

Revisit Emerging Market Business Cycle : Trend Shock Matters

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Introduction

Motivation

- Empirical regularities of emerging market business cycle (EMBC)
 - (1) higher consumption volatility relative to output
 - (2) countercyclical trade balance
 - (3) countercyclical interest rate
- Mechanisms to explain the EMBC regularities
 - Financial friction : working through the country specific interest rate
 - (1) working capital requirement, (2) expected productivity, (3) debt-elastic risk premium
 - Trend shock : adding stochastic trend shock besides the stationary productivity shock
- The role of trend shocks has diminished, while financial frictions have gained emphasis in the literature.
- However, the Korea economy is not the case.

Literature Review

- 1st generation studies
 - : Financial friction and trend shock are considered separately.
- 2nd generation studies
 - : Horse racing between financial friction and trend shock
- 3rd generation studies
 - : The sources of the EMBC varies across countries.

Literature Review - 1st generation studies

- Document the EMBC properties.
- Financial friction and trend shock are considered separately.
- Neymeyer and Perri(2005) : working capital constraint, expected future productivity
 - Argentina, quarterly data
- Aguiar and Gopinath (2008) : trend shock
 - Mexico, quarterly data
- Financial friction parameters are calibrated, **not estimated**
 - Debt elasticity is assigned small value (0.001)

Literature Review - 2nd generation studies

- Horse racing between financial friction and trend shock
- Mexico and Argentina are the primary countries of analysis.
- Gracia-Cicco, Pancrazi and Uribe (2010) : debt elasticity
 - Argentina, Annual data
 - Estimate the debt elasticity with a large value.
 - Ignore the expected productivity channel.
- Chang and Fernandez (2013) : expected productivity
 - Mexico, quarterly data
 - Estimate the expected future productivity.
 - Ignore the debt elasticity channel (assign 0.001).
- Trend shock is negligible.
The main source is the stationary shock amplified by the financial friction.

Literature Review - 3rd generation studies

- The source of the EMBC varies across countries.
- Estimating debt elasticity is critical to identify the business cycle sources.
- Miyamoto and Nguyen (2017)
 - 17 countries, annual data
 - Structurally estimate parameters for the debt elasticity and expected productivity.
 - Find the debt elasticity is sizable.
 - Trend shock serves as the main driving forces in some countries.
- Germaschewski, Horvath, and Rubini (2024)
 - Obtain results similar to those of Miyamoto and Nguyen (2017).
 - But the expected productivity is not considered.

Our paper

- Korea, quarterly data, compared with Mexico
(Not studied in Miyamoto and Nguyen (2017) and Germaschewski et al. (2024))
- Horse racing between financial friction and trend shock.
- Three types of financial frictions are included.
(1) working capital requirement, (2) expected productivity, (3) debt-elastic risk premium
- Estimate all financial friction parameters and both productivity processes.
- Use interest rate moments to identify the financial friction parameters.

Main results

- Trend shock is the main driving force of the business cycle in Korea.
 - Trend shocks account for 77% of total productivity fluctuations.
 - Trend shocks account for 54% of output and 78% of consumption fluctuations.
- Debt elasticity and expected productivity are key frictions for identifying the contribution of trend shocks.
 - The working capital constraint plays no role in the amplification mechanism.
- In particular, ignoring debt elasticity distorts the analysis, making trend shocks appear negligible.
- Moments related to interest rate are critical for estimating the structural parameters.

Business cycle properties in Korea

Business cycle statistics

- Korea: 1990Q1 ~ 2018Q4
 - agg. macro variables : output, investment, consumption, net export (BOK ECOS)
 - total labor inputs: total employment, avg. working hours (KOSIS)
 - interest rate : 90-day corporate commercial paper rate (BOK ECOS)
The nominal rate is deflated with an avg. inflation over current and 3 preceding quarters.
(J.P Morgan EMBI only covers from 1994Q1 to 2004Q1.)

