How Important Are Terms of Trade Shocks?

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Conventional View:
Terms-of-trade shocks are a major source of business-cycle fluctuations in poor and emerging countries. (ex: Mendoza, IER 1995; Kose, 2002.)

This paper:
Terms-of-trade shocks explain on average only about 10 percent of the variance of output in poor and emerging countries.

The Terms of Trade:

$$tot_t = \frac{P_t^x}{P_t^m}$$

tot_t = terms of trade.
P_t^x = price of exports.
P_t^m = price of imports.

Mendoza (IER, 1995): "Results show that terms-of-trade shocks account for nearly 1/2 of actual GDP variability."

Methodology:

1. Collect annual terms-of-trade data from 23 developing countries. Sample period is 1960 to 1990. HP filter log of tot_t. Compute serial correlation and standard deviation of tot_t. Then take averages (means) across countries. This yields:

$$corr(tot_t, tot_{t-1}) = 0.414 \qquad std(tot_t) = 0.1177$$

2. Build a theoretical model with 3 sectors, exportables, importables, and nontradables. Calibrate the model. Assume that tot_t is exogenous to the country and follows a univariate process with serial correlation 0.414 and standard deviation 0.1177.

3. Compute the standard deviation of output under the assumption that terms-of-trade shocks are the **only** source of uncertainty. This yields std(GDP_t^{model}).

4. Compare std(GDP_t^{model}) with the cross-country average standard deviation of GDP observed in his panel. Mendoza (1995) finds

$$\frac{std(GDP_t^{\text{model}})}{std(GDP_t^{\text{data}})} = \mathbf{0.56}$$

Thus, terms-of-trade shocks explain **31 percent** ($= 0.56^2 \times 100$) of the variance of GDP.

Observations on Standard Methodology

• The finding that TOT shocks explain over 1/3 of the variance of output is obtained in the context of highly stylized structural model (essentially, an open-economy version of the RBC model).

• The methodology relies on the theoretical model representing a reasonable approximation to the actual transmission mechanism of TOT shocks. This, aspect, however, is typically unexplored.

An Alternative Methodology: SVAR Analysis

• The SVAR approach presented here uses the same restrictions to identify TOT shocks, but allows for a more flexible specification of the transmission mechanism.

Part I: SVAR Analysis

Empirical Model

- Let $x_t = \left[\widehat{tot}_t, \ \widehat{tb}_t, \ \widehat{y}_t, \ \widehat{c}_t, \ \widehat{i}_t, \ \widehat{RER}_t \right]'$.

- VAR: $x_t = \mathbf{A}\, x_{t-1} + u_t$

- Identification of ToT shocks:
$$u_t = \Pi \epsilon_t$$
$$\epsilon_t \sim (0, I)$$
$$\Pi_{1,j} = 0 \text{ for } j = 2, \ldots, 6$$

- ToT process is univariate: $A_{1,j} = 0$ for $j = 2, \ldots, 6$

- All variables (except tb_t) are log-quadratically detrended.

- Estimate the SVAR country-by-country using OLS.

Data:

• Include all poor and emerging countries that have at least 30 consecutive annual observations of output, consumption, investment, net exports, the terms of trade, and the real exchange rate in the World Bank's WDI database.

• Poor and emerging countries are defined as countries with average PPP-converted GDP per capita in U.S. dollars of 2005 over the period 1990 to 2009 below 25,000 dollars.

• 38 countries satisfy both criteria.

Algeria, Argentina, Bolivia, Botswana, Brazil, Burundi, Cameroon, Central African Republic, Colombia, Congo, Dem. Rep., Costa Rica, Cote d'Ivoire, Dominican Republic, Egypt, Arab Rep., El Salvador, Ghana, Guatemala, Honduras, India, Indonesia, Jordan, Kenya, Korea, Rep., Madagascar, Malaysia, Mauritius, Mexico, Morocco, Pakistan, Paraguay, Peru, Philippines, Senegal, South Africa, Sudan, Thailand, Turkey, and Uruguay.

- Sample period: 1980-2011 (32 years).

