Modeling pension reform

The World Bank's pension reform options simulation toolkit

Today's pension policies can affect retirement incomes and the public finances for decades to come. Retirement income systems that are affordable today will often prove unsustainable in the future, given the twin pressures of demographic aging and the maturing of pension schemes.

The World Bank's pension reform options simulation toolkit, PROST, models pension contributions, entitlements, system revenues and system expenditures over a long time frame. The model is designed to promote informed policy-making, bridging the gap between quantitative and qualitative analysis of pension regimes. It is a flexible, computer-based toolkit, easily adapted to a wide range of countries' circumstances.

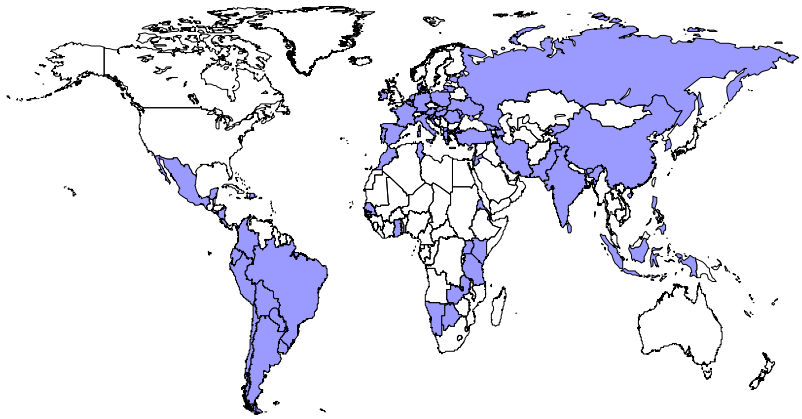
Why model pensions?

Pay-as-you-go pension systems were often introduced with little or no analysis of the medium- and long-term effects on the elderly, on workers and on the public finances. Once schemes are introduced, there remains a need for regular scrutiny of the impact on the pension system of factors such as changing life expectancy and patterns of labor force participation.

A lack of long-term quantitative input to pensions policy-making can be dangerous. Pension programs are usually politically popular. And pay-as-you-go schemes, when first introduced, can even generate net income for the government, because payroll tax revenues exceed (initially modest) benefit expenditures.

The true costs of the pension scheme only become apparent in the medium- to long-term as the system matures. People often consider these future benefits as strict entitlements, making it politically very difficult to adjust them in line with demographic and economic pressures. Indeed, pension benefits are sometimes even protected by the constitution.

PROST used in more than 80 countries [1]



Countries such as Brazil—where three-quarters of the fiscal deficit is attributable to social security—are not isolated cases. The cost of paying for pensions crowds out spending on other deserving programs: health, education *etc.* And when payments exceed contribution revenues, cross-subsidies are required from broadly based taxes, such as value-added tax. Pension benefits tend to go to a privileged minority that works in the covered, formal sector, typically just a third of the

For more information, please contact Social Protection, Human Development Network, World Bank, 1818 H Street NW, Washington, D.C. 20433; telephone +1 202 458 5267; fax +1 202 614 0471; e-mail prost@worldbank.org or visit the web site www.worldbank.org/pensions

labor force in low- and middle-income countries. The overall effect can be highly regressive.

Pension modeling assesses schemes' fiscal sustainability. Affordability is an essential pre-requisite for achieving other policy goals, such as reducing poverty among the old.

Modeling pensions can also assess different reforms, informing both policy-makers and the public about the consequences of change.

Modeling pensions with PROST

PROST is designed to answer the following kinds of question:

- How much will the pension system cost in the future? Is it viable and sustainable?
- What kind of benefits can people expect to receive in the future?
- Is the pension system equitable? Does it provide a decent retirement income to different categories of people?
- How large are the government's implicit pension liabilities?
- How would broadening coverage, changing eligibility, changing benefits, or adjusting contribution rates affect the system? How will costs, expenditures and liabilities change under various reforms?