- Mexico: 1994Q1 ~ 2012Q4
 - agg. macro variables : output, investment, consumption, net export (OECD)
 - total labor inputs: total employment, avg. working hours
(Neumeyer and Perri (2005) : 1994Q1-2001Q4, ILO: 2002Q1-2012Q4)
 - interest rate : J.P. Morgan EMBI (Emerging Market Bond Index), 1994Q1-2012Q1

Business cycle statistics - volatility

Table: Output volatility and relative volatility to output

A. Filtered variables					
	$\sigma(y)$	$\sigma(c)/\sigma(y)$	$\sigma(i)/\sigma(y)$	$\sigma(tb)/\sigma(y)$	$\sigma(R)/\sigma(y)$
Korea	1.99 (0.02)	1.54 (0.06)	2.55 (0.12)	0.83 (0.06)	0.60 (0.05)
Mexico	2.52 (0.02)	1.00 (0.05)	3.57 (0.26)	0.53 (0.05)	0.65 (0.09)
B. Growth variables					
	$\sigma(\Delta y)$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta i)/\sigma(\Delta y)$	$\sigma(\Delta tby)/\sigma(\Delta y)$	$\sigma(\Delta R)/\sigma(\Delta y)$
Korea	1.29 (0.02)	1.45 (0.20)	2.31 (0.19)	0.95 (0.05)	0.75 (0.09)
Mexico	1.50 (0.03)	1.00 (0.10)	3.60 (0.76)	0.71 (0.11)	0.94 (0.19)

Note: All moments are estimated using GMM with standard errors reported in parenthesis.

- Filtered variables : HP-filtered series, Growth variables: log difference
- The Korean business cycle exhibits the EMBC regularities : higher consumption volatility relative to output

Business cycle statistics - correlation with output

Table: Correlation with output

A. Filtered variables					
	$\rho(y, y_{-1})$	$\rho(c, y)$	$\rho(i, y)$	$\rho(tby, y)$	$\rho(R, y)$
Korea	0.82 (0.05)	0.92 (0.02)	0.88 (0.03)	-0.83 (0.03)	-0.33 (0.17)
Mexico	0.82 (0.06)	0.94 (0.01)	0.90 (0.03)	-0.66 (0.08)	-0.31 (0.08)
B. Growth variables					
	$\rho(\Delta y, \Delta y_{-1})$	$\rho(\Delta c, \Delta y)$	$\rho(\Delta i, \Delta y)$	$\rho(tby, \Delta y)$	$\rho(\Delta R, \Delta y)$
Korea	0.41 (0.09)	0.82 (0.07)	0.74 (0.08)	-0.57 (0.17)	-0.36 (0.19)
Mexico	0.41 (0.11)	0.84 (0.06)	0.81 (0.05)	-0.58 (0.13)	-0.30 (0.14)

Note: All moments are estimated using GMM with standard errors reported in parenthesis.

- The Korean economy exhibits countercyclical trade balance and countercyclical interest rate.
- Overall, Korea and Mexico broadly shares the core empirical features of EMBC.
- These summary statistics alone, however, do not offer clear evidence on whether the underlying sources of business cycle differ between Korea and Mexico.

Business cycle statistics

- Korea also shares the core EMBC statistics reported in the previous studies.
 - high consumption volatility to output : $\sigma(c)/\sigma(y) = 1.54$
 - countercyclical trade balance : $\rho(tby, y) = -0.83$, $\rho(\Delta tby, \Delta y) = -0.57$,
 - countercyclical interest rate : $\rho(R, y) = -0.33$, $\rho(\Delta R, \Delta y) = -0.36$,
- Similar business cycle statistics make it hard to identify differences in the sources of fluctuations between Korea and Mexico.
- We conduct two reduced-form estimation to explore the potential differences of the business cycle sources.
 - (1) Consumption responses to output
 - (2) Spread equation estimation

Consumption response to output

$$\Delta \ln c_t = \beta_0 + \gamma \Delta \ln y_t + \beta_1 r^{cn} + \beta_2 r^{us} + u_t$$

Table: Consumption changes response to output changes

	Korea			Mexico		
	(1)	(2)	(3)	(1)	(2)	(3)
Δy_t	1.198** (0.292)	1.246** (0.331)	1.109** (0.277)	0.799** (0.102)	0.676** (0.134)	0.626** (0.104)
$\ln R^{cn}$	-0.022 (0.040)	0.012 (0.039)	0.016 (0.033)	-0.073 (0.053)	-0.010 (0.047)	-0.022 (0.047)
$\ln R^{us}$	0.021 (0.084)	-0.053 (0.095)	-0.038 (0.091)	0.202* (0.081)	0.104 (0.083)	0.124 (0.086)

Note: (1) OLS, (2) IV (lag1), (3) IV (lag2)

- γ is less than 0.5 in developed countries such as US, UK, Canada. (Campbell and Mankiw (1991))
- $\gamma^{KOR} \gg \gamma^{MEX} > \gamma^{Developed}$
- The source of business cycle in Korea can be different from that of Mexico.

