out by taxes on a transitional generation, that generation will experience a sizeable income loss, whereas subsequent generations will experience income gains as compared to the alternative of retaining the PAYGO system. Our attitudes to such redistributions among generations, of course, depend on how we evaluate (i.e., discount) income of different generations. One argument for enforcing a redistribution to future generations may be that the previous introduction of the PAYGO pension system most likely reduced aggregate saving, and hence, the aggregate capital stock, to the disadvantage of future generations. Metaphorically speaking, because the grandparents of today's children originally received a gift at the expense of future generations, the grandchildren may ask their parents' generation

to contribute to an increase in the capital stock via compulsory pension saving. Because lump-sum taxes hardly are politically feasible, a transition generation would also be exposed to higher marginal taxes, with lower economic efficiency of work as result. Subsequent generations would instead be able to enjoy smaller marginal tax wedges, with increased work efficiency as a consequence.

All this may give the impression that the issue of shifting from a quasi-actuarial PAYGO system to an actuarially fair, fully funded pension system is a problem only of intergenerational distribution of income (wealth), and of a trade-off between work incentives and aggregate saving among different generations. There is more to it than that, however.

First, in most countries, existing capital-income taxation distorts aggregate national saving and investment. This is another reason—distinct from the one that the gift to the first generation of PAYGO pensioners has reduced aggregate saving—that the capital stock is likely to be lower than it would have been otherwise. As a result, the discount rate (regardless of whether this is the market interest rate or the subjective discount rate) may be lower than the return on capital assets, a point made by Feldstein (1996). A shift to a fully funded pensions system, like a reduction in government debt, could then be regarded as a second-best policy designed to increase the distorted stock of aggregate wealth, including real capital assets, in society.[16]

Second, we also must look at the risk-return combination of alternative pension systems. Normally, the returns on PAYGO pension claims are not fully correlated with the returns on claims in an actuarially fair pension systems. For one thing, the growth rate of the tax base of a PAYGO system (i.e., aggregate earnings) and the return on financial markets are not fully correlated, particularly when pension funds hold foreign assets. The political risk is also likely to differ. (It is often assumed that claims on funded systems with individual accounts provide stronger property rights than do pension claims in PAYGO systems.) What all this boils down to is that a combination of a PAYGO and a fully funded system provides a richer portfolio of pension assets than either of these pension systems in isolation. This is an additional rationale for a partial shift to a fully funded system.

The most problematic aspect of any shift to a compulsory, fully funded pension system is, in my view, how to minimize the risks that such a reform will—sooner or later—result in politicization of the domestic economy. There is a serious risk that future politicians will use government-

16. However, in some countries, including a number of European countries, this negative effect on the aggregate capital stock may have been compensated for by various types of investment subsidies, although these may have distorted the allocation of investment.

controlled pension funds to allocate financial funds to politically correct industries and to those parts of the national economy where it is particularly tempting to buy votes. Politicians, or their subordinates, might also start using voting rights in firms to exert influence within firms, even though they may lack knowledge as to how firms should be run. Thus, the case against nationalizing pension capital is the same as the arguments against the Lange-Lerner proposal of market socialism.

Technically, it is possible to design institutions that isolate government-operated pension funds from political pressure, including party politics. The most obvious method is perhaps to require such funds to invest only in index funds, possibly global ones, and to give the managers of the funds instructions to exercise the voting rights in firms. Future politicians anxious to exercise economic power, however, are free to change such rules. It is much easier politically to change the rules of portfolio allocation and corporate governance in existing government-operated funds than to propose outright nationalization of an economy from scratch. Thus, those who are critical of market socialism have good reasons to be critical of government-operated pension funds as well. After all, proposals of market socialism also incorporate stringent rules instructing managers of government-owned firms to behave like profit miximizers under perfect competition. Clearly, it is naive to believe that politicians, who choose their profession to exert power, would accept such rules.

The most promising way to mitigate the risks for politicization of the national economy is probably to make pension funds privately owned and operated from the outset, and to allow individuals to choose fund managers. The higher administrative costs of decentralized (versus centralized) fund management is the price of limiting the risk of politicizing the national economy. There are also devices to limit these administrative costs, such as caps on fees, which would induce some managers of mandatory pension funds to choose index funds.