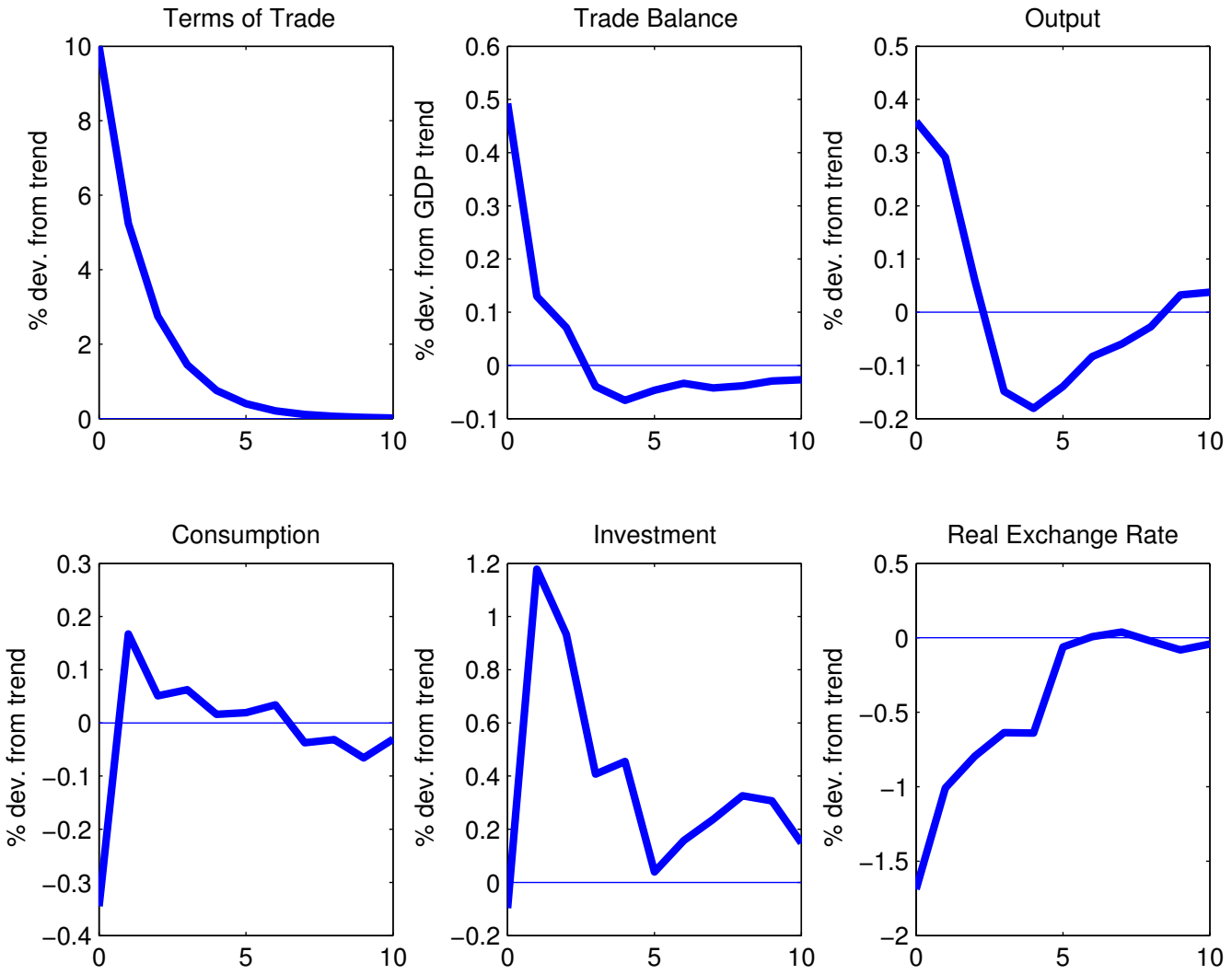
- Our sample of 38 countries.

$$\widehat{tot}_t = \rho \widehat{tot}_{t-1} + \sigma_{tot} \epsilon_t^{tot}; \qquad \epsilon_t^{tot} \sim (0, 1)$$

Estimate ρ and σ_{tot} country by country

	ρ	$\frac{\sigma_{tot}}{\sqrt{1-\rho^2}}$
Median	0.52	0.10
Interquartile Range	$[0.41, 0.61]$	$[0.09, 0.13]$

Impulse Response to A 10% Increase in the Terms of Trade
SVAR Evidence, Median across 38 countries



Observations on the estimation results:

- half-life of TOT shock is just 1 year.

- R^2 of tot equations is modest on average, 30 percent

- HLM effect (i.e., $tb \uparrow$ in response to a ToT appreciation) hold in 29 out of the 38 countries.

- On average, increase in GDP is 0.4 percent on impact.

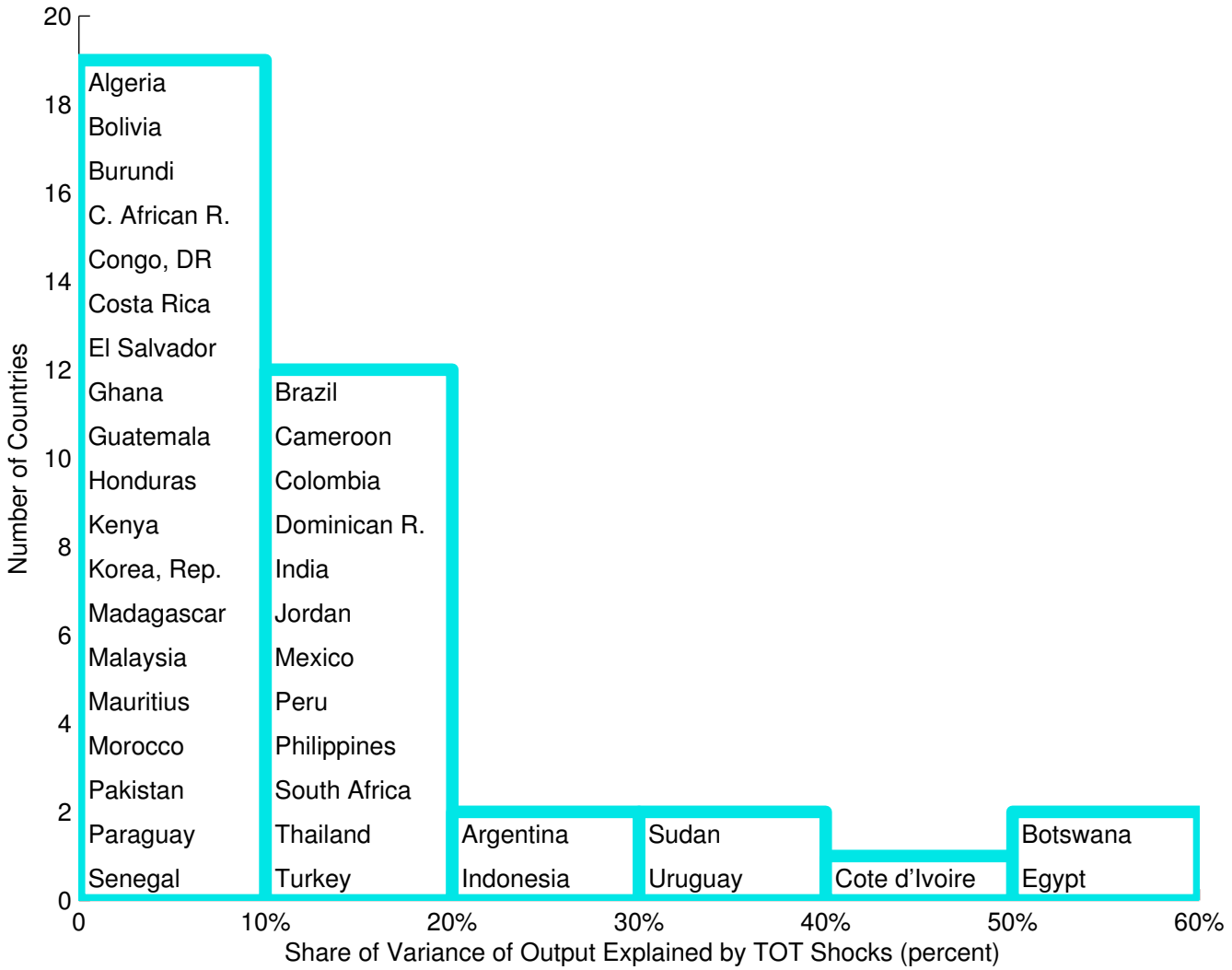
- On average, c and i increase with a one-year delay.

