Chapter 8

A Market Method to Endow NDC Systems with Automatic Financial Stability

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PENSION PLANS THAT ARE FINANCED WITH THE PAY-AS-YOU-GO (PAYG) METHOD, but that have an actuarial benefit formula that includes individual accounts, have been spreading in Europe since the end of World War II. These plans have been recently named *notional defined contribution* (NDC).[1] A more apt name is *notional accounts* (NA), since such plans can also offer defined benefits, as shown below.

An important property of a pension plan is its degree of automatic financial stability in the short run. It is normally considered valuable to insulate the government's finances from the shocks that impinge on the pension plan, and to insulate the pension plan from the shocks that affect the treasury because it destroys the risk created by random parliamentary delays in parameter adjustment to shocks—that is, it minimizes political risk.

Insulation in this sense is not an absolute concept. Fiscal policies can always be used ex post by parliament either to subsidize or to tax pension income. Insulation adds value because it gives parliament the opportunity to debate possible fiscal policies in response to shocks, free from the pressure coming from the insolvency of the pension plan.

A major precondition for mutual insulation is that the parameters of the plan are such that, if no more shocks arrive in the future, the plan would be able to meet its payment promises for the indefinite future. Call this characteristic initial financial independence, or initial solvency. Many pay-as-you-go-financed plans are currently insolvent in this sense, and for them, the issue of financial stability is simply a far-off aspiration.

For initially solvent plans, the issue of financial stability is renewed over time, as uninsurable shocks arrive and add their aggregate financial impact. These shocks can be demographic (longevity and fertility), economic (changes in average taxable income of covered workers, variations in employment), and financial (changes in stock and bond prices, which affect the fund portion in partially funded plans). The aggregate financial impact is the difference between the impact on plan liabilities and the impact on plan assets. The benefit formula of the plan, whatever it is, controls the liability side and normally specifies

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adjustments to the benefits of the individual member. For example, if taxable earnings and contributions drop, promised pension amounts drop in all earnings-related plans. Adding these adjustments across all individual members yields the aggregate financial consequence of the shock on the liability of the pension plan. Independently, the shock has an impact on the assets of the plan. The difference between both impacts is the aggregate financial impact of the shock. This impact may be relatively large in the short run.[2] An example is an increase in unemployment in an initially solvent defined benefit (DB) plan financed with the pay-as-you-go (PAYG) method.

This chapter discusses alternative ways in which a plan adjusts to aggregate financial shocks. In general, adjustment depends on four sets of rules, which operate in successive layers: (1) the benefit formula of the plan, which links individual contributions with individual benefit amounts; (2) the rules for adjusting parameters of the plan; (3) the rules for the use of eventual buffer funds and credit lines offered by a sponsor; and (4) the rules governing the exercise of discretion ex post by a set of people, say members of parliament, members of a public board governing the plan, civil servants who control deeper technical parameters, and finance ministers who retain the right to limit the plan's access to credit lines or to buffer funds. The financial stability of a pension plan can be described as "automatic" when layers (3) and (4) are avoided in almost all states of nature (except war and the like) because layers (1) and (2) are able to cope with most shocks by themselves.

The literature has proved that NA plans that use any of a set of simple benefit formulae that were adopted in Europe in the 1990s do *not* enjoy automatic financial stability in the short run in the face of demographic and economic shocks.[3] In an NA plan, the benefit formula comprises the individual account of active members, the formula used to set the notional interest rate credited to those accounts, the factor to convert the account balance at retirement into the initial pension, and the formula for indexing pensions in payment. Consider the case where the instantaneous notional interest rate credited to individual accounts is the instantaneous growth rate of contribution revenue, where pension payments are indexed to the growth rate of contribution revenue, and where the conversion factor at pension age is an adequate function of this same growth rate and expected longevity. Even in this case, which is more favorable to automatic financial stability than others, a permanent drop in the population growth rate triggers a long wave of cash deficits that lasts up to 80 years.[4] These deficits are due to discrepancies in the timing of the expenditure and revenue changes triggered by this shock. The discrepancy is significant: for a permanent drop in the population growth rate of just 0.5 percent per year, in a plan where the contribution revenue is 10 percent of GDP, the present discounted value of these cash deficits discounted at 3 percent real and located in the year of maximum deficit is about 9 percent of GDP.

In contrast, rule-based and contract-based plans such as defined contribution (DC) plans (mutual funds) and defined benefit annuities offered by life insurance companies always achieve automatic financial stability in the short run merely by using layers (1) and (2). Consider the mutual fund formula, invented in Boston in 1924, that underlies DC plans. Each individual member has a number of shares of the mutual fund, and its price is adjusted daily in the following way: the new price is the new value of assets (at forward-looking market prices) divided by the number of shares outstanding. It may be argued that rule-based and contract-based plans are irrelevant, because they require a costly transition to full funding (see definition in box 8.1). This is incorrect, as shown by Valdés-Prieto (2005), because the transition can be costless and immediate.

In 2001, the Swedish authorities devised an alternative path to reach automatic financial stability in their NA plan. The original rules were to credit notional capital of active workers at the growth rate of contribution revenue, and to adjust pensions in payment by the

Box 8.1. What Is Meant by *Funding*

The issue of whether a pension plan is "funded" or not is controversial because there are three meanings of the term. In the fiscal meaning, the pension fund is the financial securities, real estate, and other rights owned by the plan. In contrast, the present expected value of government subsidies to the plan is not a part of the pension fund, because the law can be modified and these donations can stop. These donations can be explicit subsidies, as when notional plans receive a regular budget transfer, or can be implicit subsidies such as the net lifetime tax implicit in mature PAYG finance as described in the main text. Therefore this critical revenue source is not part of the pension fund either. Generalizing, a *pension fund* is defined as the set of payment promises in favor of the plan that are protected by property rights.[5] The *degree* of funding in the financial sense is a ratio obtained by dividing the market value of the pension fund by the expected discounted value of accrued liabilities at the same date.

In its *fiscal* meaning, funding is the degree to which changes in benefit liabilities bring about changes in the net fiscal debt, or affect the riskiness of the payment profile of the net public debt. For this purpose, the "net public debt" is the standard public debt, minus publicly owned assets, plus the implicit fiscal debt to insolvent health and old-age benefit programs. The fiscally costly "transition costs" are caused by restructuring of fiscal funding, not by changes in the degree of financial funding.

