MEDIUM-TERM CYCLES: THE ROLE OF OCCASIONALLY BINDING COLLATERAL CONSTRAINTS

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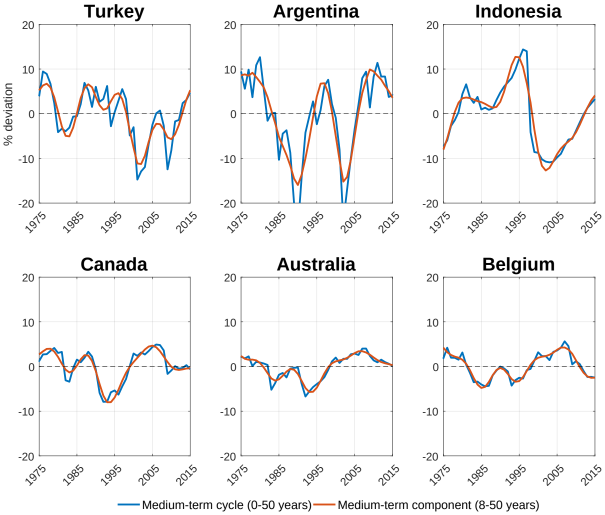
EEA-ESEM Virtual

August 23, 2021

Medium-term cycles in emerging small open economies

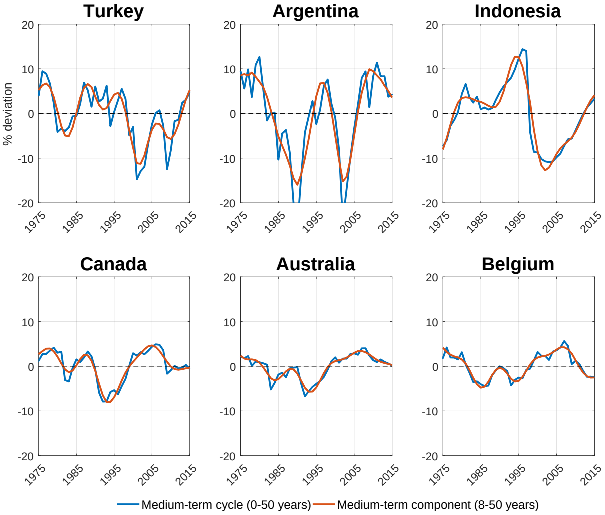


Medium-term cycles: fluctuations beyond business-cycle frequencies (Comin & Gertler 2006)

The result of endogenous response of productivity growth to business cycle shocks

Properties vary across countries

Medium-term cycles in emerging small open economies



Med.-term cycles are more volatile and negatively skewed in emerging SOE:

Mean st. dev.	Y	TFP
Developed	4.58	3.06
Emerging	7.31	5.13

Mean skewness	Y	TFP
Developed	-0.14	0.23
Emerging	-0.37	-0.45

Reminiscent of Aguiar & Gopinath (2007), among others

Medium-term cycles in emerging small open economies

Question: What can explain the greater amplitude and negative skewness of medium-term fluctuations in emerging economies?

Thesis: These can be understood as resulting from the interaction between credit cycles, occasionally binding collateral constraints *and* endogenous growth

Intuition:

- More prominent *endogenous* swings in growth in economies prone to sudden stops...
- ...as opposed to economies that are free to optimally borrow through the cycle

Medium-frequency cycles in emerging small open economies

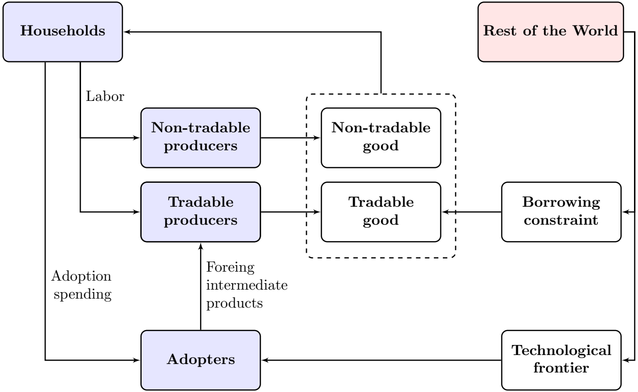
Intuition:

- More prominent *endogenous* swings in growth in economies prone to sudden stops...
- ...as opposed to economies that are free to optimally borrow through the cycle

Mechanism:

- High leverage + negative shock $\rightarrow$ binding borrowing constraint $\rightarrow$ deleveraging
- Deleveraging $\rightarrow$ Lower level of productivity-improving investment $\rightarrow$ TFP loss
- Occasionally binding borrowing constraints amplify *both* short- and medium-frequency cycles in an asymmetric manner

