Trends and Cycles in Small Open Economies:
Making The Case for a General Equilibrium Approach

by

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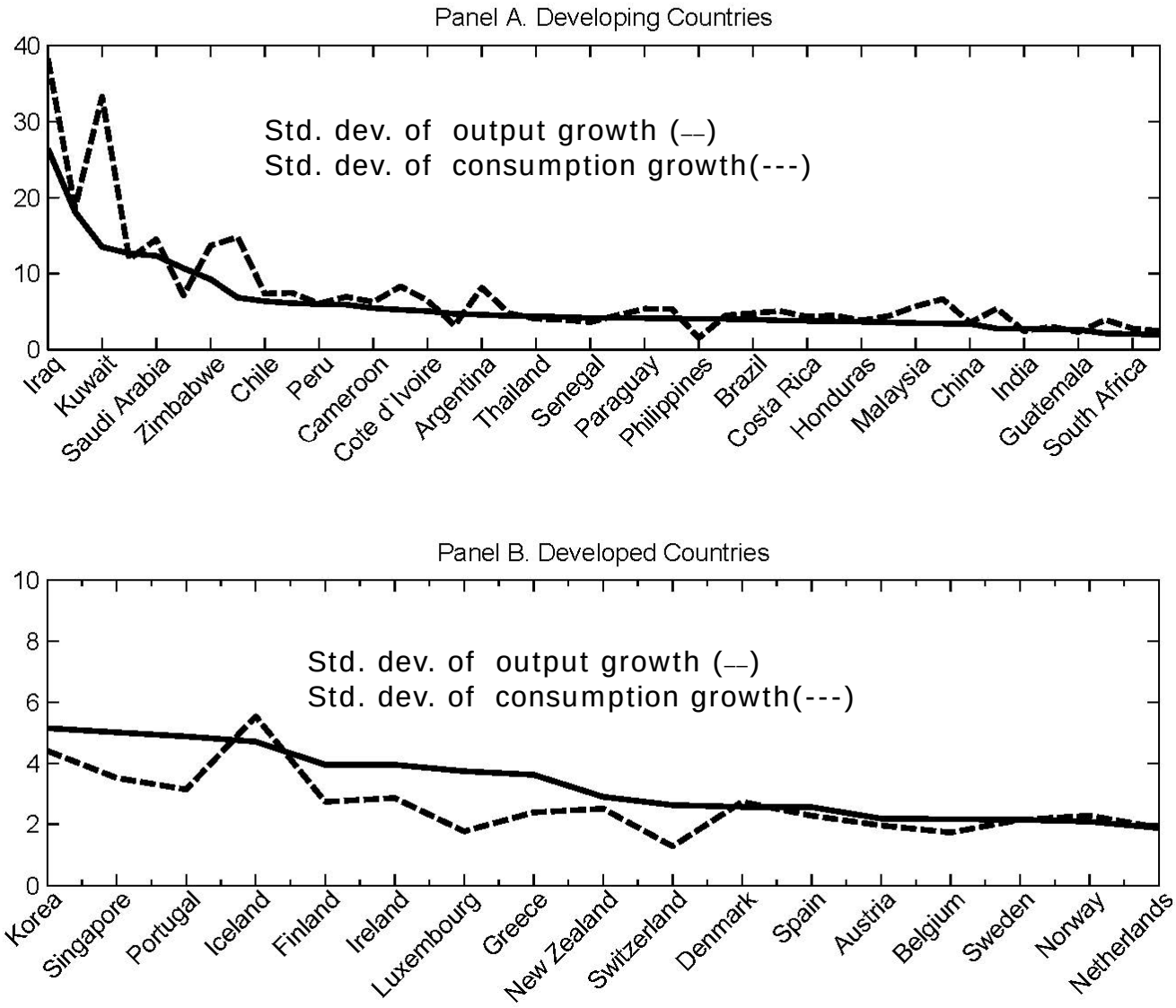
Figure 1. International business cycles



The Question

What are the relative contributions of permanent and transitory productivity shocks to a nation's output growth?

Answers

Aguiar and Gopinath (JPE, 2007)

"Emerging Markets: The Cycle is the Trend"

Permanent component accounts for **84%** of growth variability in **emerging markets**.

Permanent component accounts for **61%** of growth variability in **developed economies**

Answers

This paper

Permanent component accounts for ~~**84%**~~ **52%** of growth variability in **emerging markets**.

Permanent component accounts for ~~**61%**~~ **60%** of growth variability in **developed economies**.

Why the Big Change for Emerging Markets?