Spread equation estimation

$$S_t = c_0 + \psi(d_{t+1} - \bar{d}) + \eta(TFP_t - \overline{TFP}) + v_t$$

Table: Spread estimation results

	Korea				Mexico			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
debt	-0.315** (0.039)		0.301** (0.060)	0.281** (0.071)	0.721** (0.088)		0.739** (0.099)	0.732** (0.116)
productivity		-0.129** (0.009)	-0.211** (0.018)	-0.208** (0.025)		-0.234* (0.092)	0.031 (0.078)	0.135 (0.079)

Note: (1) (2) (3) OLS, (4) AR(1) for country specific spread

- Similar empirical framework in Bocola et al. (2019) for the advanced countries.
- $\psi > 0$, $\eta < 0$: The spread widens with high external debt but narrows with high expected productivity.
- (3) $\psi^{MEX} \gg \psi^{KOR} > 0$
- (3) $|\eta^{KOR}| \gg |\eta^{MEX}| \approx 0$

Findings from reduced-form estimations

- Summary
 - In Korea, consumption responds more strongly to output than in Mexico.
 - ⇒ The Korean economy may have extra source of business cycle.
 - Debt elasticity, ψ , is lower in Korea than in Mexico.
 - ⇒ Garcia-Cicco et al.(2010) noted that trend shock become negligible under high ψ .
 - ⇒ Trend shocks may be significant in Korea due to its low ψ .
 - Risk premium to expected output, η , is only significant in Korea.
 - ⇒ In Mexico, the spread is mainly driven by debt levels, not by the productivity.
- Two key takeaways
 - Korea is likely to exhibit different sources of business cycle compared to Mexico.
 - Both financial frictions are necessary to accurately identify the sources of business cycle.
- A structural model is essential to identify business cycle sources quantitatively.

Model

Model

- Our model builds upon the small open economy RBC (SOE-RBC) framework.
- The model is extended to incorporate (1) two productivity shocks and (2) three financial frictions.
- Two types of productivity shocks
 - (1) stationary shock (transitory shock)
 - (2) nonstationary shock (trend shock)
- Three types of financial friction
 - (1) working capital constraints: Firms are required to pre-finance a fraction of their wage bill.
 - (2) debt-elastic risk premium: Borrowing costs rises with the level of external indebtedness.
 - (3) expected future productivity: Interest rate spread varies endogenously with expected deviation of future productivity
- The world interest shock is also included.

Model - Firm

- Production function

$$Y_t = a_t K_t^{1-\alpha} (\Gamma_t h_t)^\alpha$$

- K_t : capital, L_t : labor, α : labor share
 - a_t : **transitory shock**
 - Γ_t : **trend shock**
- Profit maximization

$$\max_{h_t, K_t} a_t F(K_t, \Gamma_t h_t) - W_t h_t - r_t K_t - \theta (R_{t-1} - 1) W_t h_t$$

- r_t : the rental rate of capital, W_t : hourly wage, h_t : hours worked
- θ : **working capital requirement**

Model - Productivity process

- Transitory shock : a_t

$$\ln a_t = \rho_a \ln a_{t-1} + \varepsilon_{a,t}$$

where $|\rho_a| < 1$, $\varepsilon_{a,t} \sim i.i.d. N(0, \sigma_a^2)$

- Trend shock : Γ_t

$$\Gamma_t = g_t \Gamma_{t-1}$$

$$\ln (g_t / \bar{g}) = \rho_g \ln (g_{t-1} / \bar{g}) + \varepsilon_{g,t}$$

where $|\rho_g| < 1$, $\varepsilon_{g,t} \sim i.i.d. N(0, \sigma_g^2)$,

\bar{g} : long-run mean growth rate of labor productivity

Model - Household

- Lifetime expected utility

$$E \sum_{t=0}^{\infty} \beta^t U(C_t, h_t, \Gamma_{t-1})$$

- β : discount factor, C_t consumption, h_t working hours
- Γ_{t-1} : labor augmenting productivity, allowing for the balanced growth