There is another meaning of *funding*, which refers to the impact of the plan on the volume of economywide savings. This "macro," "ultimate," or "broad" funding is not a feature of the plan itself but of the wider macroeconomic context. The degree of broad funding is a function of private savings, national debt policy, the degree of Ricardian equivalence, and the presence of other state-sponsored transfer programs such as health subsidies for the old, student loans, and the pension plan. Broad funding is a characteristic of the economy, not the plan.

As pension plans should not be labeled on the basis of something not related to them, the meaning of *funding* should be restricted to the financial definition (the first one). The IFM reform discussed in this chapter does not affect the economy's degree of funding. However, it increases the plan's degree of financial funding because it grants the plan property right protection over the revenue of the tax implicit in the contributions extracted from future contributors who are forced to remain in or join the plan.

growth rate in average wages minus 1.6 percent per year. However, since May 2001, a different and highly creative rule—called the automatic balance mechanism (ABM)—was adopted. When the plan's liabilities exceed assets, the notional interest rate credited to active members and the rate of adjustment of pensions in payment are both cut, to equal the growth rate of average wages minus the growth rate in liabilities plus the growth rate in assets.[6] The ABM seems to endow the Swedish plan with automatic financial stability.

This chapter discusses an alternative response, which also endows NA plans with automatic financial stability in the short run, by adopting a rule-based method to allocate aggregate risk. I call it "integration to financial markets" (IFM) for reasons to be explained below. In contrast to the ABM, the IFM method is based on discount rates determined by the financial and capital markets, and thus relies on objective projections. This also allows the IFM to be decentralized, reducing the risk of political and bureaucratic interference, an aspect that might increase the confidence of members in the plan. It is also important to stress that as the IFM relies on asset values, it adjusts using rational expectations rather than slow-moving averages. In addition, the IFM method allows the plan to trade part of the uninsurable risks that it faces with other investors and internationally, creating scope for substantial economic gains.

In most NA plans, the value of the pension fund is negligible as a proportion of liabilities. Even in the case of the Swedish plan, which is endowed with a large buffer fund, the pension fund was about 10 percent of liabilities in 2001, under current accounting rules.[7] Therefore, most of the assets of a NA pension plan are the present expected value of the net lifetime tax on labor earnings that future members will have to bear. This tax revenue is not owned by the pension fund in the legal sense because the law can be modified to stop this cash flow. For example, a future law may allow Swedish workers to divert part of those contributions to the PPM (a financial DC plan). Access of the NA plan to most of the economic assets that back its promises is not protected by property rights.

Consider endowing NA plans with property rights over the net lifetime tax revenue that future covered workers will yield, followed by securitization of these cash flows and by trade of at least a few of these new securities in the financial markets. The new securities are called *covered wage bill* securities, or CWB securities (see Valdés-Prieto 2005). This chapter compares the resulting pension plan with the ABM system. It stresses that the market prices that emerge for these new securities will be forward-looking, and that these prices contain the discount rates needed to ascertain the assets and liabilities of the plan. Therefore, feeding these discount rates back into the benefit formula of the NA plan—specifically, making the notional interest rate equal to the rate of return on CWB securities observed in the financial market and adopting the mutual fund rule to determine the balance of the individual accounts—endows the plan with automatic financial stability in the short run. This stability is different from the one produced by the ABM, because it is based on forward-looking prices.

The chapter proceeds as follows. The next section summarizes the proposal to create CWB securities, to endow the NA plan with them, to trade some of them, and to insert the resulting market prices into the NA benefit formula. The third section compares this method to achieve automatic financial stability with the automatic balance mechanism adopted by Sweden in May 2001 in its pure form. The final section offers concluding comments.

Endowing a Solvent NA Plan with Automatic Financial Stability

This section summarizes the proposal to modify an NA plan that is initially solvent to endow it with automatic financial stability. These steps are developed and justified in detail by Valdés-Prieto (2005).

The Economic Asset That Backs PAYG-Financed Pension Promises

Every pension plan has a liability given by the expected present value of its commitments to pay pensions to its *current* members. The plan does not yet owe anything to future members, since they have not contributed. The size of the existing liability is set by the current benefit formula—which may be based on individual accounts or years of service—by the history of taxable salaries or contributions of current members, by pension ages, and by the formula that indexes pensions in payment.[8] The size of this liability does not depend on the financing method used by the plan.

A solvent pension plan is defined as one that does not require financial support from its sponsor, nor will pay a profit to it, in present expected value. An initially solvent plan financed with "pure" PAYG does not own financial assets or real estate in any measure comparable to its liabilities. It may seem that this plan has no assets but has a large liability, so that a large negative net worth would be needed to respect the balance sheet identity. But the cash flow in this plan is balanced at zero by the assumption of initial solvency. This implies that the net worth of the plan for its sponsor is zero, not negative. The answer

to this riddle is that the pension plan holds a special economic asset, in addition to whatever pension fund it may own.

Lee (1994) has argued that the present value of expected future transfers to be received, minus transfers to be made, is a form of wealth that is held by individuals in modern economies—and by institutions such as pension plans. He also points out that when a transfer system can obligate people as yet unborn to make future transfers to members of the current population, aggregate "transfer wealth" may be positive for the current population, and negative for the yet unborn generations.

Consider the difference between the present value of contributions and the present value of benefits promised to each future generation of members. For example, consider an overlapping-generations (OLG) economy populated by agents whose lives last two periods, young and old, with probability 1, and where the old do not work. Each worker active at date t earns covered labor income in amount y_t. The number of workers that are active in date t is N_t. Assume that plan parameters are in a steady state where contributions are paid at rate θ_O percent of labor income, while in old age benefits are received at a level such that β percent of the earnings of the previous period are "replaced." The real discount rate after inflation, given by alternative investments of the plan in the financial market or in real estate, is r percent per period.

The difference between the contributions and the present value of benefits promised in exchange to that same generation is, in the aggregate and as of young age:

$$T_t \equiv \theta_0 \cdot y_t N_t - \frac{\beta \cdot y_t N_t}{1+r} = \left(\theta_0 - \frac{\beta}{1+r}\right) \cdot y_t N_t \equiv \tau \cdot y_t N_t \,, \tag{8.1}$$

where T_t is the "lifetime hidden tax" on that generation of members. T_t is not zero unless $\beta = \theta_O \cdot (1 + r)$: that is, unless $r = (\beta/\theta_O) - 1$. The internal rate of return (IRR) of pure PAYG finance in steady state is the growth rate of the contribution base, which is also the growth rate of the economy (GDP): say, g percent real, given by the sum of population growth and labor-augmenting productivity growth. In hypothetical "golden rule" economies, the real interest rate earned by physical capital is $r = g$.[9] Box 8.2 argues that g must be *smaller* than the real interest rate available in the financial markets before taxes (and earned by pension funds invested in financial instruments or in physical assets) after discounting for risk.

