Introduction to the modeling framework

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Outline presentation

1. DPAD's capacity development activities
2. Integrated modelling framework

1. DPAD's capacity development activities

- Focus on training and advising policy-makers in developing countries to enhance their analytical capacities in:
  - designing coherent macroeconomic, social and environmental policies and strategies;
  - enabling LDCs make the most adequate use of benefits derived from the LDC category;
  - reducing vulnerability to volatility in the global economy.
- Strong component of training in the use of modelling tools, tailored to country needs to address short- to long-term development policy issues and inform policy making.
  - Teams of government experts formed and trained
- http://www.un.org/en/development/desa/policy/capacity/index.shtml

DPAD's capacity development – cont.

- Macroeconomic challenges to pursuing development goals: covered by two capacity development projects
  - Realizing the Millennium Development Goals through socially inclusive macroeconomic policies (2007-2011)
  - Strengthening Macroeconomic and Social Policy Coherence through Integrated Macro-Micro Modelling (2011-2013)
- Key questions:
  - What does it take to achieve the MDGs?
  - How much will it cost to achieve the goals on time?
  - What policy options do we have in financing the MDG strategy?
  - What are macroeconomic trade-offs of using alternative strategies to finance the MDG strategy?
  - What other policies contribute to the achievement of the MDGs?
  - What are external vulnerabilities of MDG achievement?

DPAD's capacity development – cont.

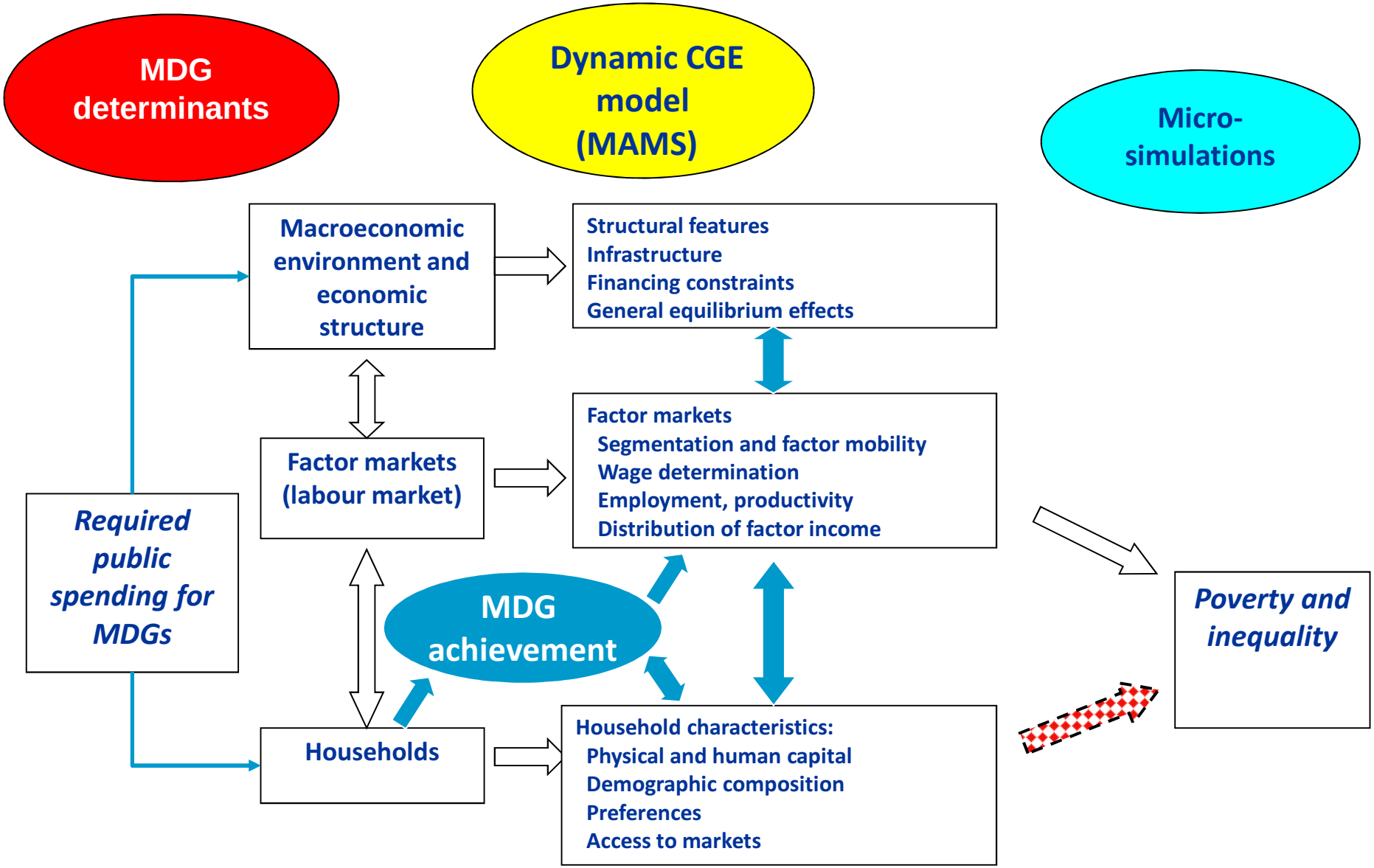
What methodology?