GE calibration matches output and consumption growth **volatility** (as in AG) but <u>also</u> output and consumption **correlations** with the G-8

Developing nation's comove less with the G-8 → **smaller spillover of G-8 permanent shock**

Serves as counterbalance to quite valid inference in AG that emerging markets are hit with large **<u>idiosyncratic</u> permanent shocks**.

The Model
Baxter and Crucini (1995)

$$U\left(C_{jt}, L_{jt}\right) = \frac{1}{1-\sigma}\left[C_{jt}^{\theta} L_{jt}^{1-\theta}\right]^{1-\sigma}$$

$$Y_{jt} = A_{jt} K_{jt}^{1-\alpha}\ N_{jt}^{\alpha}$$

$$K_{jt+1} = (1-\delta)K_{jt} + \emptyset(I_{jt}/K_{jt})K_{jt}$$

j – country

t – time period

The PE versus GE Versions

Partial Equilibrium

$$P_t^B B_{jt+1} - B_{jt} = Y_{jt} - C_{jt} - I_{jt}$$

$$\lim_{t\to\infty} \beta^t p_{jt} B_{jt+1} = 0$$

General Equilibrium

$$\pi_0(Y_{0t} - C_{0t} - I_{0t}) + \pi_j\left(Y_{jt} - C_{jt} - I_{jt}\right) = 0$$

0 – the G-8 composite

The Productivity Shocks

$$\begin{bmatrix} lnA_{jt} \\ lnA_{0t} \end{bmatrix} = \begin{bmatrix} 1 & 1 & \omega_j^P & \omega_j^T \\ 0 & 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} lnA_{jt}^P \\ lnA_{jt}^T \\ lnA_{0t}^P \\ lnA_{0t}^T \end{bmatrix}$$

$$lnA_{jt}^P = lnA_{jt-1}^P + ln\varepsilon_{jt}^P$$

$$lnA_{jt}^T = \rho lnA_{jt-1}^T + ln\varepsilon_{jt}^T$$

Partial equilibrium adds exogenous world interest rate

$$lnP_t^B = \gamma_j lnP_{jt-1}^B + ln\varepsilon_{jt}^B$$

The SOE Model
Differences from Aguiar and Gopinath (2007)

- AG use debt-elastic interest rate no role for exogenous changes in world interest rates, we follow Mendoza and have an AR(1) process for the world interest rate.
- AG indicate the debt-elastic interest rate matters little, we show the world interest rate matters somewhat
- Adjustment costs in capital are convex rather than quadratic
- We show our SOE model tells the same basic story as AG, our GE model does not!

Small Open Economies in General Equilibrium (Trick – take them one at a time!)