It turns out that for two-period lives and pure PAYG finance, the IRR for members of the plan is IRR = $(\beta/\theta_O) - 1$. In a steady state where the plans keeps a constant share of the overall economy, IRR = g. Therefore, the condition $r > g$ (see box 8.2) implies that the discount rate for plan liabilities must be $r >$ IRR. Given this, the tax T_t defined by equation 8.1 must be *positive* (see proof in Sinn 1999). One intuition for a positive tax T_t is that it is the counterpart of the gift granted to the initial old generation when PAYG finance was introduced, which is positive. This result generalizes to out-of-steady-state situations, to the partially funded case and to the uncertainty case, but refers now to the average tax paid by all generations (see proof in Valdés-Prieto 2005). However, the tax can be negative for a few generations, depending on the plan's rule for adjusting to shocks, as shown by Settergren and Mikula (2006).

Define the PAYG asset as the expected present value of the hidden taxes that the plan expects to collect from its future members, who have not yet joined the plan, for the infinite future. This is just another way to write the "expanded" balance sheet for an ongoing pension plan. The expanded balance sheet adds to the asset side the expected present discounted value of the contributions that all future generations will pay, and adds to the accrued liabilities the expected present discounted value of benefits for all future genera-

Box 8.2. Why the Rate of Return on Capital Must Be Larger Than the Growth Rate

There is abundant empirical evidence in favor of this hypothesis for developed countries (Abel et al. 1989). Moreover, there is by now a well-developed theory that explains why this inequality must be a feature of any market economy.

In the presence of assets that are infinitely durable, such as land, whose ownership is widely dispersed in many societies, it has been shown that $r > g$ in macroeconomic equilibrium (Scheinkman 1980; Richter 1993). One simple way to explain this reasoning is as follows: If land is in fixed supply and yields a rent of 1 unit of output per year, and the economy grows at rate g, and the share in consumption of land-based goods is constant, then the price of a unit of land output must grow at rate g. The present value of this rent, discounted at the real interest rate r, is $\$1/(r - g)$. Therefore, if $r = g$ as in golden rule economies, the value of land would be infinite. As land ownership attracts part of the portfolio of households, they would cease to hold other physical capital (machinery). However, a fall in the supply of other physical capital would raise its return, until $r > g$.

Confirming this result from another direction, Tirole (1985) showed that the inequality $r > g$ also follows from the need to prevent arbitrage by entities that are infinitely lived and whose income grows at rate g. Examples of such entities are governments that can issue debt, dynasties that earn a wage bill that grows at rate g and may issue debt, pension plans, and health plans for the old.

The following "slow Ponzi scheme" is possible for each such entity when $r = g$: issue \$1 million of financial debt at interest rate $r = g$, and when interest and principal comes due, refinance *both* at rate $r = g$. Although the size of the new debt grows exponentially at rate g, the ratio of the new debt to current income is fixed at a constant number, because current income also grows at rate g. Therefore, the entity remains solvent in the sense of ability to repay all its debts on time forever. Thus the entity can distribute \$1 million in dividends to its owners now, without demanding any compensating cuts in dividends in the future. Put another way, when $r = g$ in the long run, such entities are not subject to a budget constraint, and even less so if $r < g$. As owners still attach a positive marginal value to extra wealth, the supply of debt explodes to infinity when r falls so low as to equal g. This increase in the demand for credit must raise interest rates until $r > g$.

The inequality $r > g$ also implies that the economy is dynamically efficient in the sense that it would *not* be better off by destroying physical capital. Given these facts, golden rule economies where the real interest rate earned by physical capital is $r = g$ are only hypothetical.

tions. If this latter liability is written as a negative asset, the difference between these two expected present discounted values appears as the PAYG asset.[10]

As the average hidden lifetime tax is positive, the PAYG asset is positive too (given initial solvency). Therefore, this is an asset for the plan, not a liability. This is a real asset for the plan, which collects real revenue, as long as it is reasonable to expect that future contributors will continue paying the net lifetime tax embedded in their contributions. The PAYG asset is used by the plan to back its accrued liabilities to current members.

Valdés-Prieto (2002, chapter 8) proved that if the plan is initially solvent, the size of the PAYG asset will be just enough to fill up the asset side of the balance sheet of the plan. This proof has been extended to the uncertainty case (Valdés-Prieto 2005). Therefore, the PAYG asset can be calculated with a simple rule: take liabilities and subtract the pension fund, if partially funded.

However, this is not true if the plan is not solvent initially. When projections show that the present value of cash flow is negative—that is, when the plan is initially insolvent—

the PAYG asset is not large enough to cover the plan's liabilities at current values for the parameters of the benefit formula. Insolvency does not imply that the pension plan is illiquid. Its cash flow may be positive for the next 10 or 20 years. Insolvency means that financial independence is unsustainable in the longer run if current parameter values are not modified.

Let us review some implications. Young and future members are taxed because the rate of return on saving through this plan is below the rate of return offered by investment in the financial market or in physical capital. The ratio $\tau = (T_t/y_tN_t)$ is the *rate* at which the hidden tax is levied on covered labor earnings.[11] The hidden tax rate τ always meets the condition $\tau < \theta_O$ for workers who are forward-looking or "provident" regarding old age, because each one sees that he will recover a portion of contributions as pension benefits.

Relabel the Cash Flows

Consider a reform that comprises several steps. First, the tax hidden in PAYG finance is made explicit. One way to do this is to split the initial mandatory contribution rate θ_0 into a new (smaller) contribution rate θ' and a new residual payroll tax on covered earnings, levied at rate τ, where τ is equal to the estimated rate of the hidden tax in the initial situation. In our model of two-period lives for a plan that is initially solvent, this implies

$$\theta_0 = \theta' + \tau, \quad \text{where} \quad \tau \equiv \theta_0 - \frac{\beta}{1+r} > 0. \tag{8.2}$$

Second, a law endows the plan with the revenue collected by the new residual payroll tax on covered earnings. However, this law can be changed by another law in the future, and in that event, the plan will not have a right to claim any compensation for expropriation. Thus the plan does not yet enjoy a property right over this tax revenue.

These two steps merely relabel existing cash flows. The sum of income flows received by the pension plan does not change, the take-home earnings of workers do not change, and firms' labor costs do not change. The only difference so far is that the IRR earned by plan members on their new contributions (just θ') rises to *r.* Meanwhile, the IRR earned on the residual payroll tax component drops to zero. This expresses in yet another way the budget identities summarized by Lindbeck and Persson (2003).