- Public spending policies targeting the MDGs and their financing mechanisms have strong effects throughout the economy.
  - public spending → shift towards non-tradable sectors → exchange rate appreciation?
  - macro-economic trade-offs of financing
    - domestic resource mobilization → crowding out of private spending?
    - foreign resource mobilization → exchange rate appreciation?
  - educational composition of the labour force → labour market
  - improved education and health → productivity → growth
- Therefore, an **economy-wide framework** to assess MDG strategies is necessary, as a complement to **sectoral studies** (education, health, etc.).

2. Integrated modelling framework

- **MAMS: *Maquette* for MDG Simulations.**
  - Economy-wide model to analyze MDG financing strategies in different countries.
  - Dynamic-recursive Computable General Equilibrium (CGE) model
  - Dynamic MDG module, with MDG determinants
  - Developed by the World Bank
  - Refinements through application in UN-DESA's capacity development projects
- **Sector analysis of MDG determinants and of interventions** needed to achieve MDGs in education, health, water and sanitation
  - Microeconomic analysis of determinants of access to schooling, child and maternal mortality, etc. → probabilistic models
- **Microsimulation approach**
  - Translate labour market and transfers outcomes of CGE simulations into impact on poverty and income distribution at household level using micro datasets

Macro-micro linkages



Framework extensively applied

- UN-DESA/UNDP-RLAC/World Bank application in 19 Latin America and the Caribbean countries, with support from UN-ECLAC and IADB
- UN-DESA/UNDP-RBAS/World Bank covered five Arab States (Egypt, Jordan, Morocco, Tunisia and Yemen)
- UN-DESA/UNDP COs covered three countries in Asia (Uzbekistan, Kyrgyzstan and Philippines)
- UN-DESA/UNDP COs/World Bank covered three African countries (Senegal, South Africa and Uganda)

MAMS features common to most CGE models

- Computable General Equilibrium Model: A simultaneous equation system that is square (# of variables = # of equations).
  - Computable ➔ solvable numerically
  - General ➔ economy-wide
  - Equilibrium ➔
    - agents find optimal solutions subject to constraints
    - quantities demanded = quantities supplied
    - macroeconomic account balance
- Flexible in classification of commodities, production sectors, labour categories, institutions.
- A “real” model: only relative prices matter; no modeling of inflation.
- Dynamic-recursive: the solution in any time period depends on current and past periods.