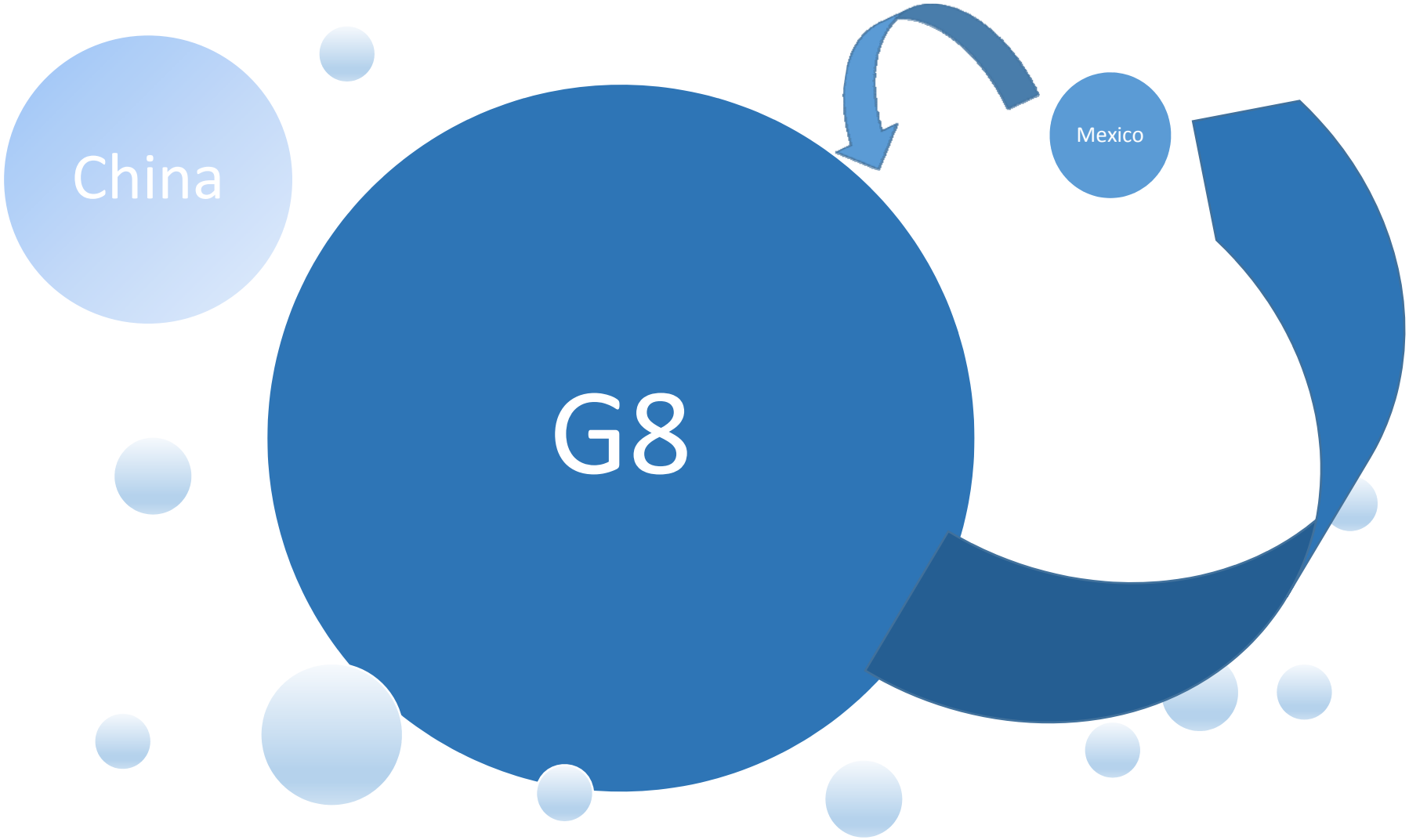


Table 1 – G-8 Moment Matching, Closed Economy

	Data	Model
Standard deviation of:		
GDP growth	1.80	1.94
Consumption growth	1.28	1.15
Consumption-GDP ratio	1.44	1.32
G-8 productivity parameters		
Std. dev. of permanent shock	**1.1**	
Persistence of transitory shock	**0.85**	
Std. dev. of transitory shock	**1.2**	

Table 2 – SOE Moment Matching, GE Model

	Developing		Developed	
	Data	Model	Data	Model
Std. Dev. of Con growth	7.77	7.74	2.45	4.43
Std. Dev. of GDP growth	5.98	7.16	3.01	4.32
Corr. with G-8 GDP growth	0.16	0.17	0.49	0.48
Corr. with G-8 Cons growth	0.04	0.04	0.37	0.38

Table 2 – Estimates of Productivity Processes (Reported: Cross-country averages)

	Developing	Developed
Std. dev. relative to G-8		
$v_j^P \in [0.1,15]$	4.21	1.18
$v_j^T \in [0.1,15]$	2.14	1.19
Spillover factor loadings		
$\omega_j^P \in [-15,15]$	0.7	2.5
$\omega_j^T \in [-15.1,15]$	0.6	0.3

Table 4. Output Variance Decompositions Small Open Economy Model w/o spillovers

	Variance Decomposition (source of shock)					
Countries	Home Permanent	Home Transitory	World Interest Rate	Total	No. of countries	Std. dev. of Output
All	48.6	44.0	7.5	100	60	5.2
Developing	59.9	35.4	4.7	100	42	6.0
Developed	22.2	63.9	13.8	100	18	3.2

Productivity spillovers are abstracted from here because they would not be identified in the SOE framework.

Figure 3. Proportion of output growth variance accounted forby permanent shocks: Comparison of SOE model with productivity spillovers to SOE model without spillovers