- Period utility function

$$U(C_t, h_t, \Gamma_{t-1}) = \frac{(C_t - \tau \Gamma_{t-1} h_t^\omega)^{1-\sigma}}{1-\sigma}$$

- $\omega > 1$: Frisch elasticity of labor supply, $1/(\omega - 1)$, τ : a scale parameter

Model - Household

- Budget constraint

$$W_t h_t + r_t K_t + q_t D_{t+1} = C_t + I_t + D_t$$

- q_t : the time t price of debt due in period $t + 1$
- D_{t+1} : the stock of debts chosen at time t

- Capital accumulation with a quadratic capital adjustment cost

$$K_{t+1} = (1 - \delta)K_t + I_t - \frac{\phi}{2}K_t \left(\frac{K_{t+1}}{K_t} - \bar{g} \right)^2$$

- δ : depreciation rate of capital stock
- ϕ : the parameter for the capital adjustment cost

Model - Country Specific Spread

- $1/q_t$: inverse of the price of new debt

$$1/q_t = R_t = S_t \cdot R_t^*$$

- R_t^* : world interest rate (US interest rate)

$$\ln \left(R_t^* / \overline{R^*} \right) = \rho_{R^*} \ln \left(R_{t-1}^* / \overline{R^*} \right) + \epsilon_{R^*,t}$$

where $\epsilon_{R^*,t} \sim i.i.d.N(0, \sigma_{R^*}^2)$

- S_t : Country Specific Spread

Model - Country Specific Spread

- S_t : Country Specific Spread

$$S_t = \exp \left[\psi \left(\tilde{d}' - \bar{d} \right) - \eta E_t \left(\frac{SR_{t+1}}{SR_{ss}} \right) \right] \bar{S}$$

- \tilde{d} : the steady-state debt-to-output ratio
- SR_{t+1} : Solow's residual, include transitory and permanent productivity shocks
- ψ : debt elasticity of the interest rate
 - governs the responsiveness of the interest rate to variations in external debt
- η : productivity-based risk premium
 - varies the spread with expected deviations of future productivity from its long-run mean

Model - Recursive formation

$$V(k, d, z, g, \Gamma_{-1}) = \max_{\{c, h, k', d'\}} \left\{ \frac{(c - \tau h^\omega)^{1-\sigma}}{1-\sigma} (\Gamma_{-1})^{1-\sigma} + \beta EV(k', d', z', g', \Gamma) \right\}$$

subject to

$$wh + rk + gqd' = c + i + d$$

$$gk' = i + (1 - \delta)k - \frac{\phi}{2}k \left(\frac{gk'}{k} - \bar{g} \right)^2$$

$$1/q = R = S \cdot R^*$$

$$S = \exp \left[\psi (\tilde{d}' - \bar{d}) - \eta E \left(\frac{SR_{t+1}}{SR_{ss}} \right) \right] \bar{S}$$

$$\Gamma = g\Gamma_{-1}$$

$$\ln a' = \rho_a \ln a + \varepsilon_a$$

$$\ln (g'/\bar{g}) = \rho_g \ln (g/\bar{g}) + \varepsilon_g$$

$$\ln (R^*/\bar{R}^*) = \rho_{R^*} \ln (R^*/\bar{R}^*) + \varepsilon_{R^*}$$

- $x \equiv X/\Gamma_{t-1}$: detrended variables

Estimation

Calibration

Table: Externally calibrated parameters

Parameter	Description	Value
σ	Relative risk aversion	2.000
ω	Labor supply elasticity	1.600
τ	Labor parameter ($\bar{h} = 1/3$)	1.717
β	Discount factor	0.980
α	Labor exponent (production)	0.680
δ	Depreciation rate of capital	0.025
\bar{d}	Debt to GDP ratio	0.100

- Model frequency is quarter.
- ϕ , θ , ψ , η and the productivity processes are structurally estimated by GMM.