Make the PAYG Cash Flow Tradable

In this step, a law grants the plan property rights, in the standard legal sense, over the cash flows indicated previously by T_t. It was already pointed out that a future law could repeal this law, totally or partially. As long as this remains possible, the plan will not have a "real" property right over the PAYG asset.

The standard approach to this problem—which affects all private property rights as well—is for the courts to enforce a "property right." Most judicial systems (courts or constitutions) specify that in case of expropriation of something covered by property rights, the previous owner is entitled to *compensation* at market value, paid by the state. This is the current legal status of government debt securities and the legal status of *all* private property, since it is always subject to the possibility that a new tax in the future may cut a large part of its value to the owner.

To protect plan ownership over the revenue T_t, the analogous approach is proposed: The law that grants the plan the revenue T_t must declare that it is *owned* by the plan, and must add that if some future government wishes to withdraw part or all of the residual payroll tax in the future, or if that government taxes or otherwise ceases to pay the tax col-

lection to the plan in the future, then the plan will be considered an expropriated owner, just like any other owner. This clause must be written in a way that is clear for the local courts. Of course, the courts must be independent from the executive power for property rights to exist. The objective of spelling out such details is to minimize the risk that procedural objections by a cash-strapped state may devalue the plan's property right over the hidden tax revenue in a significant amount.

It turns out that the resulting commitment does not reduce the freedom of future politicians to modify the rate and the base of taxes on covered earnings, and thus engage in welfare-improving tax policy in the future. Parliament keeps the freedom to replace the residual payroll tax at rate τ by other substitute revenue sources, such as an increase in value-added tax (VAT). This can be done by using the extra revenue from VAT to finance a permanent subsidy to covered workers that defrays the cost of the residual payroll tax for workers. The only requirement imposed so far is that any new policy that imposes losses on the plan by diverting its cash flow must compensate the plan. Of course, the plan may remain publicly managed at this stage (but see Valdés-Prieto 2000 for the longer term).

Securitize the New Cash Flows Owned by the Plan

Securitization is defined as a process that transforms an illiquid asset into a set of securities that are standardized at small enough sizes to make them tradable, which can be sold to investors in the financial markets.[12]

Consider transforming the PAYG asset into a tradable financial asset, by creating CWB securities. The dividend of CWB securities is T_t. The financial design of CWB securities can be uniform, consisting of a simple pro rata share of the revenue from the residual payroll tax to be received in the future. Alternatively, these shares can take different shapes over time and over states of nature, provided that the sum of all CWB dividends in each and every contingency and time period add up to total tax revenue available at that contingency and time period.

In a standard case, the volume of CWB securities is a vast proportion of GDP (if this securitization is applied to all the earnings-related NA plan). For example, if T_t is a revenue of 3 percent of GDP, the real interest rate is about 3 percent per year, and the expected growth rate of covered earnings is 1 percent per year, then the value of all CWB securities is 3 percent/(0.03 – 0.01) = 150 percent of GDP. Note that the market discount rate on CWB securities must be larger than the growth rate of the covered wage bill, because the dividend T_t grows at rate g. If the market discount rate were equal to g, then the market value of a CWB security would be infinite.

CWB securities differ from public debt in a fundamental way: CWB securities are not owed by the government. They are owed by future contributors to the pension plan, despite the fact that the state does force them to join and pay the residual payroll tax. In addition, CWB securities have a payment profile that is like equity, in the sense that it varies directly with fluctuations in fertility, labor force participation, and real earning trends. In contrast, public debt makes a fixed nominal (or CPI-indexed) payment. The owners of CWB securities take 100 percent of the loss when dividend growth falls below expectations, and also reap the gains when the dividend T_t rises faster than expected.

The amount of CWB to be sold in the market by the pension institution can take two very different values. On the one hand, some small amount must be sold to obtain a market valuation of CWB securities. Achieving sufficient trades for this purpose requires a modest sale of CWB securities compared with the total available. A schedule of weekly

sales of CWB securities adding up to, say, 0.3 percent of GDP per year for the first 10 years may be enough to free the market valuation from liquidity penalties.

On the other hand, the pension institution may attempt to abandon its inherited portfolio and move toward the risk-return frontier, creating substantial economic gains. This requires exchange of much more substantial amounts of CWB securities, say 30 percent of the total, for corporate securities, both national and foreign.[13] Valdés-Prieto (2005) argues that it will not be in the interest of pensioners for the plan to exchange much more than this because many are likely to prefer the safety of CWB securities.

Adapt the Benefit Formula of the NA Plan

In order to endow the NA plan with automatic financial stability, its benefit formula must adopt a rule that ensures that the current value of liabilities tracks the market value of plan assets on a daily basis.

One rule-based benefit formula expresses the notional account balance of each individual member as a number of *shares* in the assets of the plan. The price of each share is set daily by dividing the value of plan assets by the number of shares outstanding, just as mutual funds do. Then the notional interest rate credited to active members' account balances is chosen: the rate of change of the price of shares. The resulting rule for allocating aggregate uninsurable risk is "defined contribution."

Rule-based defined benefits can also be arranged, as follows. The plan buys fixed annuities from a life insurance company, which in turn would back those promises by purchasing a separate portfolio made up of long-term fixed-income bonds. The pension institution would purchase these annuities with the proceeds of sales of CWB securities in the same amount as the account balance of the retiring members. In addition, the owners of the life insurance company must put up some capital as a guarantee of their promise to take losses if the portfolio falls in value. (If the portfolio rises in value, the owners take the gains.) This insurance function could be performed by the pension institution itself if it had some capital, but this would have to be supplied by the state.

Of course, the supply of an adequate volume of fixed-income bonds at reasonable prices can be a problem. This problem is solved if the CWB securities are created in two different classes, the first one paying a dividend indexed to average wages and the other paying as dividend the remaining cash from T_t, (which tracks demographic and participation risks). Life insurance companies would be happy to buy the wage-indexed CWB securities and offer wage-indexed variable annuities to retiring members. The second class of CWB securities, with returns linked to demography and participation, would be held by the more risk-tolerant investors, including younger workers.

