Rising Current Account Dispersion: Financial or Trade Integration?

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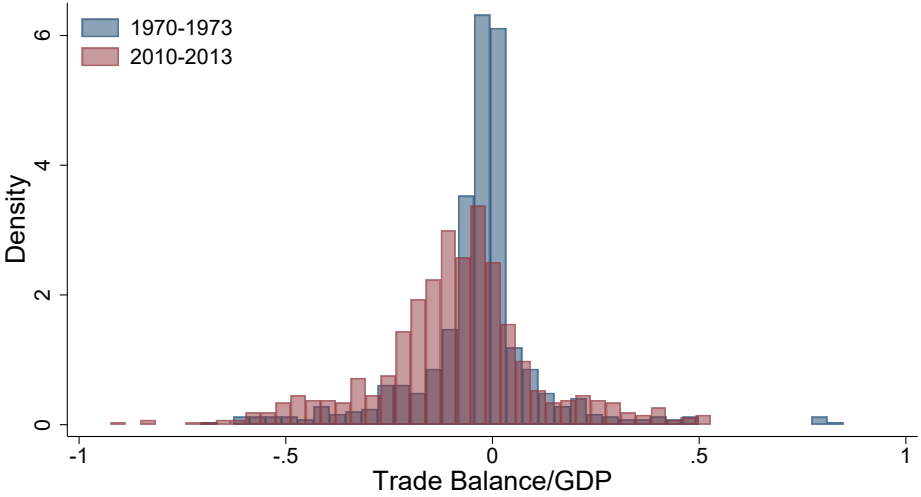
Distribution of Net Flows: 1970 vs 2010



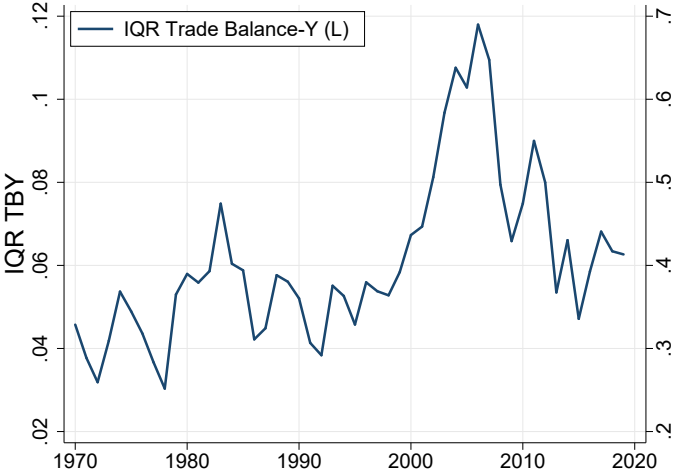
What Explains the Rise in Int'l Borrowing/Lending over Time?

Three main possibilities:

- More country-specific shocks?
- Reduced financial frictions (policy & non-policy)? Intertemporal frictions
- Fall in static trade barriers? Intratemporal frictions

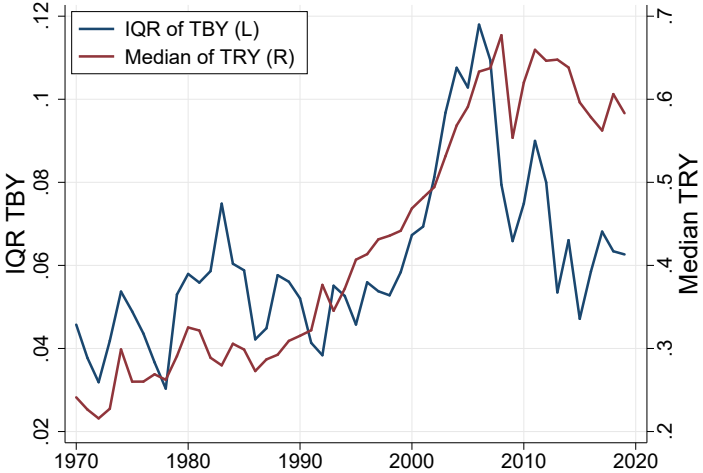
Answer: It is mostly the fall in intratemporal trade barriers!

