Introduction to the PROST Model and Modeling
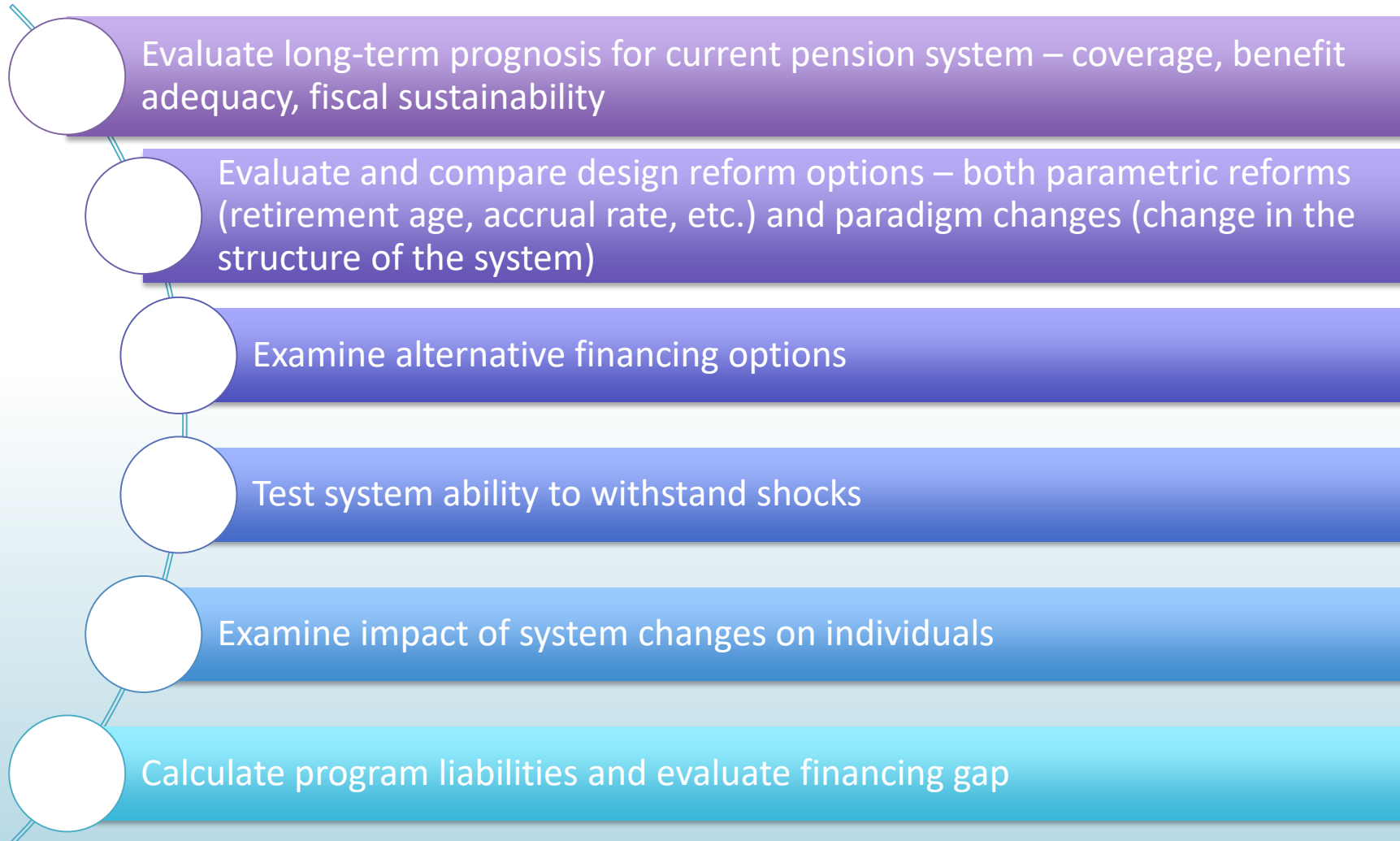
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Pensions Core Course

Why Do Modelling?