In both cases, the NA plan will have been endowed with rules that provide automatic financial stability in the short run. This follows from the use of either the mutual fund formula (defined contribution) or the hiring of a sponsor that guarantees a wage-indexed annuity (defined benefits). Let us explain the term *integration to financial markets*: Although the basic purpose of rule-based benefits is to destroy political risk by attaining automatic financial stability in the short run, a side benefit is that members become able to direct the funds in their individual account toward the portfolios available in the financial markets. Active members are likely to differ in their degree of risk tolerance. For example, those near retirement may seek a high degree of certainty about the interest rate that will be credited in the future to their individual account balance. The plan should respond by offering several balanced portfolios with different levels of uninsurable risk to active members, and also should offer to purchase deferred annuities for those members who

fear a rise in annuity prices for the year in which they plan to start a fixed annuity. At least one of these portfolios should be a fixed-income one, such as the Thrift Savings Plan offered by the U.S. government, which has 3.2 million members.[14] To create each portfolio, the plan would mix CWB securities with equities and fixed-income, long-term bonds in the financial market (purchased with the proceeds of sales of some CWB securities) in the same amount as the account balance of the members that choose the associated portfolio.

Comparison between this Proposal and the Swedish ABM

Consider as a starting point a country with a two-pillar pension policy. The first pillar comprises solidarity programs that help the old poor. The second pillar is a set of mandatory savings and insurance plans that pay earnings-related pensions. The aim of these plans is to help the improvident or myopic members of the middle class save for old age more than they would have saved on their own. An example is the two-plan second-pillar created in Poland in 1997. Assume that one of these plans is an NA plan, financed by (almost) pure PAYG finance. The other plan is a fully funded defined contribution (DC) plan.

At least two methods to endow the NA plan (in the second pillar) with automatic financial stability can be considered. The first is the ABM method, which was adopted by Sweden in May 2001. This mechanism relies on accounting measures of plan assets and plan liabilities. The "pure" version of the ABM method works as described below.

Assume that at some point the plan's measured liabilities exceed assets. Then, the notional interest rate credited in this period to active members and the rate of adjustment of pensions in payment are both set to equal the original notional interest rate, minus the growth rate in liabilities from the previous period, plus the growth rate in assets from the previous period. The conversion factor that turns an account balance into an annuity is *not* modified.[15] The second way to reach automatic financial stability is the rule-based IFM method, described in the previous section. Summarizing, the IFM method relabels contribution flows into a new contribution rate θ' and a residual payroll tax at rate τ, such that $\theta_o = \theta' + \tau$; endows the NA plan with property rights over the revenue of this new tax on earnings; creates new securities (CWB securities) out of this cash flow; trades a small share of the new securities in the financial market to obtain market valuation; and crucially, adopts a rule-based benefit formula.

There are many similarities between the two methods. For example, both adjust the value of liabilities automatically toward asset values, using either a rule-based benefit formula (IFM) or an adjustment to the notional interest rate and indexation rule (ABM). Another similarity is that neither tries to increase national savings or to reduce taxes on labor. On the other hand, the following differences between these two approaches are apparent and interesting:

1. The IFM method values the plan's assets at prices and implicit discount rates determined objectively by transactions of CWB securities in the financial markets. There, many different participants, presumably guided by the profit motive, compete to make accurate projections of dividends and apply discount rates that take into account the cost of risks that impinge on these cash flows, including their correlations with other cash flows available in the local and world economy. In contrast, the ABM method leaves valuation of the plan's assets to a single team of civil servants. This team is supervised by the political leadership, by the press, and by

public opinion, including interested academics. However, the tightness of this vigilance is bound to be quite different from the one produced by multiple participants in the financial markets.

2. The discount rate used by the ABM method to value assets is the growth rate of the economy, g. This is clear from Settergren (2001) and Settergren and Mikula (2006). They follow the tradition started by Arthur and McNicoll (1978) and summarized by Lee (1994), which analyzes asset valuation in hypothetical golden rule economies where the real interest rate earned by physical capital is $r = g$. In contrast, the IFM method values CWB securities at a discount rate actually set by the financial markets. As explained in box 8.2, this discount rate must be above the growth rate of GDP to avoid an infinite price for CWB securities. This difference in discount rates implies that the capital values of account balances, overall liabilities, and overall plan assets will be different between NA plans that adopt the IFM method rather than the ABM. This implies that the ABM method contains implicit taxes and subsidies between members that do not arise in the IFM. These taxes and subsidies have an impact on both equity and efficiency. For example, since high-earners live longer on average, they benefit on average from an implicit subsidy because the duration of their pension rights is longer and therefore the liabilities owed to them are overvalued in the ABM, compared with market discount rates.
3. The difference between discount rates also affects intergenerational distribution. Adopting the ABM method implies assigning a higher pro rata share of assets to plan members who hold longer-lived rights to benefits at any given point in time: that is, a higher pro rata share is assigned to the younger (active) members than to older (pensioned) members.
4. Valuation can produce surprises in the ABM. Valuation in the ABM is as follows: If there were just \$1 in lifetime tax revenue paid by the initial generation, and growing at rate g, then the present value of all these lifetime taxes would be $\$1/(g - g)$, infinite! On the other hand, when $r = g$, the tax T_t is zero, so the numerator in this expression is also zero. Both effects cancel each other in the limit as the discount rate falls toward g, yielding a finite asset for the ABM method. This limiting amount is the product of the current contribution revenue (a flow) and the average difference between the timing of contributions and the timing of liabilities (usually about 30–40 years). This valuation formula for assets is not valid out of steady states, so its application in an uncertain world can create surprises. For example, assume that the unemployment rate rises because of a fall in international demand, which is only transitory. The ABM valuation formula takes the fall in revenue as permanent. The asset is estimated to fall in the same percentage in which revenue fell (the average difference in timing is essentially constant). This translates into a large cut in the notional interest rate credited to active members and a drop in pensions. When the shock reverses, the notional interest rate rises and the drop in pensions is recovered. In contrast, the IFM method takes the change as transitory and the price of CWB securities is almost unaffected. The account balances are not affected. In this example, the ABM valuation method creates risk.
5. Valuation of assets in the ABM is not affected, but the valuation of liabilities is affected when the rate of economic growth changes. Consider a case where the projected economic growth rate falls slightly but permanently. Because market interest rates are fixed by international capital mobility, and because the dividend payout of a CWB security grows less rapidly, the value of CWB securities falls,

say, by 2 percent. Consider the impact on active members (workers). In the IFM method, the price of shares is cut by 2 percent in the following day and individual account balances are cut in the same proportion. Newly issued pensions will be 2 percent *smaller*. In the ABM method, the valuation of assets is not affected (it does not depend on the growth rate), but the value of accrued liabilities rises. The net impact is an actuarial deficit, so the notional interest rate will be cut and pension amounts must fall gradually. The time-phasing of this fall is different from the one in the IFM method. There, a person about to retire whose pension rights are fully invested in CWB securities takes a 2 percent cut in pensions and future generations buy CWB securities at reduced prices so are not affected. In the ABM, the same person would take a very limited immediate cut, given by a drop in the notional interest earned in the last year. That person would also take additional cuts as each year's rate of pension indexing is below the original path, as long as she lives. A share of the loss would be passed on to future generations, because those generations would be credited a smaller notional interest rate despite the fact that market interest rates have not changed (by assumption).