Net Trade Flows Has Become More Dispersed



- Net trade flow: $TBY = (X - M)/Y$

Gross Trade Flows Also Have Risen



- Net trade flow: $TBY = (X - M)/Y$
- Gross trade flow: $TRY = (X + M)/Y$

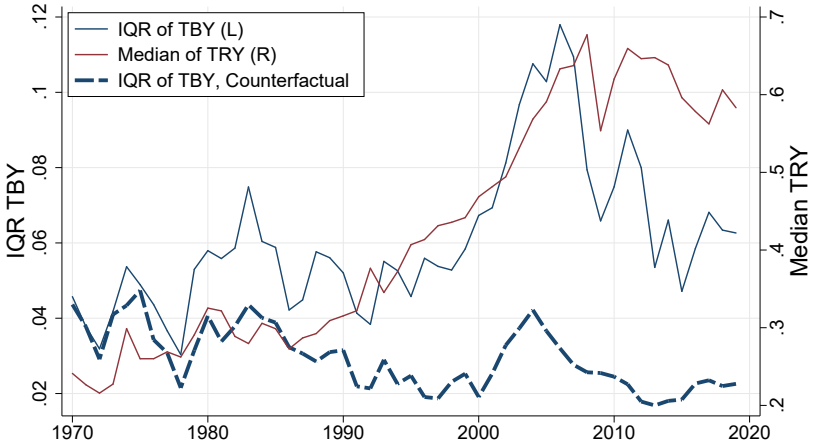
Net Flows Controlling for Gross Trade

$$\underbrace{\frac{X_t - M_t}{Y_t}}_{TBY} = \underbrace{\frac{X_t + M_t}{Y_t}}_{TRY} \times \frac{X_t - M_t}{X_t + M_t}$$

Fixing the level of trade constant,

$$TBY_t^{cf} = \underbrace{\frac{X_{70} + M_{70}}{Y_{70}}}_{TRY^{cf}} \times \frac{X_t - M_t}{X_t + M_t}$$

Net Flows "Stable" when Controlling for Trade Growth



This Paper

- Document patterns of world dispersion, as level of gross trade $\uparrow$
  - $\uparrow$ dispersion in net trade but $\downarrow$ after controlling for trade growth
  - $\downarrow$ dispersion in relative prices
  - o dispersion in output
- Using an N-country model, quantify the role of financial vs trade frictions
  - Trade frictions: bilateral iceberg costs
  - Financial frictions: debt elastic interest rate, interest premium
- Find that changes are mainly due to trade integration

Further Decomposition of Net Trade

$$\underbrace{\frac{X-M}{Y}}_{TBY} = \underbrace{\frac{X+M}{Y}}_{TRY} \times \underbrace{\frac{X-M}{X+M}}_{\approx 0.5 \ln X/M}$$

- Using CES demand

$$X = \omega^* \left(\frac{p_x \tau^*}{P^*}\right)^{-\gamma} D^* \qquad M = \omega \left(\frac{p_m \tau}{P}\right)^{-\gamma} D$$

- More structure on $\ln X/M$:

$$\ln \frac{X}{M} = -\gamma \ln \left(\frac{p_x}{p_m} \frac{P}{P^*}\right) + \ln \frac{D^*}{D} + \ln \frac{\omega^* \tau^{*-\gamma}}{\omega \tau^{-\gamma}}$$