Model structure



- RBC small open economy
- Liability dollarization: borrowing in tradable-good units (Mendoza 2002)
- Occasionally binding borrowing constraint: $B_t \leq F(\text{Income}_t)$
- Variety-based endogenous growth (Romer 1990)
- Adoption of foreign technologies through trade (Santacreu 2015)

Households

Consumption basket of tradable and non-tradable goods $C_t = (C_t^T)^{\omega}(C_t^N)^{1-\omega}$
PPP deviations: real exchange rate, $RER = F(1/P_t^N)$

$$\max \mathbb{E}_t \sum_{i=0}^{\infty} \beta^i \left[U(C_{t+i}, L_{t+i})\right] \qquad \text{s.t.}$$

$$C_t^T + P_t^N C_t^N + R_{t-1} B_{t-1} = W_t L_t + B_t + \Pi_t$$

$$B_t \leq \frac{1-\varphi}{\varphi}(W_t L_t + \Pi_t) \qquad \leftarrow \text{multiplier } \mu_t$$

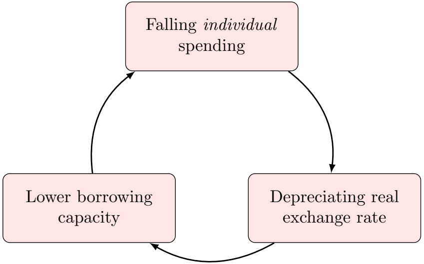
Liability dollarization:

- B_t is denominated in tradable-good units but...
- ...is limited by income from *both* tradable and non-tradable sectors
- Borrowing capacity depends on the relative price of non-tradable goods / RER

Households

Consumption Euler wedge:

$$\mathbb{E}_t\left[\Lambda_{t,t+1}R_t\right] = 1 - \mu_t$$



When households are credit-constrained ($\mu_t > 0$) the shock is amplified through **Fisherian debt deflation:**

- Binding borrowing constraint $\rightarrow$
- Lower consumption $\rightarrow$
- Lower relative price of non-traded goods / depreciating real exchange rate $\rightarrow$
- Lower borrowing capacity $\rightarrow$
- Tighter borrowing constraint $\rightarrow$ ...

Firms

Two perfectly competitive sectors

Non-tradable sector: $Y_t^N = Z_t^N (L_t^N)^{\alpha^N}$

- Sold only domestically, $Y_t^N = C_t^N$

Tradable sector: $Y_t^T = Z_t^T (L_t^T)^{\alpha^T (1-\xi)} X_t^{\xi}$

- Sold on both domestic and foreign markets
- Uses a basket of imported foreign intermediate products: $X_t = \left[\int_0^{N_t} x_t(\omega)^{\frac{1}{\nu}} d\omega \right]^{\nu}$
- $x_t(\omega)$ are imperfectly substitute $\rightarrow$ Positive profits for distributors / producers
- Endogenous growth through adoption of foreign technologies: $g_t = \Delta N_t > 0$,

Technology adoption

Growth driven by diffusion of foreign technologies

The economy is catching up with the world technological frontier that grows at $\Delta N_t^* > 0$

Foreign intermediate goods produced with new technologies need to be adopted first

Adopters:

- Buy the right to sell foreign intermediate goods domestically
- Spend $h_t \rightarrow$ adopt a product with probability $\lambda_t = \lambda(h_t)$

Stock of adopted products: $$N_{t+1} = \underbrace{(1-\phi)}_{\text{Survival rate}}\{N_t + \underbrace{\lambda(h_t)}_{\text{Adoption probability}} \underbrace{(N_t^* - N_t)}_{\text{Unadopted products}}\}$$

Technology adoption

Why adopt? **Profit incentive**

Value of an unadopted product: $$j_t = \max_{h_t} \mathbb{E}_t\{-h_t + (1-\phi)\Lambda_{t,t+1}[\underbrace{\lambda_t v_{t+1}}_{\text{Profit stream if adopted}} + \underbrace{(1-\lambda_t)\, j_{t+1}}_{\text{Continuation if unadopted}}]\}$$

Foreign intermediate products:

- Imperfectly substitutable → adopters earn positive profit
- Imported by successful adopters who set their price to max the profit stream v_t
- Priced in foreign consumption units → domestic price fluctuates with the RER

Adoption rate / distance from the world tech. frontier varies with business-cycle conditions