- Tot appreciation leads to an appreciation of the real exchange rate.

Share of Variance Explained by Terms of Trade Shocks: SVAR Evidence

	tot	tb	y	c	i	RER
Median	100	12	**10**	9	10	14
Median Absolute Deviation	0	7	7	6	7	11

Share of Variance of Output Explained by Terms of Trade Shocks



Summary of SVAR Approach

• On average, TOT shocks explain 10 percent of the variance of output in poor and emerging countries.

• In only 5 countries (Botswana, Egypt, Cote d'Ivoire, Sudan, and Uruguay) do ToT shocks explain more than 30 percent of the variance of output.

• Thus, the SVAR evidence is at odds with the conventional wisdom according to which ToT shocks account for a large share of output variability in poor and emerging markets.

Part II:

Use a structural model to assess the importance of ToT shocks. Estimate some model parameters country-by-country using data from same 38 emerging and poor countries used in the SVAR.

The Theoretical Model

- small open economy that takes terms of trade as given.

- 3 sectors of production: exportable goods, importable goods, nontradable goods, with variable capital and labor inputs.

- Similar to Mendoza (IER,1995) but with more flexibility:
  —Capital in the nontraded sector can vary over time.
  —Labor in the importable and exportable sectors can vary.
  —Investment goods have a domestically produced component.
  —Allow for sector specificity in capital and labor.

The household problem:

Preferences:

$$E_0 \sum_{t=0}^{\infty} \beta^t U(c_t, h_t^m, h_t^x, h_t^n)$$

Budget constraint:

$$c_t + i_t^m + i_t^x + i_t^n + p_t^\tau d_t + \Phi_m(k_{t+1}^m - k_t^m) + \Phi_x(k_{t+1}^x - k_t^x) + \Phi_n(k_{t+1}^n - k_t^n) = \frac{p_t^\tau d_{t+1}}{1+r_t} + w_t^m h_t^m + w_t^x h_t^x + w_t^n h_t^n + u_t^m k_t^m + u_t^x k_t^x + u_t^n k_t^n$$

Final Goods Production

$$y_t^f = \left[\chi_\tau \left(a_t^\tau\right)^{1-\frac{1}{\mu_{\tau n}}} + \left(1-\chi_\tau\right)\left(a_t^n\right)^{1-\frac{1}{\mu_{\tau n}}}\right]^{\frac{1}{1-\frac{1}{\mu_{\tau n}}}},$$

y_t^f = final goods.
a_t^τ = composite of traded goods.
a_t^n = nontraded goods.
$\mu_{\tau n}$ = elasticity of substitution between T and N goods.
χ_τ = expenditure share on tradables if $\mu_{\tau n}$.

Production of the Tradable Composite Good

$$a_t^{\mathcal{T}} = \left[\chi_m \left(a_t^m\right)^{1-\frac{1}{\mu_{mx}}} + (1-\chi_m)\left(a_t^x\right)^{1-\frac{1}{\mu_{mx}}}\right]^{\frac{1}{1-\frac{1}{\mu_{mx}}}}$$

$a_t^{\mathcal{T}}$ = composite of traded goods.
a_t^m = importable goods.
a_t^x = exportable goods.
μ_{mx} = elasticity of substitution between importables and exportables.
χ_m = expenditure share if $\mu_{mx} = 1$.

Production of Importable Goods

$$y_t^m = A^m \left(k^m\right)^{\alpha_m} \left(h^m\right)^{1-\alpha_m}$$

y_t^m = quantity of importable goods produced domestically.
A^m = level of productivity in the importable sector.
k_t^m = capital input in the importable sector.
h_t^m = labor input in the importable sector.
$1 - \alpha_m$ = labor share in the importable sector.

Production of Exportable Goods

$$y_t^x = A^x \left(k^x\right)^{\alpha_x} \left(h^x\right)^{1-\alpha_x}$$

y_t^x = quantity of exportable goods produced.
A^x = level of productivity in the exportable sector.
k_t^x = capital input in the exportable sector.
h_t^x = labor input in the exportable sector.
$1 - \alpha_x$ = labor share in the exportable sector.

Production of Nontradable Goods

$$y_t^n = A^n \left(k^n\right)^{\alpha_n} \left(h^n\right)^{1-\alpha_n}$$

y_t^n = quantity of nontraded goods produced.
A^n = level of productivity in the nontradable sector.
k_t^n = capital input in the nontradable sector.
h_t^n = labor input in the nontradable sector.
$1 - \alpha_n$ = labor share in the nontraded sector.