Estimation

- Estimate 8 structural parameters $(\rho_a, \sigma_a, \rho_g, \sigma_g, \phi, \theta, \psi, \eta)$ using GMM with an optimal weighting matrix.
 - The weighting matrix is constructed using the Newey-West estimator with a Bartlett kernel and a bandwidth following Ruge-Murcia (2013).
- 15 target moments : (1) relative to output, (2) corr. with output, (3) output growth
 - relative to output (5): $\sigma(c)/\sigma(y)$, $\sigma(i)/\sigma(y)$, $\sigma(nx)/\sigma(y)$, $\sigma(h)/\sigma(y)$, and $\sigma(R)/\sigma(y)$
 - corr. with output (8) : $\rho(y_t, y_{t-1})$, $\rho(\Delta y_t, \Delta y_{t-1})$, $\rho(y, c)$, $\rho(y, i)$, $\rho(y, nx)$, $\rho(y, h)$, $\rho(y, R)$, $\rho(nx, R)$
 - output growth (2): $\sigma(\Delta y)$, $\rho(\Delta y_t, \Delta y_{t-1})$

Estimation

- productivity process $(\rho_a, \sigma_a, \rho_g, \sigma_g)$ (Aguiar and Gopinath (2007))
: $\sigma(y), \sigma(c)/\sigma(y), \sigma(nx)/\sigma(y), \sigma(\Delta y), \rho(y, c), \rho(y, nx), \rho(y_t, y_{t-1}), \rho(\Delta y_t, \Delta y_{t-1})$
- θ (working capital constraint) : $\sigma(h)/\sigma(y), \rho(y, h)$
- ψ (debt-elasticity) and η (expected productivity risk premium) (using interest rate moments)
: $\sigma(R)/\sigma(y), \rho(y, R),$ and $\rho(nx, R)$
- Including interest rate moments is our unique features in the estimation.

Estimation

Table: Estimated parameters

Parameters	Description	Korea	Mexico
ρ_a	Persistence of transitory shocks	0.977 (0.024)	0.907 (0.035)
$100\sigma_a$	SD of transitory shocks	0.496 (0.076)	0.911 (0.080)
ρ_g	Persistence of trend shocks	0.949 (0.026)	0.876 (0.142)
$100\sigma_g$	SD of trend shocks	0.428 (0.167)	0.344 (0.246)
ϕ	Capital adjustment costs	19.35 (2.083)	10.36 (1.092)
θ	Degree of working capital frictions	0.000 (0.315)	0.165 (0.270)

- The size of trend shock is larger in Korean than in Mexico.
 - (KOR) $\sigma_a \approx \sigma_g$, (MEX) $\sigma_a \gg \sigma_g$
 - $\sigma_a^{KOR} \ll \sigma_a^{MEX}$, $\sigma_g^{KOR} > \sigma_g^{MEX}$
- θ s are insignificant in both countries.

Estimation

Table: Estimated parameters

Parameters	Description	Korea	Mexico
η	Risk premium from exp. productivity	0.315 (0.069)	0.509 (0.111)
ψ	Debt-elastic risk premium	0.036 (0.008)	0.088 (0.057)

- $\eta^{KOR} < \eta^{MEX}$
 - The sizes of η differ from the reduced-form results.
 - However, it does not reveal the relative importance of the two shocks.
- $\psi^{KOR} \ll \psi^{MEX}$
 - The estimated ψ is much larger than 0.001 for both Korea and Mexico.
 - The results are consistent with the spread equation estimation.

Estimation

Table: Moments: data vs. model

Moments	Korea		Mexico	
	Data	Model	Data	Model
$\sigma(y)$	1.99	1.73	2.54	2.38
$\sigma(\Delta y)$	1.30	1.25	1.52	1.68
$\sigma(c)/\sigma(y)$	1.54	1.51	1.00	1.00
$\sigma(nx)/\sigma(y)$	0.83	0.83	0.53	0.58
$\sigma(R)/\sigma(y)$	0.15	0.26	0.16	0.25
$\rho(y_t, y_{t-1})$	0.82	0.81	0.83	0.76
$\rho(\Delta y_t, \Delta y_{t-1})$	0.42	0.43	0.42	0.07
$\rho(y, c)$	0.92	0.94	0.94	0.97
$\rho(y, nx)$	-0.83	-0.64	-0.66	-0.59
$\rho(y, R)$	-0.33	-0.44	-0.31	-0.72

- Report the second moments from both the data and the model.
- The model demonstrates a strong fit to the data in both countries.