Full Decomposition of Net Trade

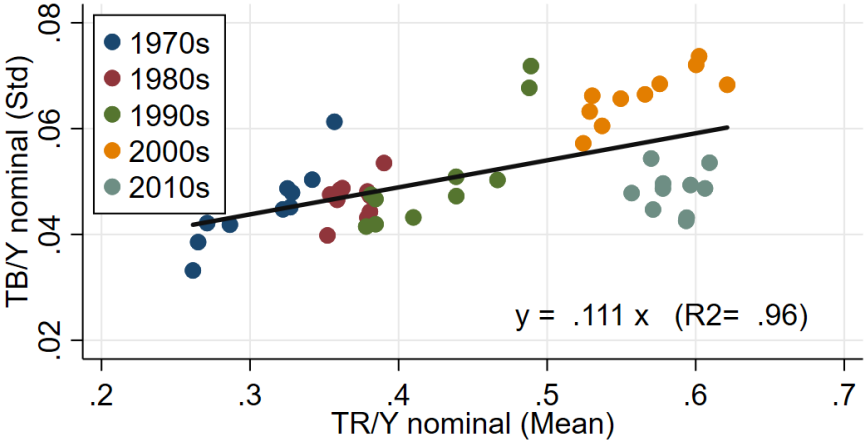
$$TBY = TRY \times 0.5 \ln \frac{X}{M}$$

$$\ln \frac{X}{M} = -\gamma \underbrace{\ln \left(\frac{p_x}{p_m} \frac{P}{P^*} \right)}_{tot-rer} + \ln \frac{D^*}{D} + \underbrace{\ln \frac{\omega^* \tau^{*-\gamma}}{\omega \tau^{-\gamma}}}_{trade\ wedge}$$

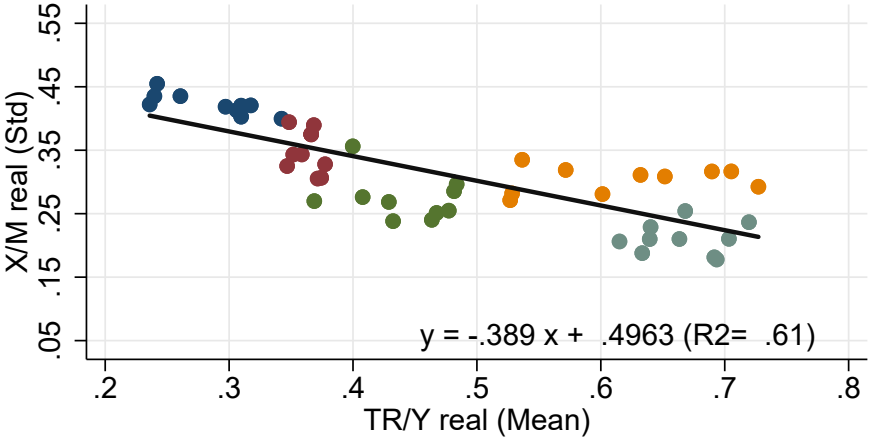
- *trade wedge*: differences in taste & trade barriers (Levchenko, Lewis, Tesar, 2010)
- Holds regardless of assumptions in asset market or prices