1.5 Adjustment to Increased Heterogeneity

Real-world pension systems have always, at least to some extent, granted (or exploited) the heterogeneity of the population. An obvious example is the overcompensation of early cohorts when PAYGO systems were introduced to bring about a rapid increase in living standards for the elderly or to create broad political support for the reform. This overcompensation was extended to a great number of cohorts by a gradual increase in the contribution rate (a rise in the ratio τ_t/τ_{t-1}).

An example of overcompensation *within* cohorts is redistribution in favor of low-income groups via either a basic (lump-sum) pension or a guaranteed pension with means testing on pension benefits. In most earnings-

based pension systems in the real world (when fixed annuities are tied to earnings during a limited number of years of work), females are also favored because of fewer years of work and a larger number of years after retirement. However, there are also well-known regressive redistributional elements in most real-world pension systems, although it is difficult to say whether these effects are intentional. One example is redistribution in favor of the individual with a steep income profile over his or her life cycle (when the pension level is tied to earnings late in the individual's working life). Another example is redistribution to individuals with high expected longevity (in systems with fixed annuities). In both cases, the arrangements tend to favor highly educated individuals with relatively high lifetime income (wealth).

In recent decades, it is only natural that new types of heterogeneity in the population have given rise to proposals for pension reforms. An obvious example is increased instability of the typical family structure. Pension systems established in the early twentieth century were careful to provide support for widows and their children because the death of the (usually male) income provider was a major factor in the breakup of families. A strong trend toward the labor-force participation of married women has reduced the need for special pension claims for widows. It does not seem reasonable that widows should receive pensions based on both their own previous incomes (or contributions) and widowhood. A delicate issue, however, is what should be regarded a reasonable length of time to phase out the latter type of pension claim, if politicians decide about such an outphasing. The huge increase in part-time work, also largely a result of increased labor force participation of women, also raises the issue of whether the benefit rules in contribution-based and earnings-based systems should favor or disfavor part-time work of different durations.

Today, family instability is largely related to divorce and temporary cohabitation outside marriage. One way of adjusting pension systems to this new situation would be to give couples property rights on one another's pension capital, in the same way that the law stipulates such property rights for spouses regarding real estate and financial assets. Such arrangements may also solve the problem of pensions for survivors (including widows). After all, pension capital usually accumulates gradually over the working life of the family in a manner similar to that of other assets. A delicate issue here concerns how other forms of cohabitation than marriage should be treated.

The heterogeneity of the population has also increased as a result of changes in the traditional life cycle, characterized by the linear sequence of education-work-retirement. This sequence is currently being replaced by more complex and individually varied life cycles. The continuity of working life is often interrupted by education, retraining, periods of work

at home (e.g., caring for children) and prolonged periods of leisure. This is an important background for contemporary proposals to replace existing welfare-state arrangements with compulsory saving accounts (possibly negative accounts early in life) and related drawing rights on claims accumulated before retirement.[17] Proposals of compulsory saving with drawing rights are based on the assumption that individuals can handle modest economic setbacks on their own by drawing on accumulated compulsory saving, for instance, in connection with short periods of unemployment or health problems. However, people would be obligated to reserve a certain minimum balance in their accounts for old age. Thus, proposals of this type may be seen as efforts to encourage individuals to take greater responsibility for their own income protection in the event of moderate strains on their economic situations. Of course, when having to deal with major income losses, the system of drawing rights must be combined with insurance; this point is also granted in most proposals. Another basic idea behind the scheme of drawing rights is to provide the individual with increased resources to shift among work, education, and leisure over the life cycle. Work incentives would then also be improved (via smaller tax wedges) and problems of moral hazard mitigated—two major problems of today's social insurance systems (evidenced by moral hazard in connection with unemployment, sick leave, and early retirement insurances).

It is also a commonplace that higher international labor mobility creates difficulties in assigning individuals to national pension systems. It will certainly become necessary to adjust pension rules in the future to deal with this issue and, in particular, to decide whether pensions should be provided on the basis of an individual's country of origin or of residence. Without some coordination of national rules, individuals may in some cases lose entitlements earned in one country, yet in other instances may end up with more favorable pensions by living part of their lives in one country and part in another. In the former case, the pension system would impede international mobility of labor in the same way that nontransferable occupational pensions among firms or sectors reduce domestic labor mobility. In the latter case, international labor mobility may, in fact, be subsidized. Shifts to quasi-actuarial or fully actuarial systems, or to compulsory saving with individual accounts, would mitigate or even eliminate such problems. Of course, ambitions to use pension systems as tools of redistribution would then be reduced. Increased international flexibility of the choice of residence of individuals also creates an increased need to unify the taxation principles for private pension policies, including occupational pensions. In some countries, governments permit tax deductions

17. An early proposal along these lines is Rehm (1961). More elaborate plans have been developed by Fölster (1999) and Orzag and Snower (1999).

for such insurance contributions while taxing subsequent pension benefits, whereas governments in other countries do the opposite, which clearly distorts residence decisions.