Estimation - The role of the interest rate moment

Table: Estimates without using interest rate moments

	Korea			Mexico		
	Benchmark	(1)	(2)	Benchmark	(1)	(2)
ρ_a	0.977 (0.024)	0.901 (0.825)	1.000 (0.021)	0.907 (0.035)	0.852 (0.249)	0.993 (0.009)
$100\sigma_a$	0.496 (0.076)	0.384 (0.341)	0.503 (0.090)	0.911 (0.080)	0.852 (0.143)	1.123 (0.141)
ρ_g	0.949 (0.026)	0.940 (0.088)	0.824 (0.435)	0.876 (0.142)	0.901 (0.450)	0.569 (85752)
$100\sigma_g$	0.428 (0.167)	0.372 (0.506)	0.298 (0.371)	0.344 (0.246)	0.199 (0.568)	0.001 (129.9)
ϕ	19.35 (2.083)	21.87 (24.50)	23.92 (3.682)	10.36 (1.092)	14.90 (4.550)	13.92 (1.220)
θ	0.000 (0.315)	0.000 (0.417)	1.320 (0.436)	0.165 (0.270)	0.300 (0.346)	1.017 (0.792)
η	0.315 (0.069)	0.969 (0.720)	0.000 (—)	0.509 (0.111)	0.609 (0.506)	0.000 (—)
ψ	0.036 (0.008)	0.062 (0.029)	0.001 (—)	0.088 (0.057)	0.041 (0.038)	0.001 (—)

- Letendre and Obaid (2020): The interest rate series are important for the Bayesian estimation.
- Re-estimate the model without 3 interest rate moments, $\sigma(R)$, $\rho(y, R)$, $\rho(nx, R)$. (12 moments)
- ψ and η are poorly identified without the interest rate moments.

Results

Results - Random Walk Component (RWC)

$$\text{RWC} = \frac{\alpha^2 \sigma_g^2 / (1 - \rho_g^2)}{2 / (1 + \rho_a) \sigma_a^2 + \alpha^2 \sigma_g^2 / (1 - \rho_g^2)}$$

- RWC: the relative importance of trend shocks to TFP growth variability
- $\sigma_g^2 / (1 - \rho_g^2)$: the contribution of the trend shock
- $2 / (1 + \rho_a) \sigma_a^2$: the contribution of the transitory shock

Table: RWC results

	RWC	Estimated shock parameters			
		ρ_a	$100\sigma_a$	ρ_g	$100\sigma_g$
Korea	77.3%	0.977	0.496	0.949	0.428
Mexico	21.2%	0.907	0.911	0.876	0.344

- Trend shock contribution : (KOR) 77% vs. (MEX) 21%

Results - Variance decomposition

Table: Variance decomposition: baseline model

	Korea			Mexico		
	ϵ_a	ϵ_g	ϵ_{R^*}	ϵ_a	ϵ_g	ϵ_{R^*}
y	44.5	54.6	0.8	82.8	16.6	0.5
c	27.2	69.7	3.1	68.5	29.8	1.7
i	38.1	32.7	29.2	79.2	6.4	14.4
nx	13.0	54.7	32.2	50.3	14.7	35.0

- Variance decomposition of macroeconomic variables with respect to each structural shock.
- Trend shock on y : (KOR) 54.2% vs. (MEX) 16.6%
- Trend shock on c : (KOR) 69.7% vs. (MEX) 29.8%
- In Korea, trend shock is the main source of business cycle.

