Modeling the Impact of Structural Reforms and their International Spillovers in the G-20 Model (G20MOD)

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Outline

• An overview of the structure of G20MOD
• Simulating the impact of structural reforms
• International spillovers
G20MOD

- Semi-structural with single good rather than fully structural with multiple goods like other IMF models (GIMF and GEM)
- Private consumption and investment structural (micro-founded)
- Trade, labor supply, and inflation have reduced-form representations
- Supply is determined by an aggregate Cobb Douglas production function
- Full stock-flow consistency with rational expectations
- Monetary and fiscal policy are endogenous - pinned down with simple rules
Why a Semi-Structural Model

- For G20MAP applications it necessary to have results for each G20 member
- Fully structural models like GIMF and GEM with multiple goods and full tracking of bilateral trade flows are too hard to solve with more than 6 countries or regions
- Collapsing to a single good with reduced-form trade dramatically reduces the complexity of the problem making it feasible to have 24 blocks in G20MOD
- Sufficient structure is still retained to address the key savings-investment issues at the heart of the G-20 mandate to ensure strong, sustainable and balanced growth
Aggregate Demand and Supply

- Aggregate demand is the sum household consumption, private investment, government absorption, and exports less imports.
- Aggregate supply is determined by a Cobb Douglas production function in capital and labor scaled by total factor productivity.
- The interaction of aggregate demand and aggregate supply pins down core consumer price inflation.
Household Consumption

- Consumption is modeled with a discrete-time representation of the Blanchard-Weil-Yaari overlapping generations model (OLG).
- The OLG framework implies important non-Ricardian properties – government debt path has significant economic implications.
- Households treat government bonds as wealth since the associated taxes could fall due beyond their planning horizons.
- OLG households consume out of wealth according to:
  \[ C_{OLG} = MPC \times TW \]
- Total consumption is given by:
  \[ C = C_{OLG} + C_{LIQ} \]
OLG Framework

- The OLG framework results in the endogenous determination of national savings given public debt.
- The world real interest rate is endogenous and adjusts to equilibrate the demand for and supply of global savings.
Private Investment

- Private investment is driven by a Tobin’s Q model with quadratic real adjustment costs.
- Tobin’s Q is essentially the market value of the firm for each unit of capital held.
- Q depends on the depreciation rate, the corporate tax rate, the expected corporate interest rate, the expected marginal product of capital, and the expected marginal cost of adding a new unit of capital.
- If Q is above the market price of capital, the firm will increase investment; if below, investment declines.
Trade

- Reduced-form models
- Exports are driven by a scale variable (foreign import demand) and a relative price variable (Real Competitiveness Index RCI)
- Imports driven by a scale variable (components of domestic demand), a relative price variable (import prices), and the cyclical position (output gap)
- The output gap captures cyclicality in import propensities – imports have a high proportion of durables that are volatile over the business cycle – leads to larger business-cycle spillovers
Commodities Sectors

- Reduced form models for oil, metals and food sectors
  - Sluggish supply reacting to the price of commodities
  - Reduced form equations for consumption, exports and imports of commodities
    - Price and income effects
- Global prices of commodities depend on
  - supplies of commodities
  - global GDP, as a proxy for demand
Aggregate Supply

- Aggregate supply is determined by Cobb Douglas production technology
  - Private capital stock
  - Equilibrium labor
  - Total factor productivity (TFP)
- In addition to its exogenous component, TFP depends endogenously on the level of the public capital stock (a function of public investment)
- There are also productivity spillovers from innovation that occurs in trading partner economies
Inflation

- Core consumer price inflation is determined by a reduced-form Phillips curve.
- Core inflation is a function of lagged inflation, expected future inflation, and the gap between aggregate demand and aggregate supply (the output gap), oil prices.
Financial Structure

- Government bonds are the only asset traded internationally
- The exchange rate adjusts in the long-run to ensure external stability
- In the short-run, the exchange rate is determined by uncovered interest parity
- The monetary policy rate is the “risk free” benchmark
- Sovereigns face an exogenous risk premium and term premium
- Firms pay the sovereign rate plus an exogenous risk premium plus an endogenous BGG-style financial accelerator
Monetary Policy

- Monetary policy is characterized as inflation-forecast targeting
- The policy rate adjusts to the gap between the one-year ahead model-consistent inflation forecast and the target rate
- Model can incorporate managed and fixed exchange rate regimes
Fiscal Policy

- The fiscal authority:
  - purchases final goods directly for both consumption and investment,
  - makes transfers to households, and
  - funds these with a full range of tax instruments.

- The fiscal authority can impose:
  - indirect taxes on consumption,
  - direct taxes on labor and corporate income,
  - as well as lump-sum taxes on households.

- Fiscal policy is implemented via a simple policy rule that ensures a stable debt-to-GDP ratio in the long run, but allows for a countercyclical fiscal stance in the short run.
Using G20MOD to Quantify the Impact of Member’s Growth Strategies

- Joint IMF/OECD assessment of new growth strategy measures’ impact on total factor productivity and labor supply
- New commitments on public infrastructure investment
Policy Drivers

- Productivity is raised by
  - Product market reforms
  - Research and development expenditures
  - Tax reform
  - Trade related measures

- Labor supply increased by
  - Improvements in childcare provision
  - Active-labor-market policies
  - Pension reforms
  - Average-replacement-rate reforms
Transmission of Reforms

- Increase in productivity
- Increase in labor supply
- Increase in infrastructure investment
- Total impact on G-20 GDP
- Own effects and spillovers
Increase in Total Factor Productivity
(1% after 5 years)

**Graph 1:**
- *Y-axis:* Real GDP (Percent difference)
- *X-axis:* Time (0 to 5 years)

**Graph 2:**
- *Y-axis:* Real Consumption and Investment (Percent differences)
- *X-axis:* Time (0 to 5 years)

**Graph 3:**
- *Y-axis:* Real Wage (Percent difference)
- *X-axis:* Time (0 to 5 years)

**Graph 4:**
- *Y-axis:* Real Labor Income (Percent difference)
- *X-axis:* Time (0 to 5 years)
Increase in Labor Supply
(0.5% after 5 years)
Increase in Public Infrastructure Investment
(0.2 percent of GDP each year for 5 years)

- **Real GDP** (Percent difference)
- **Real Consumption and Investment** (Percent differences)
- **Real Wage** (Percent difference)
- **Real Labor Income** (Percent difference)
Estimated Growth Strategy Impact on G-20 GDP

- Labor market reforms
- Add product market reforms
- Add R&D and tax reforms
- Add public investment
- Add EU-wide policies

G20 Total GDP (percent deviation)

February Policy Scenario

- Graph showing the estimated growth impact on G20 GDP from 2013 to 2018 with different policy scenarios.
Own Effects and Spillovers

- own effects without spillovers
- with trade spillovers, without productivity spillovers
- with trade and productivity spillovers
Productivity Spillovers
Summary

- G-20MOD allows for simultaneous policy analysis on all G-20 member countries
- It embodies the necessary structural features to capture the key savings-investment decisions at the heart of strong, sustainable and balanced growth
- Used here to estimate the impact of members’ growth strategies on G-20 GDP
- Roughly 25 percent of growth strategies’ impact on G-20 GDP comes from spillovers
- Productivity channel spillovers account for roughly 1/3 of that