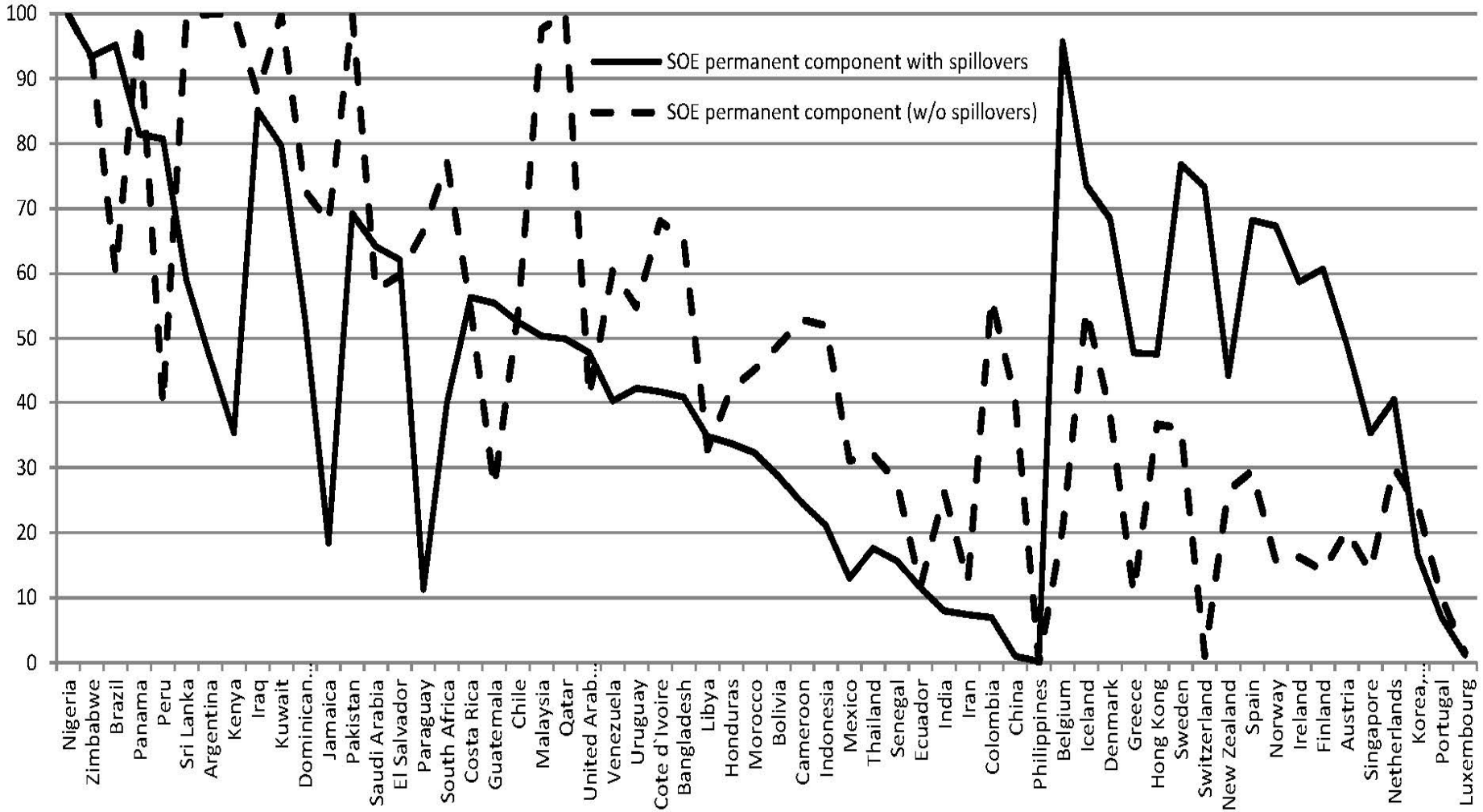
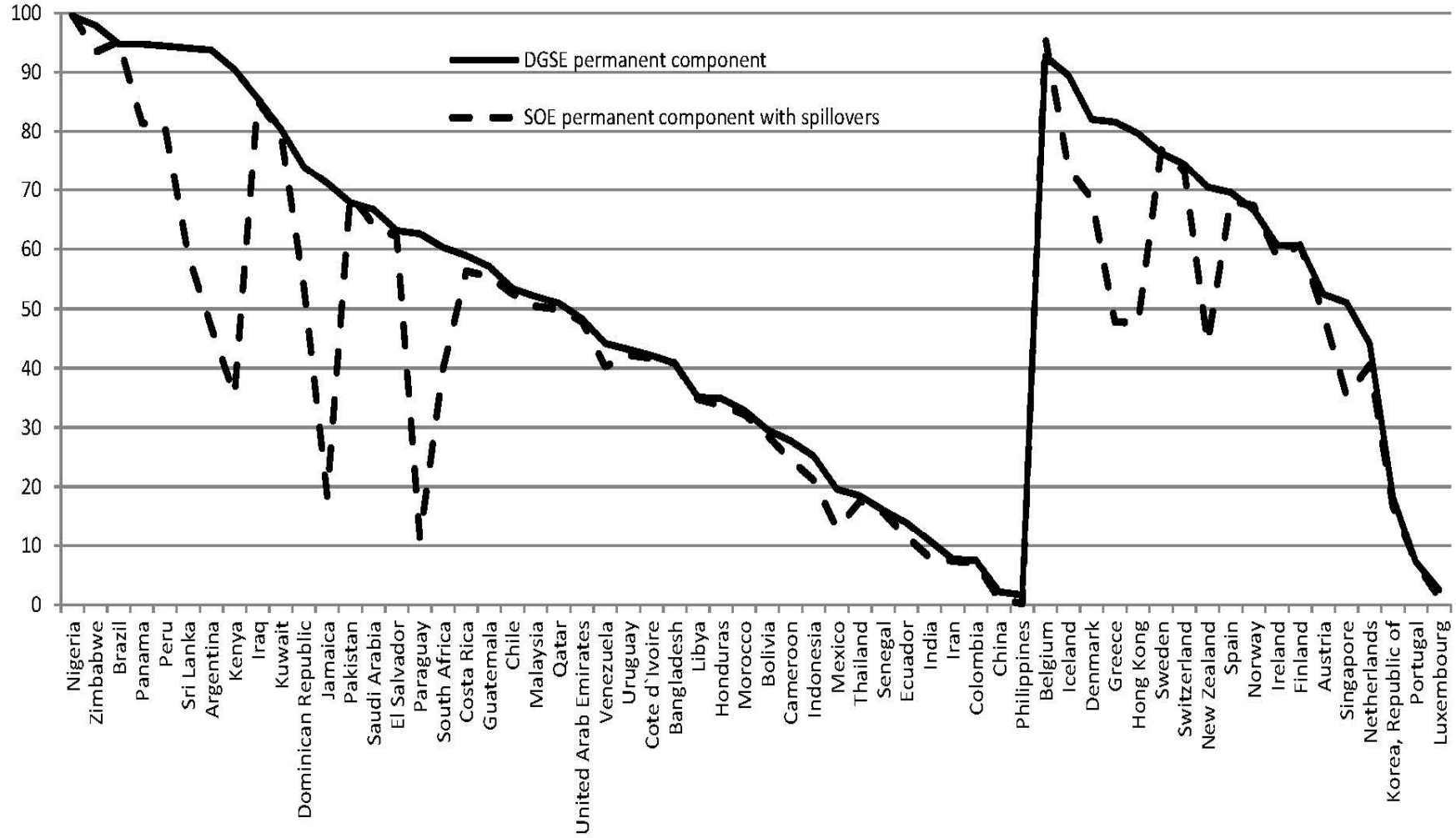