Results - Role of financial friction

- The debt-elasticity(ψ) and the risk premium(η) are the critical financial friction.
- Previous studies about ψ and η
 - Aguiar and Gopinath (2008) : Set $\psi = 0.001$ and $\eta = 0.0$, not estimated.
 - Garcia-Cicco et al. (2010), Germaschewski et al. (2024) : Estimate ψ but set $\eta = 0.0$.
 - Chang and Fernandez (2013) : Set $\psi = 0.001$ and estimate η .
 - Miyamoto and Nguyen (2017) : Estimate both ψ and η .
- Counterfactual analysis
 - Benchmark : estimate ψ and η
 - CF(1) : Fix $\psi = 0.001$, Fix $\eta = 0.000$
 - CF(2) : Fix $\psi = 0.001$, Estimate $\eta = 0.000$
 - CF(3) : Estimate $\psi = 0.001$, Fix $\eta = 0.000$

Results - Role of financial friction

Table: Counterfactual Analysis for Korea - Parameter estimates

	(BM) Benchmark	CF(1) Fix $\psi = 0.001$ Fix $\eta = 0.000$	CF(2) Fix $\psi = 0.001$ Estimate η	CF(3) Estimate ψ Fix $\eta = 0.0$
ϕ	19.35 (2.083)	23.03 (1.296)	29.72 (3.178)	15.56 (1.295)
θ	0.000 (0.315)	1.523 (0.294)	0.224 (0.288)	0.055 (0.958)
η	0.315 (0.069)	0.000 (—)	0.174 (0.041)	0.000 (—)
ψ	0.036 (0.008)	0.001 (—)	0.001 (—)	0.020 (0.006)
ρ_a	0.977 (0.024)	1.000 (0.007)	0.983 (0.012)	0.978 (0.085)
$100\sigma_a$	0.496 (0.076)	0.590 (0.066)	0.800 (0.052)	0.299 (0.142)
ρ_g	0.949 (0.026)	0.861 (0.027)	0.950 (0.408)	0.917 (0.017)
$100\sigma_g$	0.428 (0.167)	0.591 (0.065)	0.093 (0.588)	0.683 (0.076)
RWC	77.3%	64.2%	6.0%	93.8%

Results - Role of financial friction

Table: Variance decomposition with different cases (Korea)

	(BM) Benchmark		CF(1) $\psi = 0.001$ $\eta = 0.000$		CF(2) $\psi = 0.001$ Estimate η		CF(3) Estimate ψ $\eta = 0.0$	
	ϵ_a	ϵ_g	ϵ_a	ϵ_g	ϵ_a	ϵ_g	ϵ_a	ϵ_g
<i>y</i>	44.5	54.6	40.1	51.8	96.8	1.7	10.8	88.0
<i>c</i>	27.2	69.7	25.1	52.7	83.9	5.0	4.5	92.3
<i>i</i>	38.1	32.7	12.6	31.9	62.7	2.9	3.5	49.2
<i>nx</i>	13.0	54.7	2.3	34.1	36.3	7.9	0.0	59.1
<i>h</i>	44.5	54.6	32.0	41.6	96.0	1.6	10.7	87.9

- (CF1) $\psi = 0.001, \eta = 0.0$: Trend shock is the dominant factor.
- (CF2) $\psi = 0.001, \eta = 0.174$: σ_g insignificant. Trend shock is negligible.
- (CF3) $\psi = 0.020, \eta = 0.0$: σ_g and ψ are significant. Trend shock is the dominant factor.
- Estimating ψ is critical for identifying the contribution of trend shock.
- Ignoring η overestimates σ_g and the contribution of trend shock.

Conclusion

Conclusion

- This study revisits the sources of business cycle fluctuations in emerging markets, with a particular focus on the Korean economy.
- A structural model is developed and estimated, jointly incorporating:
 - Both trend shocks and transitory productivity shocks, and
 - Three key financial frictions
 - (1) Debt-elastic risk premia
 - (2) Risk premia tied to expected productivity
 - (3) Working capital constraints

Conclusion

- The findings reveal substantial cross-country heterogeneity in the origins of macroeconomic volatility:
 - **Korea: Trend shocks** account for the majority of volatility in aggregate variables.
 - **Mexico: Transitory shocks** remain the dominant source of fluctuations.
- Financial frictions are quantitatively crucial to identify the source of business cycle.
- The **working capital constraint** is found to be **insignificant** in both economies.
- Debt elasticity and the risk premium of expected productivity play a central role in correctly identifying trend shocks.
 - Omitting or mis-specifying these two factors leads to substantial bias.
 - Estimating debt elasticity is critical to identify the contribution of trend shock.

Thank you.