To ensure a stationary equilibrium process for external debt, we assume that the country interest-rate premium is debt elastic,

$$r_t = r^* + p(d_{t+1})$$

Terms of Trade Process

$$\ln\left(\frac{tot_t}{\overline{tot}}\right) = \rho \ln\left(\frac{tot_{t-1}}{\overline{tot}}\right) + \sigma_{tot}\epsilon_t^{tot}; \quad \epsilon_t^{tot} \sim (0,1)$$

$\overline{tot} > 0$.
$\rho \in (-1,1)$.
$\sigma_{tot} > 0$.

Functional Form Assumptions

$$p(d) = \psi\left(e^{d-\bar{d}} - 1\right)$$

$$\Phi_j(x) = \frac{\phi_j}{2}x^2; \quad j = m, x, n$$

Calibrated and Estimated Parameters

Calibrated Structural Parameters											
ρ	σ_{tot}	α_m, α_x	α_n	$\omega_m, \omega_x, \omega_n$	μ_{mx}	$\mu_{\tau n}$	$\overline{tot}$	A^m, A^n	β	σ	δ	r^*
$*$	$*$	0.35	0.25	1.455	1	0.5	1	1	$1/(1+r^*)$	2	0.1	0.11
Moment Restrictions												
$\frac{\sigma_i}{\sigma_y}$	$\frac{\sigma_{tb}}{\sigma_y}$	$\frac{\sigma_{im+ix}}{\sigma_{in}}$	s_n	s_x	s_{tb}	$\frac{p^m y^m}{p^x y^x}$						
$*$	$*$	1.5	0.5	0.2	0.01	1						
Implied Structural Parameter Values												
ϕ_m	ϕ_x	ϕ_n	ψ	χ_m	χ_τ	$\overline{d}$	A^x	β				
$*$	$*$	$*$	$*$	0.8980	0.4360	0.0078	1	0.9009				

Notes.

*Country-specific estimates.

$\frac{\sigma_i}{\sigma_y}$ and $\frac{\sigma_{tb}}{\sigma_y}$ are conditional on tot shocks

$s_n \equiv p^n y^n / y$,

$s_x \equiv x/y$,

$s_{tb} \equiv (x-m)/y$, where $y \equiv p^m y^m + p^x y^x + p^n y^n$.

Key parameters determining the importance of terms of trade shocks:

• ρ and σ_{tot}, the more volatile and the more persistent are terms of trade shocks, the more volatile is output.

• The size of the nontraded sector: $\frac{p^n y^n}{y}(= 50\%)$. The larger the nontraded sector, the smaller the output effects of tot shocks.

• The steady-state trade share: $\frac{x+m}{y}(= 39\%)$. The larger the trade share, the larger the output effects of tot shocks.

Estimate capital adjustment cost parameters and the debt elasticity of the interest rate, ϕ_m, ϕ_x, ϕ_n, ψ, χ_m, to match country-by-country the relative standard deviations

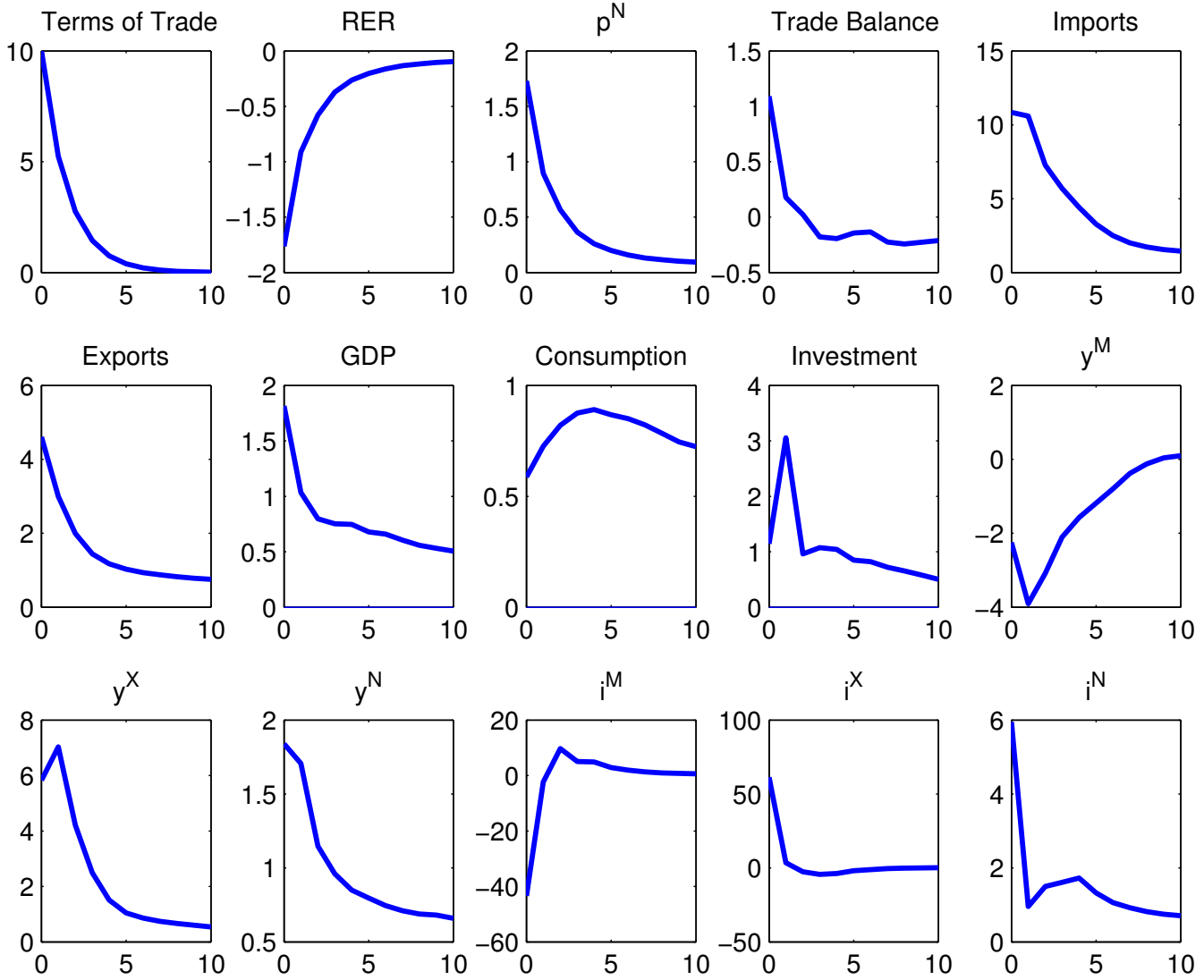
$$\sigma_i/\sigma_y \quad \text{and } \sigma_{tb}/\sigma_y$$

