P R O S T – Pension Reform Options Simulation Toolkit

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Why Modelling?

- Many factors have to be taken into account when assessing a real pension system, and its different reform options:
  - Demographic
  - Economic
  - Policy variables/pension system parameters
  - Individuals behavior
- Pension system analysis requires long-term projections
- Useful tool in pension system diagnosis and evaluation of reform options; a tool to organize thinking about pension systems
What is PROST?

• PROST – computer-based toolkit to simulate pension systems over a long timeframe
• Created to support World Bank pension policy dialogue in client countries
• User-friendly, input-output in Excel
• Regular updates with new features
• Individual country and cross-country studies (used in 90+ WB client countries and some cross-country studies)
Key Features of PROST

• Deterministic cohort-based model: models single year cohorts, tracks them down over time
• Projects coverage, contributions, entitlements, financial flows
• Allows to look at pension system as a whole as well as at individuals
• Addresses all main pension policy dimensions, all policy variables exogenous
• Generic, flexible, easily adapted to various country circumstances
• Modeling reforms relatively fast and easy
Input Data and Assumptions

• Demography
  – Population
  – Fertility
  – Mortality
  – Migration

• Economy
  – Macroeconomy (GDP, inflation, interest rates)
  – Labor market (LFPR, unemployment)

• Pension system
  – Pension system data (number of contributors, pensioners, wages, initial pensions)
  – Pension policy
  – Behavior of pension system members (contribution density, retirement pattern)
Input Data: policy variables

- PAYG, non-financial DC, fully funded DC
- Coverage
- Contribution rate, contribution ceiling
- Retirement age, early retirement
- Benefit formula in DB systems (accrual rate, max replacement rate, averaging period, valorization)
- Min, max pension
- Penalties for early retirement
- Pension commutation
- Pension indexation
- Notional interest rate
- Annuity factors
General Calculation Scheme

Contributors → Population → Pensioners → Economy

PS revenues → Pension system → PS expenditures

Annual current balance

→ Implicit Pension Debt

→ Individuals
- Demographic projections
  - Population
  - Life expectancy
  - Population dependency ratios

- Pension system demographics
  - Number of contributors
  - Number of pensioners (by pensioner category)
  - System dependency rate
  - Coverage rate

- Pension system finances (PAYG DB, NDC, FFDC)
  - Wages, entitlements
  - Pension system revenues, expenditures, current balance, assets/debt
  - Implicit pension debt in PAYG
  - Equilibrium contribution rate for PAYG DB

- Output for individuals (contributions, benefits, NPV, IRR)
Example: pension system diagnosis

No Reform: System Dependency Rate
(number of pensioners/number of contributors)

No Reform: Average Pension for Old Age Pensioners
(% of average wage of contributors)

No Reform: System Finances, % of GDP

No Reform: Implicit Pension Debt, % of GDP
Example: impact of raising retirement age

**Raising Retirement Age**

**System Dependency Rate**
(number of all pensioners/number of contributors)

**Average Pension for New Old Age Pensioners**
(% of average wage of contributors)

**Average Pension for Existing Old Age Pensioners**
(% of average wage of contributors)

**Annual Current Balance, % of GDP**

Example: individual perspective

<table>
<thead>
<tr>
<th>Profile : input</th>
<th>No reform</th>
<th>Raising retirement age</th>
<th>Contribution gaps (age)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Male</td>
<td>22</td>
</tr>
<tr>
<td>Starts Working at Age</td>
<td>18</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Plans to Retire at Age</td>
<td>60</td>
<td>65</td>
<td>24</td>
</tr>
<tr>
<td>Mortality Multiplier</td>
<td>1</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>Starting Wage as % of Cohort Avg.</td>
<td>80%</td>
<td>80%</td>
<td>26</td>
</tr>
<tr>
<td>Productivity Growth Multiplier</td>
<td>0.8</td>
<td>0.8</td>
<td>34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>No reform</th>
<th>Raising retirement age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Replacement Rate in Terms of Average Wage</td>
<td>45.1%</td>
<td>45.9%</td>
</tr>
<tr>
<td>Initial Replacement Rate in Terms of Individual's Last Wage</td>
<td>74.8%</td>
<td>85.8%</td>
</tr>
<tr>
<td>Replacement Rate at Death in Terms of Average Wage</td>
<td>45.1%</td>
<td>45.9%</td>
</tr>
<tr>
<td>Internal Rate of Return</td>
<td>5.5%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Net Present Value of Being Covered in Terms of Average Wage</td>
<td>1.2</td>
<td>0.6</td>
</tr>
</tbody>
</table>
Pension System Diagnosis: policy questions

- Financial sustainability of PAYG systems (financial flows, government liabilities, implicit pension debt, financing gap)

- Adequacy of expected benefits (at retirement, post-retirement, by pensioner category)

- Intra- and intergenerational distributional effects and equity issues
Assessment of Pension Reform Options with PROST

- Impact of reforms on pension system finances and benefits, transition costs
- Types of pension reform
  - PAYG “parametric” reforms (changing contribution rates, retirement age, benefit formula, indexation, etc.)
  - Systemic reforms (fully funded DC, notional DC schemes, any combination of PAYG DB, FF DC and NDC)
- Different transition paths
  - Switching pattern
  - Accrued rights
- Allows to model on-going DC/multipillar schemes
Thank You!