6. In an uncertain world, the discount rate assigned by the financial market to CWB securities is stochastic as well. If this discount rate changes, the ABM method leaves account balances and pensions unaffected because financial prices do not enter its valuation formulae. In contrast, the IFM method appears to transmit this risk to active members (assuming average wages are not affected, pensioners with wage-indexed annuities will not be affected either). For example, if the discount rate on CWB securities rises, active members will suffer a cut in their account balances. However, the dividend payout of CWB securities is not affected by changes in the discount rate, and pensions are financed mostly from this payout.[16] This creates a sort of immunization: a member just about to retire would *not* be affected by a rise in the discount rate if he wanted an annuity indexed to average wages. If the insurance company offers such annuities and backs it with the first tranche of CWB securities (which are perpetuities), it would earn a higher interest on this portfolio after the rise in discount rates. Thus, annuity *prices* should drop in the same proportion as the drop in the member's account balance, allowing the member to purchase an annuity of the same size as before the shock. The difference, however, is that in the IFM method the contributions made after the rise in discount rates would earn a higher return, while in the ABM method they would still earn the growth rate g, which did not change.
7. Regarding the allocation of the plan's aggregate uninsurable financial risk *among* plan members, in the ABM method all members get a single level of uninsurable risks. In contrast, the IFM method allows the plan to offer several balanced portfolios with different levels of uninsurable risk, allowing each member to self-select according to his or her risk tolerance. The ABM method must offer a single portfolio to all its members. Therefore, the IFM method can do better by recommending a portfolio to each member as a function of the determinants of the member's predicted risk tolerance, such as the presence of other wealth, earnings variability, and access to insurance and credit lines, in addition to age.
8. Adopting the ABM method does not allow the plan to trade uninsurable risks with other participants in the financial markets, such as other institutional investors, owners of firms, and foreigners. The IFM method allows this. This option is

especially valuable for smaller countries, which place a greater value on international risk diversification.

9. Distributional impact of changes in corporate risk premia. Consider a case where some members have chosen a balanced portfolio where corporate securities (bonds and equities) have a substantial weight, and their risk premia rise but the discount rate on CWB securities remains constant. In the IFM method, only the more risk-tolerant members who chose the balanced portfolios with corporate securities are affected. They should respond to the losses by increasing their saving rate and by working more hours per year, if still active, and by cutting lifetime consumption. To compare this outcome with the one occurring under the ABM method, assume that the plan is partially funded and holds such corporate securities in the same total amount. In this case, the rise in risk premia cuts the value of the plan's fund, and this translates into a cut to the notional interest rate for *all* active members and into a cut in the indexation rate for *all* pensions in payment. The more risk-averse members are not spared.

Concluding Comments

It has been shown that an NA plan can be endowed with automatic financial stability in the short run. This feature is appreciated because it helps insulate the government budget from demographic pressures and in the future would insulate the pension budget from fiscal pressures. However, the literature proved that the initial generation of benefit formulae did not achieve automatic financial stability in the short run in the face of demographic and economic shocks. Sweden responded to this challenge by creating an ABM, which was legislated in May 2001.

This study discusses an alternative response, which also endows NA plans with automatic financial stability in the short run. The method is presented in more detail in Valdés-Prieto (2005) and labeled here *integration to financial markets* (IFM). In contrast to the ABM, which relies on asset valuations made by a single group of civil servants supervised by politicians and the press, this proposal bases asset valuation on market-determined discount rates set by multiple investors, presumably guided by the profit motive. In this dimension, the difference boils down to private versus public management. Both have well-known advantages and disadvantages, the magnitudes of which differ across countries.

Another important difference is that the discount rate used by the ABM method to value assets is the growth rate of the economy, g. This is appropriate for asset valuation in hypothetical golden rule economies where the real interest rate earned by physical capital is $r = g$. In contrast, the IFM method values the PAYG asset at the discount rate actually set by the financial markets. These market discount rates come from real economies where infinitely lived assets pay a return that is higher than g, and provide the efficient incentives.

A critical difference is that the IFM method allows the pension institution to abandon its corner portfolio and move toward the risk-return frontier, creating substantial economic gains. The participation in the financial market also allows the offer to individual members of a set of, say, five balanced portfolios, permitting a better adaptation of the pension plan to individual circumstances. This would also create immediate social gains.

It is apparent that the choice between the ABM and IFM methods merits attention from policy makers. This choice has many facets. The weights that should be granted to each

one are likely to differ across economic and political settings, and therefore across countries. It is possible that advanced nations that have an independent judiciary, well-regulated financial markets, and are well integrated to international capital markets can gain relatively more by having their pension plan engage in international risk diversification through the IFM method.

Notes

1. "Notional defined contribution" and "non-financial defined contribution" should be understood to have the same definition.

2. It is important to be precise about the meaning of "short" run. For our purposes in this chapter, the "short" run is an election cycle. This is the maximum time available for adjustment before politicians respond to an aggregate deficit in the plan with legal reforms, taxes, subsidies, and other discretionary measures taken ex post. In most well-functioning democracies, political response can be faster.

3. See Valdés-Prieto (2000). The paper by Arthur and McNicoll (1978) does not discuss the issue of financial stability. On the contrary, that paper restricts itself not only to the case of steady state growth but, within that, it considers only the case where the growth path meets the "golden rule" condition (marginal productivity of capital equal to the growth rate of the economy), which implies dynamic inefficiency.

4. The original paper by Valdés-Prieto (2000) made the mistake of stating that in that event, there would be a cash *surplus* rather than a cash *deficit* (table 1 in that paper). Professor Friedrich Breyer spotted this mistake. His correction and my response are available in the *Scandinavian Journal of Economics* (see Breyer 2004 and Valdés-Prieto 2004).

5. See Valdés Prieto (2002, pp. 391–3).

6. See Settergren (2001).

7. See Settergren (2001).

8. With lives spanning two or more active periods, some current plan members have not yet completed their career at any given reform date. To measure the plan's liability to them, it is necessary to determine the "recognition bond" that the plan's charter grants to members who leave the plan at mid-career. This recognition might equal past contributions plus interest, or, alternatively, might equal the present value of future expected benefits for a full career minus future expected contributions. Which approach is used is important out of steady state.