conditional on terms of trade shocks and $\sigma_{i_x+i_m}/\sigma_{i_n} = 1.5$.

Medians of Country-Specific Estimates of the Capital Adjustment Cost Parameters and the Debt Elasticity of the Interest Rate

					σ_i/σ_y		σ_{tb}/σ_y	
	ϕ_m	ϕ_x	ϕ_n	ψ	Data	Model	Data	Model
Median	1.13	1.40	0.69	0.84	3.36	3.00	0.64	0.74
MAD	1.13	1.40	0.69	0.77	1.42	0.52	0.33	0.34

Median of Country-Specific Predicted Impulse Response to a Ten-Percent Terms-of-Trade Shock



Observations of the figure:

- Substitution effect of an increase in tot_t on supply side. Firms produce more exportables and less importables, and given p_t^n would produce less nontradables.

- Substitution effect of an increase in tot_t on demand side. Demand for importable goods and nontraded goods rises, domestic demand for exportable goods falls. Wealth effect is positive increasing the demand for all goods. Price of nontradables, p_t^n, rises and the real exchange rate appreciates.

- Both exports and imports increase. Net effect on trade balance turns out to be positive. Thus model impulse response is consistent with Harberger-Laursen-Metzler effect.

- Aggregate investment increases by less than 10% on impact. But investment in the exportable sector rises by 61% while in decreases by over 40% in the importable sector.

Variance Decomposition:

We construct the counterpart to the observable variable 'GDP at constant LCU' in the theoretical model as:

$$y_t^{\text{constant prices}} = p_{ss}^x y_t^x + p_{ss}^m y_t^m + p_{ss}^n y_t^n,$$

where p_{ss}^i denotes the steady-state price of good $i = x, m, n$.

In the theoretical model, we deflate consumption and investment by the GDP deflator (constructed as a Paasche index):

$$P_t = \frac{p_t^x y_t^x + p_t^m y_t^m + p_t^n y_t^n}{p_{ss}^x y_t^x + p_{ss}^m y_t^m + p_{ss}^n y_t^n}$$

Finding:

The median share of the variance of output explained by tot shocks, according to the 38 calibrated models is **13** percent.

This number is close to the SVAR results but far from the conventional wisdom.

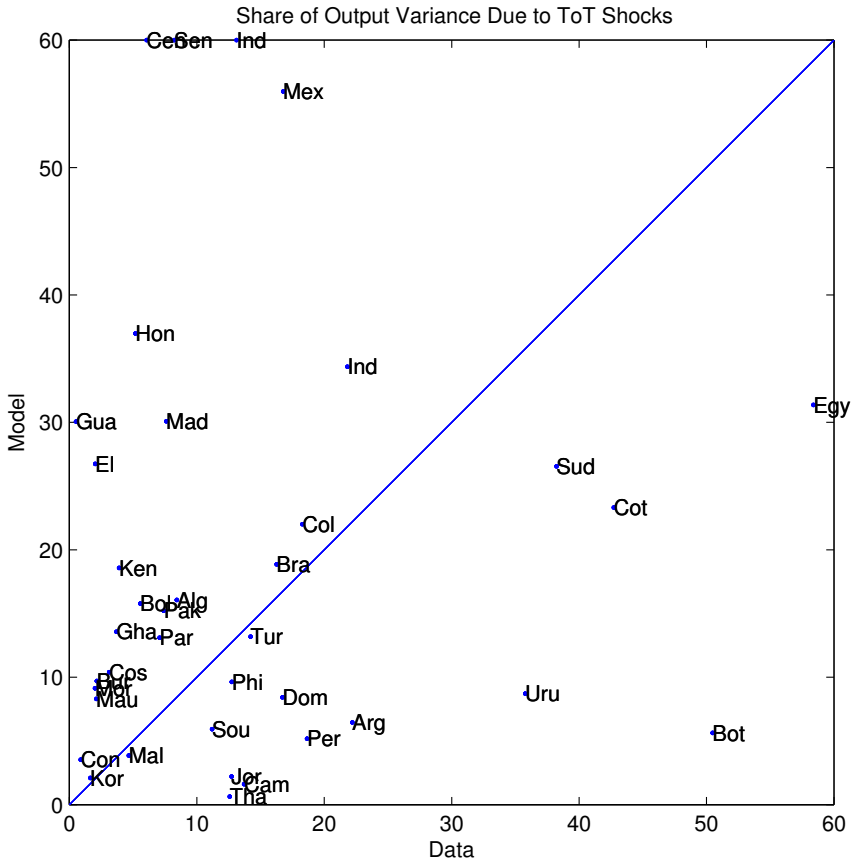
Median Share of Variance Explained by Terms of Trade Shocks

	tb	y	c	i	RER
Theoretical Model	21	13	18	11	1
SVAR Model	12	10	9	10	14

Cross Country Variation in the Share of Variance Explained by Terms of Trade Shocks in the Theoretical Model