1.6 Concluding Remarks

As we have seen, the consequences for pension systems of various types of socioeconomic changes depend crucially on the detailed structure of the pension system.[18] For instance, there is no (direct) risk sharing in PAYGO pension systems in response to variations in the number of workers or the number of pensioners. By contrast, both a fixed-fee and a fixed income-ratio system incorporate automatic risk-sharing devices between workers and pensioners in the event of shocks in wages and hours of work. Although there is no direct risk sharing in the case of socioeconomic shocks in fully funded systems, I have argued that indirect effects of different types may create some risk sharing.

It is clear that several weaknesses of current PAYGO systems can be solved within the framework of existing systems. For instance, problems concerning financial vulnerability and unexpected redistribution may be mitigated by ad hoc increases in fees, cuts in benefits (often by way of less-favorable price indexing), or increased retirement age. At the same time, such interventions highlight the political risks inherent in government-operated pension systems.

If more-automatic risk sharing between generations is desired, an obvious reform is to shift to what have in this chapter been called fixed income-ratio systems, in which the relation between pensions and the earnings of contemporary workers is fixed. The consequences of increased instability of the family can also be alleviated, for instance, by legislation requiring spouses to share one another's pension claims. If enhanced work incentives were called for instead, then the actuarial elements of the PAYGO system could be extended by strengthening the link between contributions and benefits for each individual, possibly by shifting to what have here been called quasi-actuarial systems. In the context of such a system, it is also technically easy to have a flexible retirement age without individuals' being able to shift the costs of early retirement upon others. I have also mentioned that compulsory saving accounts with individual drawing rights, combined with compulsory insurance systems, provide an interesting response to increased heterogeneity among individuals and to demands for placing greater responsibility on the individual for his or her own economic security.

The most obvious argument for a shift to an actuarially fair, fully funded

18. This type of observation has been made about welfare-state arrangements in general by Freeman (1995) and Atkinson (1999).

pension system is perhaps to favor future generations at the expense of currently working generations—if such a redistribution is regarded ethically fair. One specific twist of this argument is to expand the capital stock in order to compensate either for reduced national saving when the PAYGO system was introduced or for distortions of saving and investment decisions via the existing capital-income tax system. If we start from a PAYGO system with a weak (or nonexistent) marginal link between contributions and benefits for individuals, a shift to a fully funded system will also result in an efficiency gain via smaller marginal tax wedges, in the same way as when such a PAYGO system is replaced with a quasi-actuarial system. However, it should be noted that a shift from a quasi-actuarial system to an actuarially fair system does not reduce the marginal tax wedge for any generation without raising it for some other generations. The reason is that a removal of an earlier existing PAYGO system must in reality be financed by distortionary taxes (Lindbeck and Persson 2000).

However, there is also a portfolio diversification argument for a *partial* shift to a fully funded pension system. The reason is that the returns on pension claims are not completely correlated among pension systems. A partial shift would provide individuals with more well-balanced portfolios of pension claim than would either a PAYGO or an actuarially fair system alone. This is an important point in a world with different types of market risks (risk in earnings versus risk in returns on capital markets) and different types of political risks (such as different strengths of property rights among types of pension claims). The most severe problem inherent in either a partial or complete shift to a fully funded system lies in finding ways to avoid politicizing the domestic economy. The most promising way to achieve this is probably to let pension funds be privately owned and operated from the outset, and to allow individuals to choose fund managers, possibly combined with caps on the administrative fees to pension fund managers.

References

Atkinson, A. B. 1999. *The economic consequences of rolling back the welfare state.* Cambridge, Mass.: MIT Press.

Auerbach, A., and L. Kotlikoff. 1987. *Dynamic fiscal policy.* Cambridge: Cambridge University Press.

Barr, N. 1999. A public-private partnership in pensions: Getting the balance right. In *Partnership in pensions? Responses to the Pensions Green Paper.* Case Paper no. 24. London: London School of Economics.