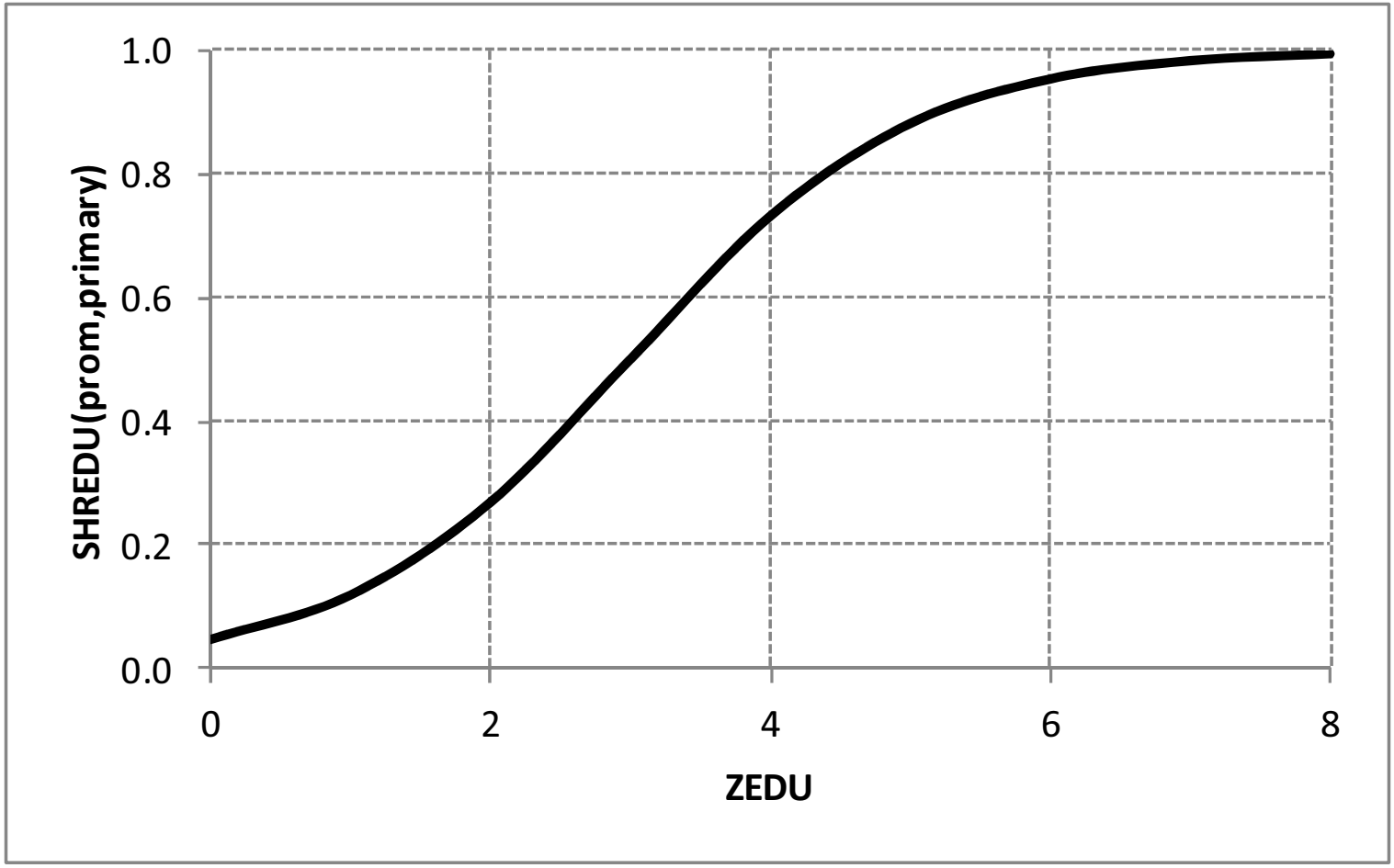
MAMS features uncommon to most CGE models

- Dynamic MDG block
  - Typically covers a number of MDGs and education behaviour
  - Feeds back on labour market, prices, etc.
- Non-poverty MDGs are "produced" by a set of determinants using logistic functions:
  - **MDG 2**: Achieve higher primary school completion
    - a function of student behaviour
  - **MDG 4**: Reduce child mortality by two-thirds
  - **MDG 5**: Reduce maternal mortality by three-quarters
  - **MDG 7w**: Halve % of people without access to drinking water
  - **MDG 7s**: Halve % of people without access to basic sanitation
- Poverty (**MDG 1**) and inequality indicators may be generated inside MAMS (representative household approach) or through microsimulations (**top-down approach**).

Determinants of MDG outcomes in MAMS

Determinant / MDG	Service per capita or student	Consump-tion per capita	Wage incen-tives	Public infra-structure	Other MDGs
2 – Primary schooling	√	√	√	√	4
4 – Under-five mortality	√	√		√	7w, 7s
5 – Maternal mortality	√	√		√	7w, 7s
7w – Water	√	√		√	
7s – Sanitation	√	√		√	