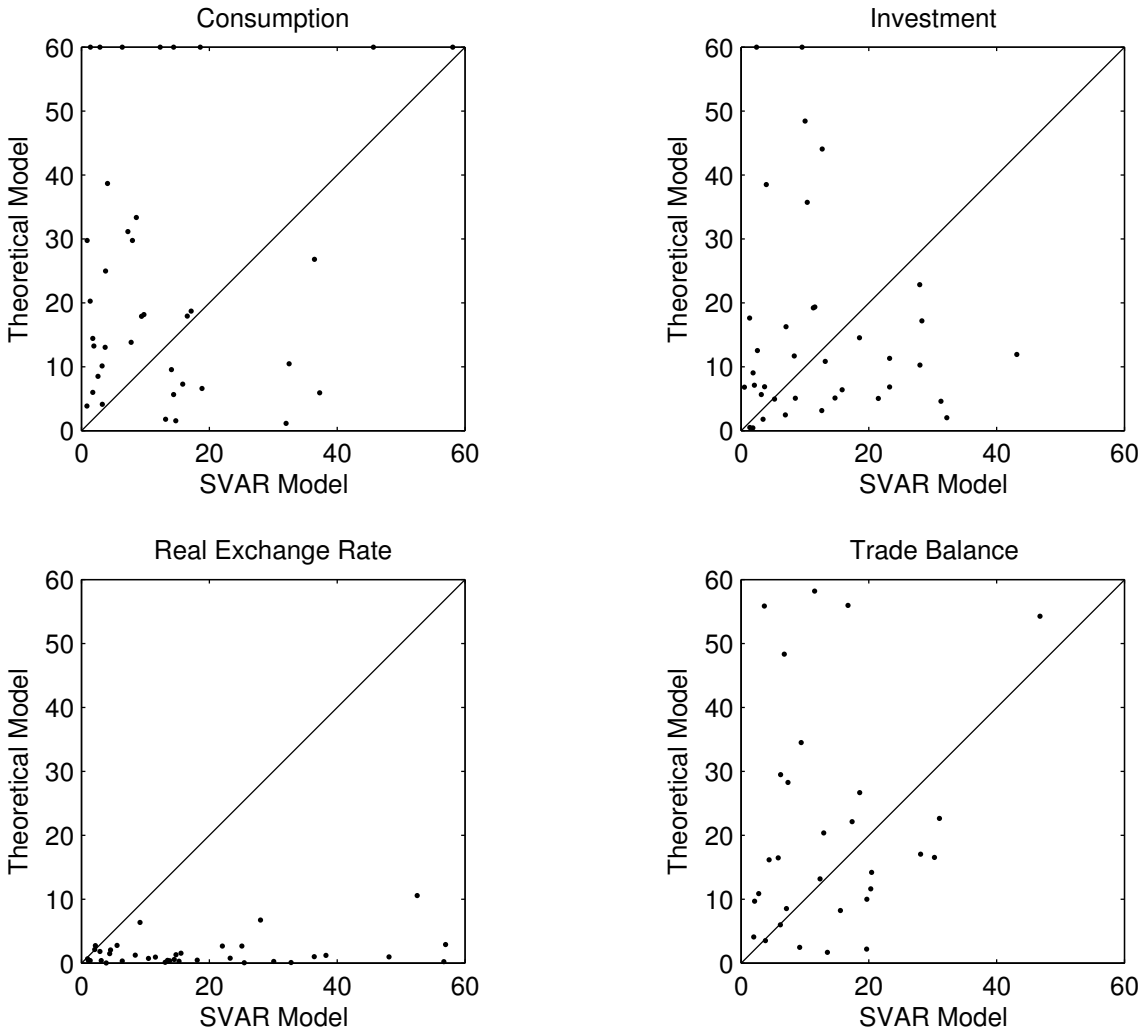
	tot	tb	y	c	i	RER
Cross-country Median	100	21	13	18	11	1
Median Absolute Deviation	0	13	8	12	6	1

Evaluating The Conventional Wisdom
How Does the Model Fit Country-Level Data?



The RBC framework appears to have difficulty capturing the propagation of TOT shocks.

Variance of Consumption, Investment, the Trade Balance, and the Real Exchange Rate Explained By Terms-of-Trade Shocks: SVAR Versus Model



Conclusion

1. Conventional wisdom has it that terms of trade shocks represent a major source of fluctuations for emerging countries.

2. Using SVAR analysis, the present study finds a modest role for TOT shocks.

3. The analysis suggests that the theoretical framework on which the conventional wisdom is based, an open economy version of the RBC model, fails to capture well the transmission mechanism of TOT shocks at the country level.