Table 5 – Output Variance Decompositions, DGSE Model

	Permanent			Transitory		
	Total	**Home**	**G8**	**Total**	**Home**	**G8**
Developing	**51.5**	39.0	12.5	**48.4**	36.1	12.3
Developed	**60.0**	14.4	45.5	**40.0**	29.3	10.7

Figure 2. Proportion of output growth variance accounted for by permanent shocks: Comparison of DGSE model and SOE with productivity spillovers



Concluding Remarks

We all know GE analysis is appropriate when studying large open countries.

Less well known is the importance of GE analysis when studying small open economies.

As first pointed out in Crucini (1991), in stochastic environments we need to know not only that a country is small enough to not affect world interest rates, we need to know how home and foreign shocks correlate. How idiosyncratic is the country?

The method outlined in this paper is not more demanding than the SOE model, but has starkly different business cycle implications.

Moreover, it allows all prices to be endogenous.

Thank you!

Table 4. Output Variance Decompositions Small Open Economy Model

	Variance Decomposition (source of shock)					
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All	48.6	44.0	7.5	100	60	5.2
Developing	59.9	35.4	4.7	100	42	6.0
Developed	22.2	63.9	13.8	100	18	3.2
AG Sample	34.6	54.0	11.4	100	20	3.3
Developing	49.9	47.2	2.8	100	9	4.2
Developed	22.2	59.5	18.4	100	11	2.5

Productivity spillovers are abstracted from here because they would not be identified in the SOE framework.

Table 5 – Output Variance Decompositions, Model Comparison

	DGSE Model					SOE Model				
	Permanent		Transitory			Permanent		Transitory		
	Home	G8	Home	G8		Home	G8	Home	G8	Interest Rate
Developing	**39.0**	12.5	**36.1**	12.3		9.2	33.9	10.6	35.0	11.4
Developed	14.4	**45.5**	**29.3**	10.7		38.6	13.2	9.2	28.8	10.2