9. Such economies were labeled "golden" by an earlier literature that compared steady states without taking into account the cost of moving from one steady state to another. Rate g can be positive, zero, or negative.

10. The PAYG asset differs from a Buchanan bond—a type of public debt that pays a rate of return equal to the growth rate of national income—in two fundamental ways (see also Góra and Palmer 2004). The Buchanan bond is a debt of the state, serviced by the treasury, and its holders are protected by property rights against expropriation. In contrast, the PAYG asset is a debt of future members of the pension plan (the present value of the lifetime taxes they will pay), not the state. Morever, its holder, the pension institution, is not protected by property rights because if future legislation allows contributors to quit the plan (and, say, contribute instead to a mutual fund), or cuts the coverage of contributions, the pension institution does not have the right to claim compensation in the courts. In addition, there is a financial difference: the rate of return of the PAYG asset differs from the rate of growth of national income almost surely due to variations in average taxable wages, coverage, benefits, and longevity.

11. This definition of τ assumes that the tax rate hidden in PAYG finance is applied to earnings, when the member is active.

12. See Kendall and Fishman (1996). For example, securitization can transform assets such as the accounts receivables of a telephone company into securities that can be traded in a stock exchange.

13. Asset exchanges between the pension institution and foreign residents have no impact on the exchange rate because international capital inflows and outflows balance exactly.

14. For details of the TSP plan, see www.tsp.gov. The TSP plan is available for complementary tax-favored savings for employees at the federal, state, and municipal levels in the United States, and offers five balanced portfolios, including international and national equities and bonds.

15. The factor used by the current ABM method to convert individual account balances into annuities is not sensitive to the extent by which liabilities exceed assets because it always uses a discount rate of 1.6 percent. This small divergence could be overcome in a more advanced version of the ABM method.

16. See Valdés-Prieto (2005).

References

Abel, A., G. Mankiw, L. Summers, and R. Zeckhauser. 1989. "Assesing Dynamic Efficiency." *The Review of Economic Studies* 56 (1), 185, January: 1–20.

Arthur, W. B., and G. McNicoll. 1978. "Samuelson, Population and Intergenerational Transfers." *International Economic Review* 10 (1): 241–6.

Breyer, F. 2004. "Comment on S. Valdes-Prieto, 'The Financial Stability of Notional Account Pensions.'" *Scandinavian Journal of Economics* 106 (2): 387–88.

Góra, M., and E. Palmer. 2004. "Shifting Perspectives in Pensions." Discussion Paper 1369, IZA Institute for the Study of Labor, Bonn (October), http://www.iza.org.

Kendall, L., and M. Fishman. 1996. *A Primer on Securitization.* Cambridge, Mass.: MIT Press.

Lee, R. 1994. "Population Age Structure, Intergenerational Transfer and Wealth: A New Approach, with Application to the U.S." *Journal of Human Resources* 29 (4): 1027–63.

Lindbeck, A., and M. Persson. 2003. "The Gains from Pension Reform." *Journal of Economic Literature* XLI (March): 74–112.

Richter, W. 1993. "Intergenerational Risk Sharing and Social Security in an Economy with Land." *Journal of Economics (Zeitschrift für Nationalökonomie),* Suppl. 7: 91–110, Springer Verlag.

Scheinkman, J. 1980. "Notes on Asset Trading in an Overlapping Generations Model." Dept. of Economics, University of Chicago, unpublished.

Settergren, O. 2001. "The Automatic Balance Mechanism of the Swedish Pension System: A Non-Technical Introduction." *Riksförsäkringsverket*, August. www.rfv.se/English.

Settergren, O., and B. D. Mikula. 2006. "The Rate of Return of Pay-As-You-Go Pension Systems: A More Exact Consumption-Loan Model of Interest." In *Pension Reform: Issues and Prospects for Non-Financial Defined Contribution (NDC) Schemes*, ed. R. Holzmann and E. Palmer, chapter 7. Washington, DC: World Bank.

Sinn, H. W. 1999. "Why a Funded Pension is Useful and Why It is Not." CESifo Working Paper 195, Institute for Economic Research, Munich. (Also printed in *International Tax and Public Finance* 2000 (7): 389–410.)

Tirole, J. 1985. "Asset Bubbles and Overlapping Generations." *Econometrica* 53 (6): 1499–1527.

Valdés-Prieto, S. 2000. "The Financial Stability of Notional Account Pensions." *Scandinavian Journal of Economics* 102 (3): 395–417.

———. 2002. *Políticas y Mercados de Pensiones.* Santiago, Chile: Ediciones Universidad Católica.

———. 2004. "Response to Breyer." *Scandinavian Journal of Economics* 106 (2): 387–90.

———. 2005. "Pay-As-You-Go Securities." *Economic Policy* 42 (April): 215–51.

Discussion of "A Market Method to Endow NDC Systems with Automatic Financial Stability"

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THE CHAPTER ADDRESSES A VERY IMPORTANT ISSUE, namely short-run stability of unfunded pension plans. The focus of analysis is on non-financial defined contribution (NDC) systems. The author provides a set of arguments to support the view that pension systems that are not backed with financial assets are potentially unstable. More precisely, even if they are automatically solvent over the long term, they do not have the property of short-run stability. The arguments provided in the chapter are strong and lead to clear conclusions.

The author suggests creating a mechanism called *integration to financial markets* (IFM) that will impose more financial stability in NDC systems. The idea—similar to various types of buffer fund existing in countries running NDC—is interesting, and worth further discussion and possibly implementation.[1]

Valdés-Prieto's chapter is not only technical, but it is also a very inspiring background for a broader discussion on pension systems and their reforms. The discussion starting from this chapter can lead to various specific issues. I shall address only some of them.

The arguments supporting the key thesis of the chapter, namely the possible lack of stability of NDC, can also be applied to pension systems using financial markets (financial defined contribution, FDC) that are not pure savings plans but are saving plans in the activity period and are turned into insurance after retirement. So arguments should take into account the method of annuitization in NDC versus annuitization in FDC. Full obligatory annuitization of account values irrespective of their type is natural if pension systems are a part of social security.

This leads to a very important point. Does implementing individual accounts mean privatization of the pension system (whatever this means) or creating public-private partnership based on public (social) goals and private management (using financial markets) of the system? We can assume that defined contribution (DC) is a voluntary savings plan or a forced private savings plan that is treated as a voluntary one, even if it is mandatory. However, we can also assume that a DC regime applied to a pension system is just a method leading to stabilization in economy. The chapter assumes the first, while for instance the design of the new Polish pension system—both the NDC and FDC part—assumes the latter. So different understanding of the issues discussed in the chapter may stem from deep differences in assumptions.