Extras

Model Predictions Using the Median ToT Process and Matching Median Moments

ϕ_m	ϕ_x	ϕ_n	ψ	ρ	σ_{tot}
0.00	41.16	0.37	1.56	0.52	0.08

Share of Variance Explained by Terms of Trade Shocks

	tb	y	c	i	RER
SVAR Model	12	10	9	10	14
Theoretical Model	24	19	15	13	0

$$\widehat{tot}_t = a_{11}\widehat{tot}_{t-1} + \pi_{11}\epsilon_t^1; \quad \epsilon_t^1 \sim (0,1)$$

Table 1: The Terms of Trade Process: Country-by-Country Estimates

Country	a_{11}	π_{11}	R^2
Algeria	0.43	0.20	0.18
Argentina	0.41	0.08	0.19
Bolivia	0.52	0.08	0.29
Botswana	0.52	0.06	0.33
Brazil	0.53	0.08	0.31
Burundi	0.59	0.17	0.34
Cameroon	-0.05	0.13	0.00
Central African Republic	0.86	0.09	0.71
Colombia	0.29	0.08	0.08
Congo, Dem. Rep.	0.41	0.14	0.17
Costa Rica	0.53	0.07	0.30

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Table 1 (continued from previous page)

Country	a_{11}	π_{11}	R^2
Cote d'Ivoire	0.46	0.16	0.22
Dominican Republic	0.44	0.09	0.19
Egypt, Arab Rep.	0.70	0.09	0.50
El Salvador	0.32	0.13	0.12
Ghana	0.17	0.09	0.03
Guatemala	-0.43	0.11	0.19
Honduras	0.55	0.10	0.32
India	0.63	0.09	0.38
Indonesia	0.55	0.11	0.30
Jordan	0.48	0.08	0.22
Kenya	0.66	0.07	0.52
Korea, Rep.	0.69	0.05	0.41
Madagascar	0.65	0.09	0.43
Malaysia	0.51	0.05	0.27
Mauritius	0.57	0.05	0.40
Mexico	0.78	0.09	0.60
Morocco	0.41	0.06	0.17

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Table 1 (continued from previous page)

Country	a_{11}	π_{11}	R^2
Pakistan	0.61	0.08	0.39
Paraguay	0.40	0.12	0.15
Peru	0.52	0.08	0.27
Philippines	0.53	0.08	0.35
Senegal	0.75	0.09	0.50
South Africa	0.74	0.04	0.53
Sudan	0.61	0.09	0.40
Thailand	0.55	0.04	0.34
Turkey	0.32	0.05	0.11
Uruguay	0.39	0.07	0.19
Median	0.52	0.08	0.30
MAD	0.11	0.01	0.11

Table 2: Share of Variance Explained by Terms of Trade Shocks: Country-Level SVAR Evidence

Country	tot	tb	y	c	i	RER
Algeria	100	67	8	58	10	25
Argentina	100	28	22	14	16	33
Bolivia	100	6	6	8	11	6
Botswana	100	20	50	32	32	8
Brazil	100	47	16	4	28	57
Burundi	100	4	2	4	1	9
Cameroon	100	9	14	13	13	16
Central African Republic	100	37	6	14	13	53
Colombia	100	7	18	7	13	13
Congo, Dem. Rep.	100	3	1	1	7	12
Costa Rica	100	17	3	1	2	2
Cote d'Ivoire	100	30	43	36	43	70

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Table 2 (continued from previous page)

Country	tot	tb	y	c	i	RER
Dominican Republic	100	20	17	16	28	14
Egypt, Arab Rep.	100	62	58	46	65	48
El Salvador	100	8	2	4	4	22
Ghana	100	4	4	3	3	4
Guatemala	100	5	1	2	2	13
Honduras	100	7	5	1	7	15
India	100	4	13	19	1	1
Indonesia	100	13	22	17	23	14
Jordan	100	31	13	32	4	5
Kenya	100	6	4	9	12	2
Korea, Rep.	100	17	2	3	28	36
Madagascar	100	7	8	1	3	6
Malaysia	100	6	5	3	5	1
Mauritius	100	9	2	6	2	4
Mexico	100	12	17	12	10	28
Morocco	100	2	2	2	3	10
Pakistan	100	2	7	2	1	3

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Table 2 (continued from previous page)

Country	tot	tb	y	c	i	RER
Paraguay	100	12	7	8	10	1
Peru	100	16	19	14	23	15
Philippines	100	19	13	17	8	38
Senegal	100	4	8	3	19	57
South Africa	100	12	11	9	8	23
Sudan	100	20	38	10	21	18
Thailand	100	14	13	15	2	25
Turkey	100	4	14	19	31	3
Uruguay	100	20	36	37	15	30
Median	100	12	10	9	10	14
Median Absolute Deviation	0	7	7	6	7	11

Note. Shares are expressed in percent.

Table 3: Country-Specific Estimates of the Capital Adjustment Cost Parameters and the Debt Elasticity of the Interest Rate

					σ_i/σ_y		σ_{tb}/σ_y	
Country	ϕ_m	ϕ_x	ϕ_n	ψ	Data	Model	Data	Model
Algeria	0.01	60.49	32.27	0.01	2.79	6.36	2.10	4.66
Argentina	0.55	4.87	1.03	3.33	2.01	2.37	0.36	0.52
Bolivia	0.00	76.88	0.00	1.07	4.28	3.32	0.78	0.78
Botswana	12.66	0.00	0.00	0.12	5.93	4.45	1.62	1.62
Brazil	0.00	108.63	0.00	4.34	3.24	2.72	0.48	0.48
Burundi	15.36	0.00	0.04	0.09	2.52	4.23	0.90	1.71
Cameroon	0.98	1.07	9.33	84.41	2.14	3.11	0.10	0.15
Central African Republic	87.13	0.02	31.60	0.03	7.78	2.92	1.65	1.65
Colombia	0.00	47.58	0.00	16.10	3.09	2.56	0.39	0.39
Congo, Dem. Rep.	0.00	22.96	0.00	16.82	8.18	2.45	0.30	0.30
Costa Rica	12.54	1.06	2.39	0.12	3.05	3.08	1.50	1.50
Cote d'Ivoire	0.00	16.81	0.00	16.65	3.37	2.40	0.27	0.27
Dominican Republic	0.95	63.29	1.62	7.67	2.86	2.44	0.41	0.41
Egypt, Arab Rep.	129.27	0.00	44.73	0.14	5.74	3.37	0.97	0.97
El Salvador	0.08	68.21	1.15	6.07	3.35	2.88	0.60	0.60
Ghana	0.00	76.88	0.00	3.49	9.55	3.59	0.91	0.91
Guatemala	1.28	0.05	1.71	3.10	9.28	9.15	1.81	2.06
Honduras	15.51	0.00	0.00	0.29	6.02	3.42	1.09	1.09
India	0.30	2.05	0.76	0.97	1.49	1.54	0.27	0.39
Indonesia	0.00	41.24	0.00	10.21	4.26	2.37	0.30	0.30
Jordan	2.88	2.88	0.62	0.03	1.04	3.40	1.30	2.65
Kenya	143.99	0.00	114.22	0.28	5.17	3.07	0.71	0.71
Korea, Rep.	133.26	0.00	63.34	0.15	4.86	3.36	0.95	0.95
Madagascar	47.35	0.17	0.00	0.28	2.61	2.91	0.85	0.84
Malaysia	12.13	0.05	0.05	0.09	4.39	4.67	1.68	1.82