Solution method and experiments

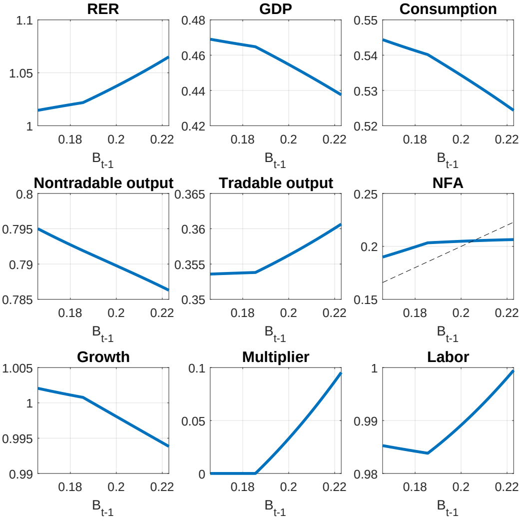
Solution:

- Detrended stationary variables: $y_t^T = \frac{Y_t^T}{N_t}$, $w_t = \frac{W_t}{N_t}$, etc.
- Tradable productivity shock: $\log(Z_t^T) = (1 - \rho^{Z^T})\log(Z^T) + \rho^{Z^T}\log(Z_{t-1}^T) + \varepsilon_t^{Z^T}$
- Global solution by parameterized expectations (e.g. den Haan & Marcet 1990)
  Approximate $t + 1$ conditional expectations as a function of the state vector

The model generates the non-linear and state-dependent relation between growth, foreign debt, and exogenous shocks. **Illustrations / experiments:**

- Policy functions
- State-dependent IRFs
- Stochastic simulation: an average sudden stop

Policy functions



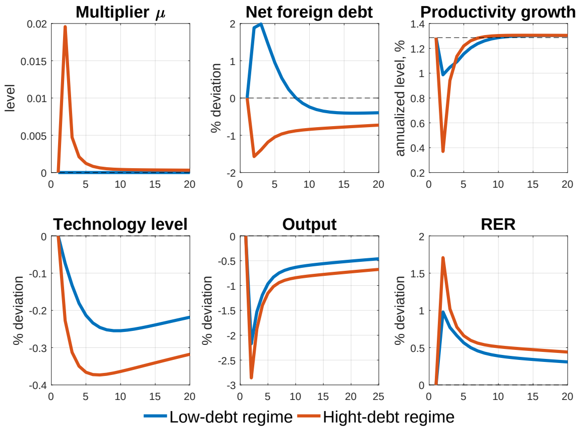
Decision rules:

- 2σ negative tradable productivity shock
- Period-t values as a function of B_{t-1}
- All other state variables are at their stochastic steady state

Non-linearity and state-dependence:

- Two regimes: binding borrowing constraint ($\mu > 0$) or not
- Credit-constrained regime when initial debt B_{t-1} is high
- Negative productivity growth in the credit-constrained regime

Negative tradable productivity shock: high-debt vs low-debt regimes



1σ shock at two points of the state space

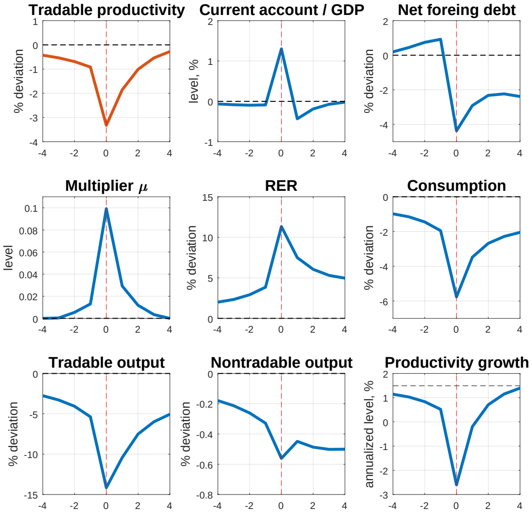
Low-debt regime:

- Far from the borrowing constraint
- Optimal debt accumulation in response to a transitory negative shock

High-debt regime:

- Close to the borrowing constraint
- Constraint binds → deleveraging
- Sharper decline in adoption / growth
- 50% greater endogenous TFP decrease

An average sudden stop



Definition:

- Binding borrowing constraint
- Current account reversal $> 2\sigma_{CA}$
- Average over events in a 1m periods

Properties:

- Quarterly probability: $\approx$3%
- Standard sudden stop features and...
- ...a sizable drop in productivity growth
- Long-term effect of the sudden stop

Conclusion

- Rare and severe leverage/deleverage cycles can have a significant detrimental effect on productivity growth
- Countries more prone to instability on credit markets would exhibit greater volatility and negative skewness of the medium-frequency component of TFP / output

- Has broader implications, e.g. why recoveries from financial crises are so different from “regular” recessions