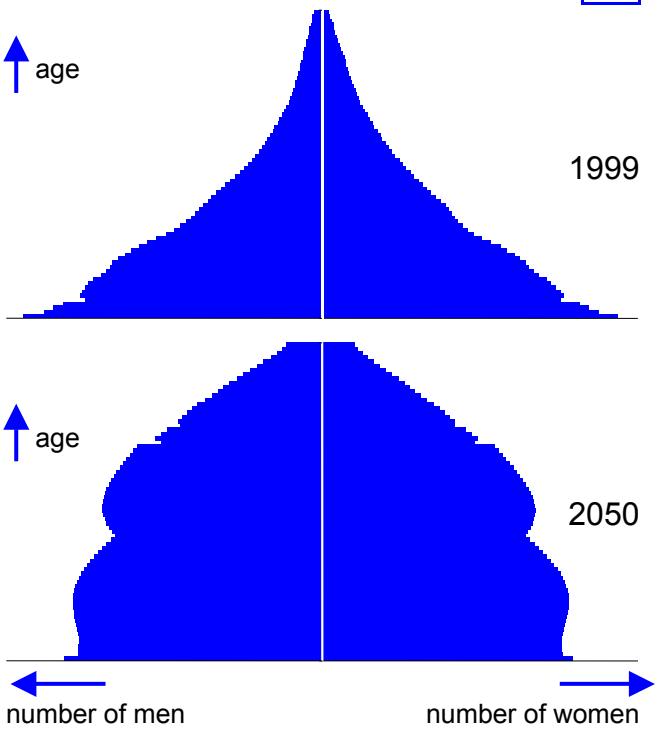
The model takes country specific data provided by the user. It generates population projections (Figure 2), which, combined with economic assumptions, are used to forecast future numbers of contributors and beneficiaries. These in turn generate flows of revenues and expenditures. The model then projects fiscal balances, taking account of any partial pre-funding of liabilities.

The model can use either a 'stock' or a 'flow' approach. In the stock concept, parameters such as retirement are expressed as total retirees as a percentage of population rather than as probabilities of retirement, since the stocks can be more stable predictors of the future. Also, projections can be based on either population or employment.

A second PROST module analyses the impact of pensions at an individual level. The user can explore the impact of the system on workers with different income levels, mortality rates, earnings profiles, job entry ages, retirement patterns *etc.*

The model can assess anything from 'parametric' reforms of initial pay-as-you-go systems—changing pensionable age, contribution rates, benefits, indexation *etc.*—to fundamental reforms, such as the introduction of individual, funded retirement savings accounts. A shift from a defined benefit pay-as-you-go scheme to one based on notional accounts can also be modeled. PROST can handle provident fund schemes as well as pay-as-you-go systems as the starting point, before reform. The model can also be used for

Population pyramids 2



Population pyramids give a quick graphical summary of changing demographics. In 1999, the population is relatively young, with a steep decline in the number of people with age. By 2050, we expect the 'pyramid' to be much less steep, with fewer children and youths and many more elderly. Note too the bulges in the 2050 pyramid showing baby 'booms' and 'busts'.

closed population civil servant schemes or open population national schemes.

The model also allows for different transition paths to the new system, including the age cohorts (generations) covered by the new system and the treatment of pension rights accrued before the reform. Accrued rights can be paid in multiple ways, including as recognition bonds and as proportional wages.

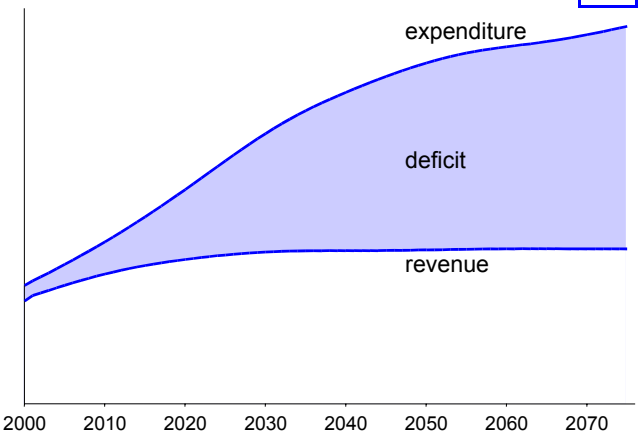
The model can accommodate a distribution of wages per cohort which allows users to determine the effects of changes in floors and ceilings of income subject to contribution and the effects of changes in the minimum and maximum pension levels.