Evaluate long-term prognosis for current pension system – coverage, benefit adequacy, fiscal sustainability

Evaluate and compare design reform options – both parametric reforms (retirement age, accrual rate, etc.) and paradigm changes (change in the structure of the system)

Examine alternative financing options

Test system ability to withstand shocks

Examine impact of system changes on individuals

Calculate program liabilities and evaluate financing gap

Modeling is Complex

- Many factors have to be taken into account when assessing a pension system, and different reform options
  - Demographic
  - Labor market
  - Macroeconomic factors and wage growth
  - Policy choice/ pension system parameters
  - Individuals' behavior (behavioral economics)
- Pension system analysis requires long-term projections (75 to 100 years)
- Useful to have a tool to assist with pension system diagnosis and evaluation of reform options; 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, programmed in Visual Basic for Applications
- Regularly updated with new features (currently version 15)
- Individual country and cross-country studies (used in about 100 WB client countries and some cross-country studies)
- More details in "Modeling Pension Reform: The World Bank's Pension Reform Options Simulation Toolkit" (www.worldbank.org/pensions)

Key features of PROST

- Generic, flexible, easily adapted to various country circumstances
- Deterministic cohort-based model: models single year cohorts, tracks them over time
- Projects coverage, benefits and financial flows
- Can look at pension system as a whole as well as at individuals

Key features of PROST (cont.)

- Addresses all main pension policy dimensions; all policy variables are exogenous
- Modeling reforms is relatively fast and easy
- Flexible projection period, annual results
- Allows assumptions to vary by year

# Inputs: Data and Assumptions

Demography
- Population
- Fertility
- Mortality and mortality improvement
- Migration

Economy
- Macroeconomy (GDP, inflation, interest rates)
- Labor market (LFPR, unemployment)
- Average wage by age and sex; distribution of wages