Defining key concepts helps the discussion. Valdés-Prieto provides a clear definition of funding. The term is often broadly used, referring to all types of savings in the economy, including ones based on political decisions. By contrast, Valdés-Prieto prefers to use the narrow definition of funding that is based on property rights. The difference between the two definitions and its consequences lead to an interesting multifold problem.

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Property rights are needed to protect pension rights against political manipulation. They are needed for two reasons. The first is to reduce the tax wedge; the second is to contribute to economic stability. The latter needs explanation. Traditional mandatory pension contributions, although perceived as "robbery" (leading to an increased tax wedge), are in fact "charity," since participants typically receive more, or even much more, than the present value of contributions paid.

Implementation of individual accounts leads to actuarial neutrality. This means reduction of pension rights: that is, the amount of pension if compared with prior law is reduced. The reduction is socially just if the welfare of each subsequent generation is equally valued. The political manipulation that societies need to be protected against is an attempt to finance inflated pension rights at the expense of lower remuneration of production factors.

The successful implementation of the new pension system in Poland was based—among other factors—on the common feeling that the old system cheated people. In fact, it paid out too much. The new one (NDC + FDC) will generate much lower replacement rates. So both effects will be achieved: namely, reduction of the part of GDP allocated to the entire retired generation (GDP^R), and reduction of the contribution of the reduced GDP^R on the tax wedge.

Promoting property rights within NDC does not need to be restricted to IFM. Upon first thought, the most straightforward idea that comes to mind would be to give the NDC rights the same legal protection as they would have if they were FDC rights, based on government bonds with explicit property rights. From an economic viewpoint, this would be natural. In both cases, namely NDC and FDC based on government bonds, running the system is just rolling debt. It is easier to understand the similarity when the institution administering NDC is split into two parts. The first collects contributions and passes them to the budget; the other pays out benefits, receiving money from the budget. FDC based on government bonds can be described in the same way. The only difference— and it is an important one—is the property right. So why not turn NDC liabilities into legally protected rights? The only thing preventing that is accounting procedures. A country that drew the logical conclusion from the economic similarity of NDC and FDC would show huge deficits. In Europe, this would violate the Stability and Growth Pact. In the whole world, this would be badly perceived by financial markets—although economically neutral. So NDC is used as a clever trick to avoid the accounting problem, rather than to achieve full DC purity.

Valdés-Prieto's definition of funding in the narrow sense provokes an important question. Is a funded system possible if it covers entire population? The answer "yes" is possible only if government debt is assumed to be economically identical with private debt/investment. From the economic viewpoint, this is not necessarily true. Discussing this issue goes beyond the scope of my comment. The discussion should take into account not only FDC but also NDC.

Commenting on Valdés-Prieto's chapter is difficult because it needs a much broader discussion that can be offered here. So I shall address only one additional issue: the argument that the market rate of return, r_F, is larger than the economic growth, g. There are both theoretical and empirical arguments to support that view. Irrespective of that discussion, it is interesting to discuss the consequences of $r_F > g$.

The pension system is an institutional framework for intergenerational exchange. Irrespective of whether participation is voluntary or mandatory, current GDP is divided between the working and the retired generation. This is done with or without the intermediation of financial markets. The latter method has a lot of advantages but eventually leads to the same qualitative result. Proportions of the division are subject to the market or implicit rate of return. Actually, both can be—and often are—"too" high. Traditional pen-

sion systems must increase contributions to pay out pensions inflated by promises that are too high (implicit rate). We can also imagine a funded pension system based on government bonds that are overvalued by markets (the reason for this does not matter). Individual accounts receive high rates of return. However, the result will be higher taxes. This is the problem of fiscal policy, but the pension system—as a large share of nations' economies—can accelerate the problem.

The pension system, especially the one that covers the entire population, is a large part of the economy. What really matters is the stability of the entire economy. The stability of a pension system can contribute to economic stability—or just the opposite. A poorly designed pension system that generates ever-increasing costs can destabilize the economy. The key goal for pension reform is to stop the increase of GDP^R/GDP (the pension system consuming too large a portion of GDP).[2] From that viewpoint, NDC can be as effective as FDC, even if one of them or both are not perfectly stable themselves. Actually, NDC can do the job quicker since the rate of return it generates, r_N, is close to if not equal to the GDP growth rate.[3] Both NDC and FDC can lead to reintroducing intergenerational equilibrium, which means keeping GDP^R/GDP constant over the long term.

Equilibrium could be reached even without involving financial markets. However, it would be more difficult because for ordinary people, investing in financial markets is based more on intuition than on a grasp of macroeconomic fundamentals. So if their contributions are managed in financial markets in a way similar to their other financial resources, they will feel more comfortable and accept the concept of individual accounts. Without financial markets, the reform would be less understandable, and hence less acceptable for the public. Financial markets play a "demonstration" role.

However, NDC has a very good property: namely, $r_N = g$. This prevents inflation of pension rights, which will have to be financed out of real GDP—irrespective of the type of the system. Here we could suggest extending the definition of funding formulated in the chapter. The very narrow definition of funding would refer to this part of funding, in the narrow sense that is not based on government bonds. In spite of the privileged legal status (property rights) of the government bonds, tax revenues are needed to turn them into income-financing consumption. The IFM (buffer fund)—being a short-run concept—can be less strict. Valdés-Prieto's narrow definition of funding is especially appropriate for designing the IFM financing.

NDC could replace FDC in the part that is based on rolling government bonds. At the same time, NDC should be limited to the level that cannot or should not be spent on private investment instruments. FDC can be more efficient because it is much more rooted in thinking of economists, policy makers, and general public. So coming back to Valdés-Prieto's idea, making NDC more like FDC is really a good one. However, one of the preconditions for property rights within NDC would require some modernization of procedures applied to national accounts (the calculation of the deficit and debt in the economy). This modernization is needed anyway, since without it, pension reforms will not be manageable, irrespective of their designs. So it probably will be possible to implement the idea of endowing NDC with at least some property rights.

Notes

1. In the new Polish system the buffer fund has been designed in a similar way to the concept of IFM. The fund is invested in financial markets.

2. The scale of the share of $GDP^{R\,t}$ to GDP does not matter for aggregate demand, but it does for supply.

3. Technically, this can be another rate converging to g.