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Table 3 (continued from previous page)

Country	ϕ_m	ϕ_x	ϕ_n	ψ	σ_i/σ_y Data	σ_i/σ_y Model	σ_{tb}/σ_y Data	σ_{tb}/σ_y Model
Mauritius	13.07	0.01	0.13	0.05	4.25	4.71	2.34	2.26
Mexico	7.56	1.01	0.61	0.24	1.58	1.61	0.40	0.60
Morocco	0.00	116.29	0.00	3.25	5.03	3.15	0.67	0.67
Pakistan	23.32	0.00	0.00	0.20	8.43	3.48	1.16	1.16
Paraguay	0.00	10.68	4.50	0.72	2.13	3.45	0.62	1.02
Peru	0.25	14.39	2.61	9.82	2.21	2.27	0.20	0.28
Philippines	0.10	8.17	1.11	1.12	1.78	2.43	0.44	0.61
Senegal	104.65	0.00	57.74	0.16	14.21	3.22	0.86	0.86
South Africa	122.76	0.01	56.35	0.68	2.47	2.63	0.28	0.40
Sudan	98.98	0.00	0.00	0.96	4.14	2.41	0.45	0.45
Thailand	1.74	1.74	1.32	0.30	0.74	1.62	0.61	0.97
Turkey	0.00	16.91	0.00	20.02	6.29	2.50	0.31	0.31
Uruguay	0.40	0.40	2.05	4.72	1.70	2.04	0.27	0.42
Median	1.13	1.40	0.69	0.84	3.36	3.00	0.64	0.74
Median Absolute Deviation	1.13	1.40	0.69	0.77	1.42	0.52	0.33	0.34

Table 4: Share of Variance Explained by Terms of Trade Shocks: Country Level Predictions of the Theoretical and SVAR Models

	tb		y		c		i		rer	
Country	TH	SVAR	TH	SVAR	TH	SVAR	TH	SVAR	TH	SVAR
Algeria	635	67	16	8	410	58	95	10	3	25
Argentina	17	28	6	22	6	14	6	16	0	33
Bolivia	16	6	16	6	30	8	19	11	0	6
Botswana	2	20	6	50	1	32	2	32	1	8
Brazil	54	47	19	16	13	4	23	28	0	57
Burundi	65	4	10	2	39	4	7	1	6	9
Cameroon	2	9	2	14	2	13	3	13	2	16
CAR	920	37	149	6	308	14	44	13	11	53
Colombia	9	7	22	18	31	7	11	13	0	13
Congo	11	3	4	1	4	1	2	7	1	12
Costa Rica	56	17	10	3	30	1	7	2	2	2
Cote d'Ivoire	17	30	23	43	27	36	12	43	2	70
Dom Rep	10	20	8	17	7	16	10	28	0	14
Egypt	33	62	31	58	61	46	12	65	1	48
El Salvador	102	8	27	2	25	4	39	4	3	22
Ghana	16	4	14	4	8	3	2	3	0	4
Guatemala	352	5	30	1	14	2	136	2	0	13
Honduras	48	7	37	5	20	1	16	7	1	15
India	104	4	161	13	236	19	18	1	1	1
Indonesia	20	13	34	22	19	17	11	23	1	14
Jordan	23	31	2	13	10	32	7	4	2	5
Kenya	29	6	19	4	33	9	19	12	3	2
Korea, Rep.	22	17	2	2	4	3	17	28	1	36
Madagascar	28	7	30	8	87	1	13	3	3	6
Malaysia	6	6	4	5	10	3	5	5	0	1

(continued on next page)

Table 4 (continued from previous page)

	tb		y		c		i		rer	
Country	TH	SVAR	TH	SVAR	TH	SVAR	TH	SVAR	TH	SVAR
Mauritius	35	9	8	2	63	6	9	2	1	4
Mexico	85	12	56	17	197	12	36	10	7	28
Morocco	10	2	9	2	6	2	6	3	1	10
Pakistan	4	2	15	7	13	2	0	1	2	3
Paraguay	58	12	13	7	14	8	48	10	0	1
Peru	8	16	5	19	10	14	7	23	0	15
Philippines	27	19	10	13	18	17	12	8	1	38
Senegal	56	4	126	8	254	3	15	19	3	57
South Africa	13	12	6	11	18	9	5	8	1	23
Sudan	14	20	27	38	18	10	5	21	0	18
Thailand	2	14	1	13	2	15	0	2	0	25
Turkey	4	4	13	14	7	19	5	31	0	3
Uruguay	12	20	9	36	6	37	5	15	0	30
Median	21	12	13	10	18	9	11	10	1	14
MAD	13	7	8	7	12	6	6	7	1	11