Bohn, H. 1999. Social security and demographic uncertainty: The risk sharing properties of alternative policies. University of California, Santa Barbara, Department of Economics, Working Paper.

Buchanan, J. 1968. Social insurance in a growing economy: A proposal for radical reform. *National Tax Journal* 21 (4): 386–95.

Diamond, P. 1977. A framework for social security analysis. *Journal of Public Economics* 8:275–98.

———. 2001. *Social security reform* (forthcoming). Uppsala, Sweden: Lindahl Lectures.

Feldstein, M. 1996. Would privatizing Social Security raise economic welfare? NBER Working Paper no. 5281. Cambridge, Mass.: National Bureau of Economic Research.

Fenge, R. 1995. Pareto efficiency of the pay-as-you-go pension system with intragenerational fairness. *Finanzarchiv* 52:357–63.

Fölster, S. 1999. Social insurance based on personal savings accounts: A possible reform strategy for overburdened welfare states? In Buti, M., Franco, D. and Pench, L. (eds.), *The Welfare State in Europe,* 93–115. Cheltenham, UK: Edward Elgar.

Freeman, R. 1995. The large welfare state as a system. *American Economic Review, Papers and Proceedings* 85:16–21.

Hassler, J., and A. Lindbeck. 1997. Intergenerational risk sharing, stability and optimality of alternative pension systems. University of Stockholm, Institute for International Economic Studies, Seminar Paper no. 631.

Kotlikoff, L. 1998. "Simulating the privatization of Social Security in general equilibrium. In *Privatizing Social Security,* ed. Martin Feldstein, 265–306. Chicago: University of Chicago Press.

Lindbeck, A., and M. Persson. 2000. What are the gains from pension reform? Research Institute for Industrial Economics (IUI), Working Paper no. 535. Stockholm: IUI.

McHale, J. 1999. The risk of social security benefit rule changes: Some international evidence. NBER Working Paper no. 7031. Cambridge, Mass.: National Bureau of Economic Research, March.

Merton, R. C. 1983. On the role of social security as a means for efficient risk sharing in an economy where human capital is not tradable. In *Financial aspects of the U.S. pension system,* ed. Z. Bodie and J. B. Shoven, 325–58. Chicago: University of Chicago Press.

Organization for Economic Cooperation and Development (OECD). 1988. *Aging populations: The social policy implications.* Paris: OECD.

Orzag, M., and D. Snower. 1999. Expanding the welfare system: A proposal for reform. In *The welfare state in Europe,* ed. M. Buti, D. Franco, and L. Pench, 116–35. Cheltenham, U.K.: Edward Elgar.

Persson, M. 1998. Reforming social security in Sweden. In *Redesigning social security,* ed. H. Siebert, 169–85. Tübingen, Germany: Mohr Siebeck.

Rehn, G. 1961. "Arbetsmarknadspolitik som samhällsidé" (Labor market policy as a vision of society). In *Femton år med Tage Erlander,* ed. O. Svensson. Stockholm: Tiden.

Sinn, H. W. 1999. Pension reform and demographic crisis: Why a funded system is needed and why it is not needed. CESifo Working Paper no. 195. Munich: CESifo.

Thomson, L. 1998. *Older and wiser.* Washington, D.C.: Urban Institute Press.

Discussion Summary

Martin Feldstein shared the worry expressed in the paper that a centrally managed, funded system would create problems of political interference. He cited some evidence from the United States in which state governments have pension systems for their workers and often have rules about investing the funds locally. He concluded that this could be avoided by having a system of individual accounts. *Rolf Langhammer* suggested that in making a relative assessment of the desirability of government versus privately operated pension funds, the probability of insolvency should also be taken into consideration. He brought up the American Orange County case, which shows that lower levels of state authority can also go bust.

A. Lans Bovenberg argued that Pareto improving transitions from pay-as-you-go (PAYGO) to funded systems are possible and that everyone can gain if there is a distortion in the economy. In Europe, more important than the capital income tax already mentioned by Martin Feldstein would be labor market distortions, and he suggested exploitation of this distortion for efficiency gains. He conceded, however, that this is a difficult task because many of these distortions are connected with intragenerational redistribution, which makes it much harder to come up with something like a Pareto improvement. Bovenberg concluded that the key challenge is to perform redistribution more efficiently. *Eytan Sheshinski* pointed out that the extent to which a fully funded system eliminates distortions depends on the details of the system with respect to provisions against idiosyncratic risks, individual risks, or macro risks, and that every kind of guarantee will involve some kind of distortion. He gave the example of government guarantees in case of bankruptcy, which will have distortive effects on the portfolio choices of the managers. As further distortions, which he suggested can be acceptable for distributional purposes, he mentioned mandatory pricing of annuities when there are different risks—for example, with respect to longevity.