Example: Logistic student behaviour



MAMS scenarios

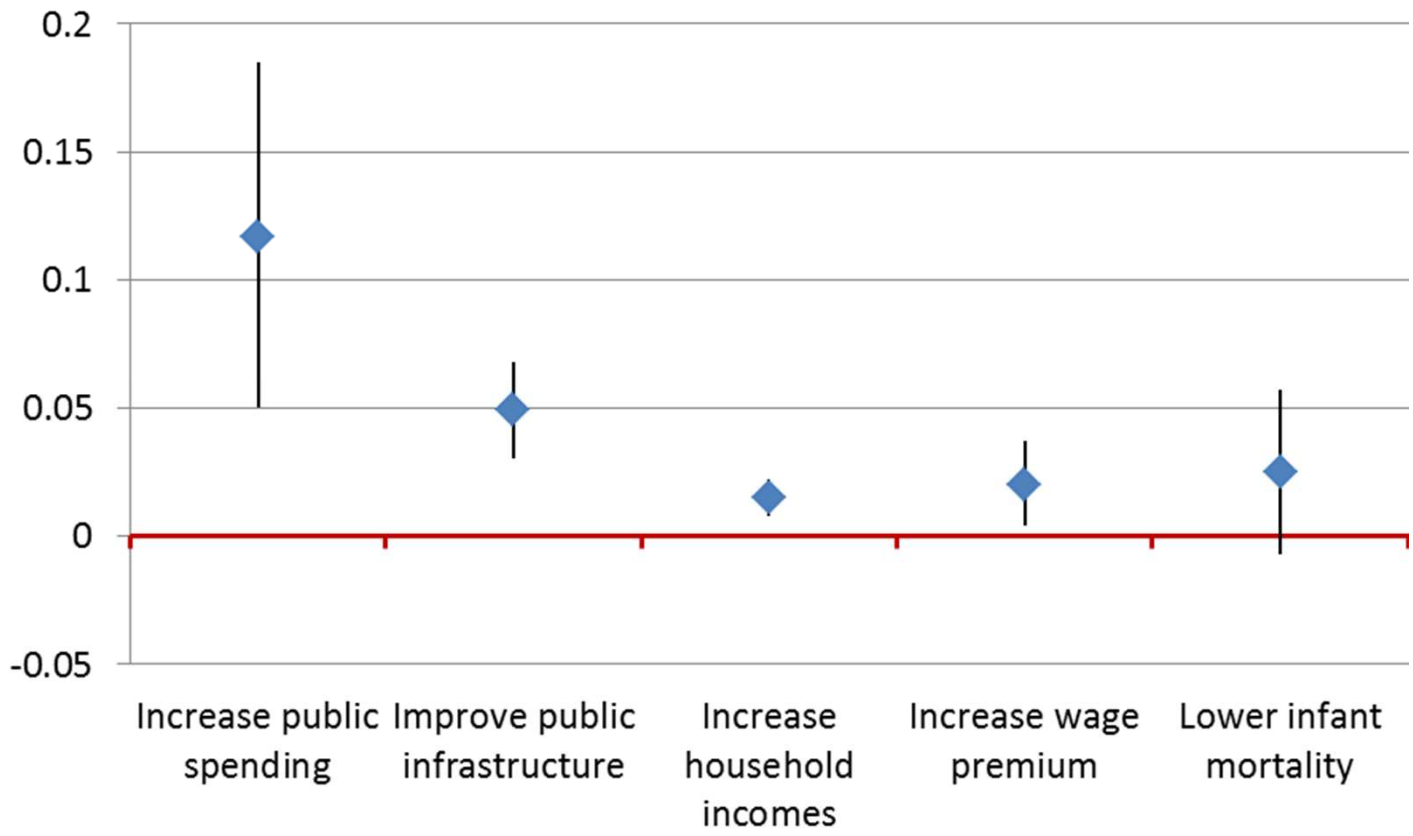
- **Baseline scenario** (runs from a base year to 2015 or later):
  - GDP growth calibrated to trend from last 5-15 years
  - Continuation of public policies (spending, revenue, financing, debt stock accumulation/repayment) -- as a share of GDP
  - Balanced and sustainable evolution of other macro aggregates (private investment, FDI, remittances, etc.) -- as a share of GDP
  - Non-linearities in the effectiveness of social spending
    - More realistic benchmark to assess whether countries are "on/off track" towards MDGs vis-à-vis studies that project past trends linearly
  - **Are MDG targets met under the baseline?**
- **Alternative scenarios**, involving separate/simultaneous:
  - stepping up of public spending/financing to achieve MDGs (**MDG-achieving scenarios**) by 2015 or any other year;
  - stepping up of public spending/financing to improve public infrastructure
  - financing spending through different sources
  - etc.