Model output

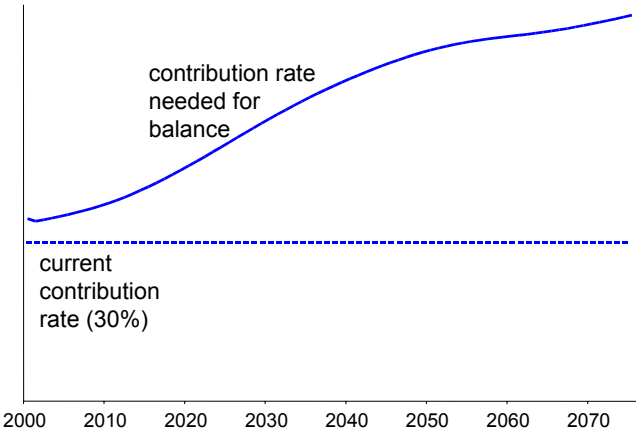
The PROST program produces five output modules, comprising Microsoft Excel tables with graphical summaries. The modules are:

- **Population projections**, including life tables, population pyramids, population dependency ratios *etc.* (Figure 2).
- **Demographic structure**: labor force and employment, numbers of contributors and beneficiaries, system dependency ratio.
- **Financial flows**: projections of wages, benefits, revenues and expenditures of the pension system (Figure 3), pension scheme balance and the implicit pension debt.
  The financial flows module also calculates the adjustments—to benefit levels or contribution rates—that would 'balance' the system, *i.e.* bring revenues and expenditures into line (Figures 4 and 5).

A growing pension deficit... 3



...means higher contributions... 4

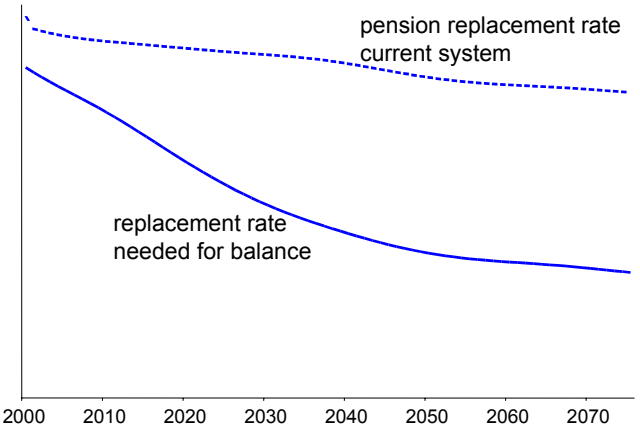


- **Fundamental, systemic reform:** this module looks at the effect of a shift to a 'multipillar' regime, incorporating both a pay-as-you-go, defined benefit pension and a funded, defined contribution scheme or exclusively one or the other. Again, it measures the impact both on the public finances and on individual's pension entitlements, including measurements of transition costs. The total pension benefit and the value of each of the pillars are provided separately.
- **Effects on example individuals:** the model works out contributions and benefits for different example individuals, specified by age, sex, age of labor market entry, retirement age, earnings profile, mortality *etc.* With results for

six different example people per age cohort, the distributional effects of the current system and potential reforms can be assessed both within and between generations.

All of the modules allow for analysis of the sensitivity of results to key demographic and economic parameters, such as fertility, longevity, wage growth and interest rates.

...or lower benefits 5



PROST users

Pensions experts from the World Bank and other institutions have used PROST in 80 countries around the world (see map). Over 364 people had taken the one week training program by December 2002.

We continue to evaluate feedback from users. This has confirmed that:

- PROST, with constant new development in the last three years, has remained **state-of-the-art**. The model's algorithms are optimized for speed.
- PROST is **cost-effective**. It requires only two weeks to prepare the first, basic output. Building models for each country from scratch can take months and cost hundreds of thousands of dollars
- The model's **quality** is maintained by constant vetting and use in a wide range of diverse countries around the world.
- PROST is **easy to use**, with training programs, clear and concise manuals, documentation of underlying formulae, and troubleshooting, technical support. Model assumptions are transparent and sensitivity analysis is readily accessible.

Technical requirements

The latest issue of PROST—version 11—requires:

- Microsoft Office 97/2000/XP running under Microsoft Windows 95/NT/98/2000/XP in English.
- Multi-lingual input output possible.
- Basic knowledge of Microsoft Excel. The program is developed in visual basic, with input and output in Excel. PROST is policy oriented with minimal information requirements, allowing easy operation for technical novices.
- Intel Pentium computer with 128 megabytes of Ram.

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