Martin Feldstein argued that the potential gains from going beyond notional defined contributions to actually funded defined contributions are much greater than suggested in the paper, because differences in rates of return prevail for more than one year. He cited the example in which a defined contribution system produces the rate of growth in the economy of 2 percent and a funded system provides the real rate of return on capital of 8 percent, and assumed that the contributions would be in the accounts for an average of thirty years (put in at age forty-five in the middle of the working life and withdrawn at age seventy-five in the middle of the retirement life). In this case he calculated that the difference between a 2 percent growth rate and an 8 percent growth rate would be a factor of 5 or 6 leading to an enormous implicit tax wedge if one was forced to take the lower rate of return. *Assar Lindbeck* replied that there would effectively be

less return than 8 percent if there was a PAYGO system to begin with because of financing of the inherited PAYGO pensions. He pointed out that in the case of starting from a PAYGO system, it is possible to gain from a move toward a funded system only when the rate of return is higher than the discount rate. *Pierre Pestieau* remarked that it is not clear that there is a gain from the move toward the stock market, at least in a general equilibrium framework, unless there are liquidity-constrained households.

The issue of risk sharing emphasized in the paper was stressed by *A. Lans Bovenberg,* who argued that it is particularly important in the European context, because Europeans tend to be particularly risk averse, due in part (as he suggests) to the fact that the less risk averse left the continent and went to the United States. He argued that in order to diversify risk it would be appropriate to combine various types of pension systems. Risk sharing is also behind the problems with portability in funded systems, according to Bovenberg, because in Europe funded plans tend to include many intergenerational transfers—meaning that they are not purely funded systems but contain, in a sense, elements of PAYGO systems. The element of intergenerational risk sharing in many funded systems actually enabled these systems to better exploit the equity premium, because they did not need to be particularly risk averse, as an individual would be (especially when nearing retirement age). As the population generally appreciates arrangements of this kind, it seems important to Bovenberg to look for ways to maintain them in the face of increasing competitive pressures. One of only a few available options would be to increase the use of the capital market and take advantage of capital market integration to improve risk diversification. Another option could be to go to a pan-European system, but he deemed this very difficult as well because of huge transaction costs. *Assar Lindbeck* endorsed the view that there is a strong case for a mixed system because the systems are associated with different risks that are not completely correlated. Therefore, it would be possible to achieve an improved portfolio. However, he warned that it might not be sensible to set up a very small funded system because of high fixed costs, and added that it might have been unwise for Sweden to relegate only 2.5 percentage points of the contributions to the fully funded system. With respect to the equity premium, he noted that it is has proven very difficult to explain it by mere consideration of risk. To the extent that this premium is higher than the compensation for risk, a fully funded system would give the entire population the chance to enjoy this equity premium. He argued that the possibility of investing on a voluntary basis was limited, given the high level of taxes.

Laurence J. Kotlikoff remarked that the prevailing notion that switching to a funded system would be neutral when the government would borrow money to pay for the funding and assess taxes to cover the interest overlooks the facts that the European pension systems are simply not sustain-

able, and that governments have only a few years left in which to make adjustments to prevent a complete collapse of the systems. This is, he reported, the conclusion of recent generational account exercises that suggest that tax rates will have to be raised dramatically in the future, beginning with tax rates that are already enormously high. He pointed out that the situation is that of drastically disadvantaging future generations so as to maintain the situation for current generations—the current elderly in particular—and concluded that a reasonable position on the question of whom to hurt is to share the harm across current and future generations. He argued that it would be insufficient to go to a notional account system and slightly improve the incentive system, but that it is necessary to do something major that addresses the intergenerational equity issue, and suggested that this would occur through a move to a funded system.

Edward Palmer raised the issue of the risk of longevity and noted that one advantage of notional account systems is that they put longevity into the equation and increase the transparency of the system with respect to the expected benefits. He noted that in a notional or financial-account defined contribution system it is clear that the worker bears the longevity risk, whereas this is not the case in a defined benefit system.