Pension system
- Pension system data (number of contributors, pensioners, wages, initial pension amounts)
- Pension policy
- Behavior of pension system members (contribution density, retirement and disability pattern, etc.)
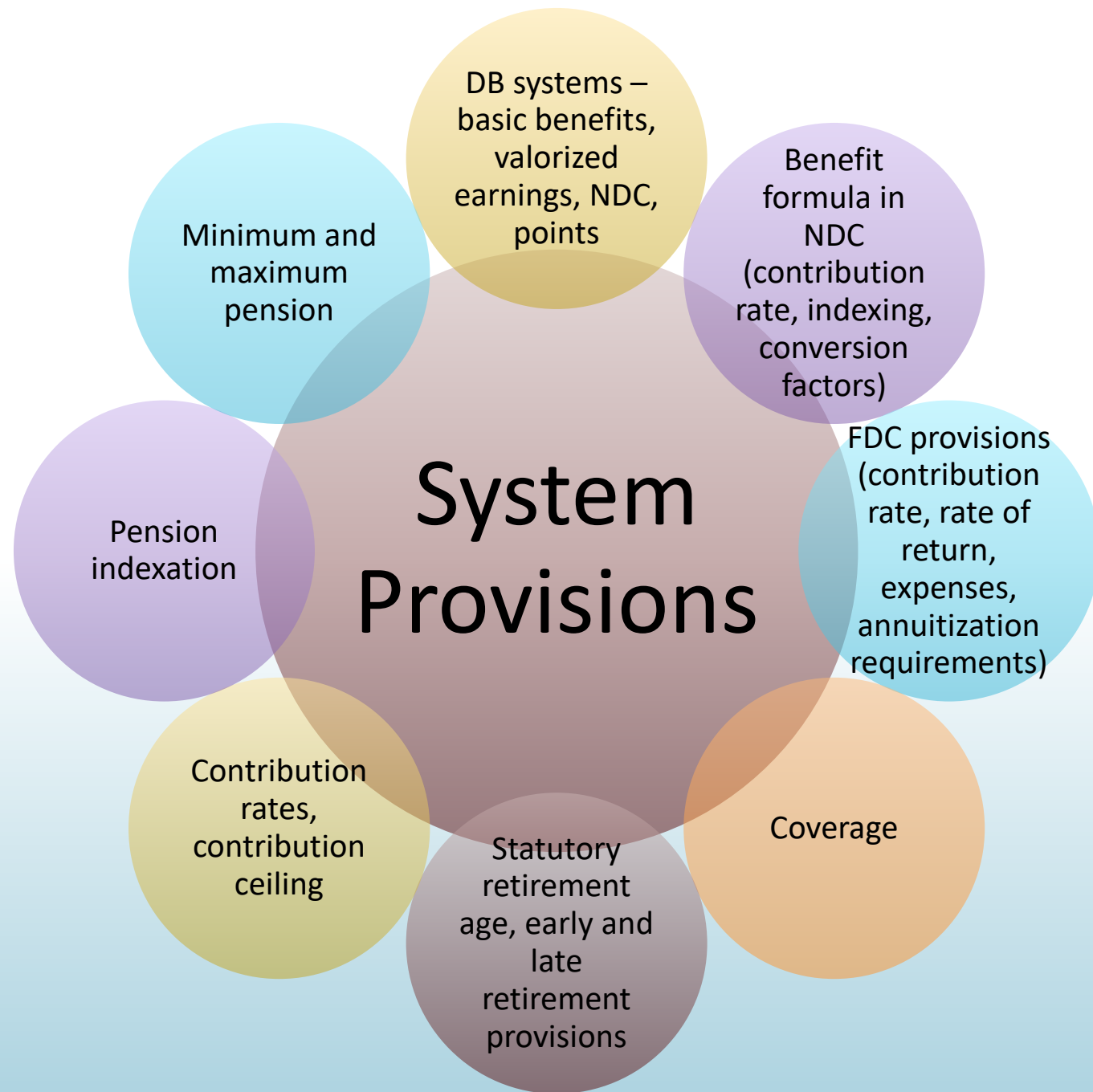
General Calculation Scheme

Population

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Labor Force and Employment

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Number of Contributors and Beneficiaries

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Macroeconomic variables including wage projections

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Benefits for new and existing pensioners

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Revenues, Expenditures, Surplus or Deficit

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Reserves, Liabilities

PROST Output

- Population demographic projections
  - Population
  - Life expectancy
  - Population dependency ratios
- Pension system demographics
  - Number of contributors
  - Number of pensioners (by type)
  - Pension system dependency ratio
  - Coverage rate

PROST Output (cont.)

- Pension system benefits and finances
  - Wages
  - Pensions (initial and post-retirement)
  - Pension system revenues, expenditures, current balance, assets/debt
  - Program liabilities
  - Equilibrium contribution rate for DB plans
- Output for individuals (annual contributions and benefits, present values, internal rate of return)

Pension System Diagnosis: Policy Questions

- Financial sustainability of PAYG systems
  - Financial flows
  - Government transfers for deficits
  - Implicit pension debt
  - Financing gap
- Adequacy of expected benefits
  - At retirement
  - Post-retirement
  - By pensioner category
- Intra and inter-generational distributional effects and equity issues

Pension Reform Options with PROST

- Impact of reforms on system finances and benefits
- PAYG parametric reforms
  - Changing contribution rates
  - Eligibility rules
  - Benefit formula
  - Indexation, etc.
- Systemic reforms
  - Fully funded DC (FDC)
  - Notional DC schemes (NDC)
  - Any combination of PAYG DB, FDC and NDC

Pension Reform Options with PROST

- Different transition paths
  - Switching pattern
  - Accrued rights
- Modeling ongoing DC and multi-pillar schemes