Sectoral studies of MDG determinants

- **What is needed to get all children in school and make them complete all grades?**
  - Build more school infrastructure?
  - Improve quality of other school inputs (teachers, textbook supplies)?
  - Increase access to school by improved household income and demand subsidies?
  - All of the above?
- **What is needed to reduce child mortality?**
  - Better nutrition?
  - Expansion of immunization programs?
  - Improving maternal-child health facilities?
  - Better education?
  - All of the above?
- **Are there synergies across the MDGs?**
- **What is the direct cost of interventions to achieve MDGs?**

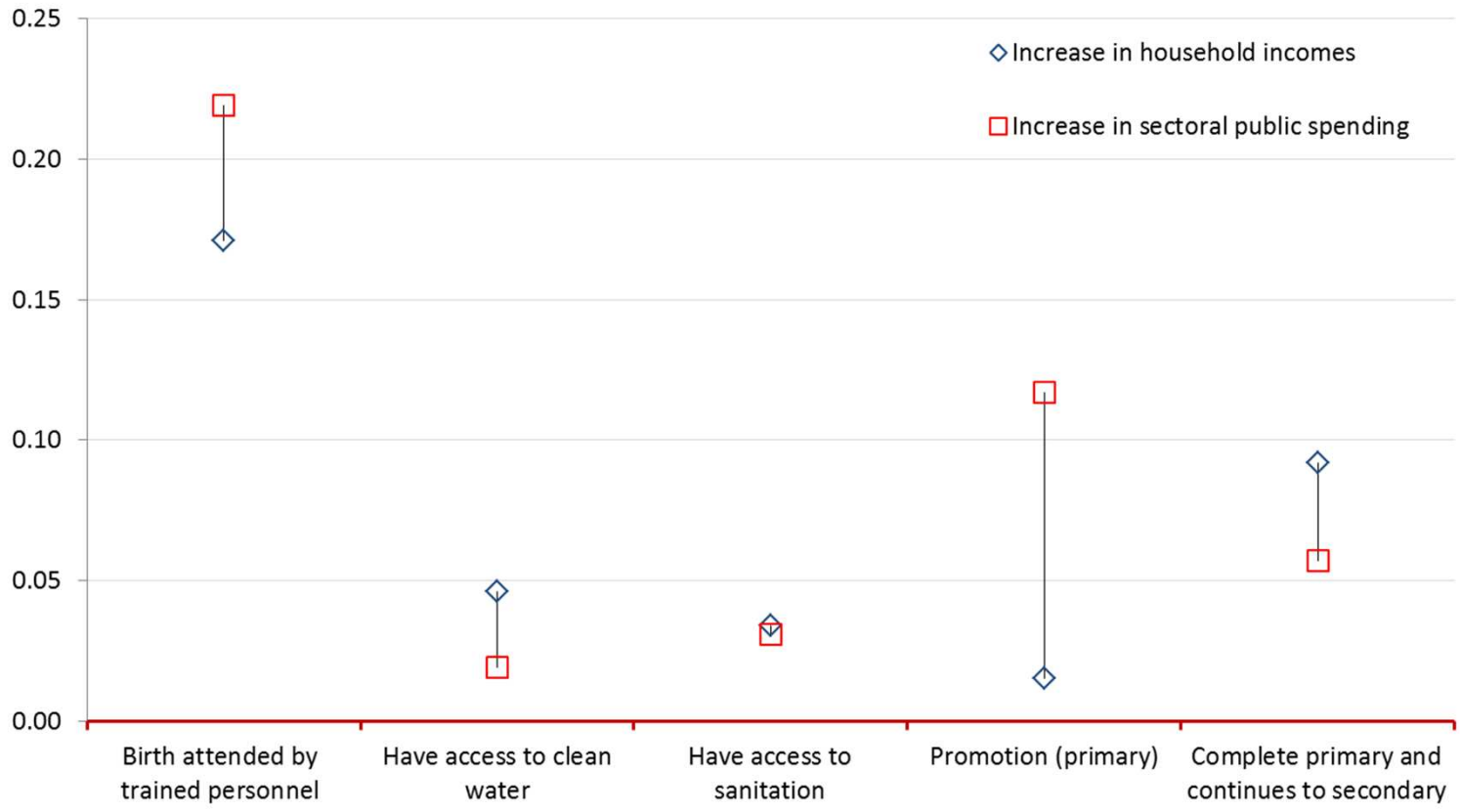
Importance of sectoral studies of MDG determinants

Change in the probability of promotion in primary education (results from a logit model for Honduras)



Importance of sectoral studies – cont.

Change in the probability of improving MDG outcomes in response to increasing household income or sectoral public spending (results from a logit model for Honduras)



Microsimulation model

- MDG 1: Monetary poverty is endogenous to overall economy-wide interactions – rather than to a set of determinants
- MAMS/CGE: too aggregate representative household categories (insufficient detail of income/consumption distribution)
- Microsimulations:
  - Use full household survey data
  - Impose counterfactual factor market and transfers outcomes from MAMS/CGE simulations on full distribution
  - Generate new income/consumption distribution
  - Calculate poverty and distribution outcomes using a wide range of indicators
- "Top-down" approach: no feedback to CGE