- Using data on 37 countries, measure the dispersion in each component ▸ Data

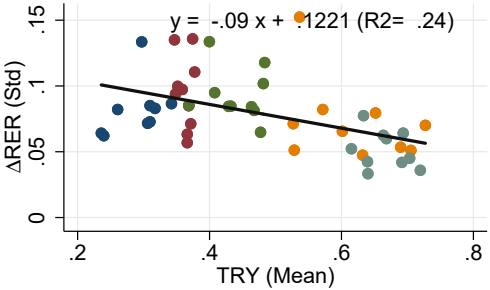
Higher Dispersion in Net Flows

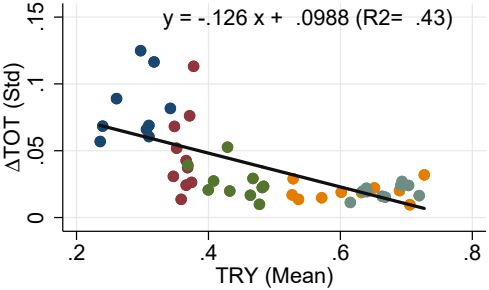


Less Dispersion in Export-Import Ratio

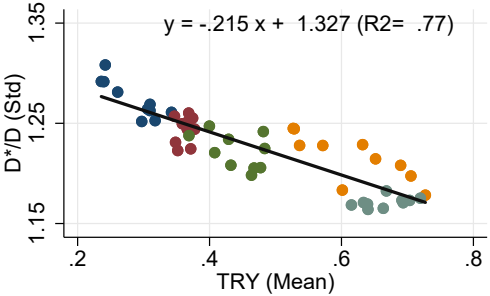


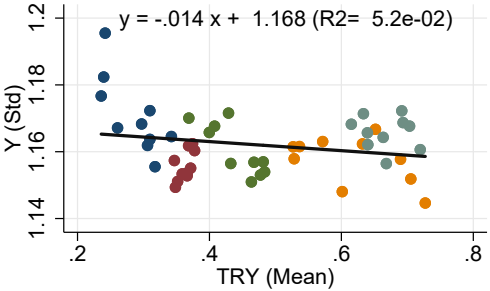
Less Dispersion in Relative Prices





Less Dispersion in Relative Quantities





Summary of Empirical Findings

Rise in TRY (gross trade flows) linked to

1. More dispersed TBY but less dispersed X/M
2. Less dispersed relative prices
3. Converged domestic absorption, and flat output ▸ TFP

$\Rightarrow$ Discipline the mechanism for the rising dispersion

An N-Country IRBC Model

- Each country produces a differentiated intermediate goods
- Intermediates combined into final non-traded consumption/investment goods
- Trade frictions: Bilateral iceberg costs
- Financial frictions: Non-contingent bond, debt elastic interest rate
- Shocks (global/local/bilateral)
  - Real: productivity & iceberg trade costs
  - Financial: interest premium (UIP) & debt elasticity

Model

- Household

$$\max\ E_0 \sum_{t=0}^{\infty} \beta^t u(c_{nt}, \bar{h}_n - h_{nt})$$

$$\begin{aligned}
\text{s.t.}\ \ & c_{nt} + i_{nt} + e_{nt} q_{nt} b_{nt+1} = w_{nt} h_{nt} + r^k_{nt} k_{nt} + e_{nt} b_{nt} + \Pi_{nt} \\
& k_{nt+1} = (1-\delta) k_{nt} + i_t - \Phi(k_{nt+1}, k_{nt}) \\
& 1/q_{nt} = r_t + e^{F_t} \left(e^{-(b_{nt} - \bar{b}_n)} - 1 \right) + \left(e^{\phi_{nt} - 1} - 1 \right)
\end{aligned}$$

- Final good producers

$$\max\ P_{nt} D_{nt} - \sum_{m=1}^{N} p_{nmt} \tau_{nmt} a_{nmt}$$

- Intermediate good producers

$$\begin{aligned}
\max\ \ & \frac{p_{mnt}}{P_{nt}} \tau_{mnt} a_{mnt} - w_{nt} h_{mnt} - r^k_{nt} k_{mnt} \\
\text{s.t.}\ \ & \tau_{mnt} a_{mnt} = z_{nt} k^{\alpha}_{mnt} h^{1-\alpha}_{mnt}
\end{aligned}$$

Two Tweaks

- **Trade dynamics** with external habit (Ravn, Schmitt-Grohe, Uribe, 06)

$$\ln \frac{a_{nmt}}{D_{nt}} = (1-\delta)\left\{\ln \omega - \gamma \ln\left(\frac{p_{mnt}}{P_{nt}}\tau_{mnt}\right)\right\} + \delta \ln \frac{a_{nmt-1}}{D_{nt-1}}$$

- **Pricing-to-market**: assume firms charge a destination specific markup that depends on the real exchange rate (Alessandria, 09; Alessandria & Kaboski, 11)

$$\frac{p_{mnt}}{P_{nt}} = \frac{\eta\left(\frac{P_{nt}/P_{mt}}{P_n/P_m}\right)^{\theta}}{\eta\left(\frac{P_{nt}/P_{mt}}{P_n/P_m}\right)^{\theta} - 1} \cdot \frac{1}{z_{nt}}\left(\frac{1}{\alpha}\right)^{\alpha}\left(\frac{1}{1-\alpha}\right)^{1-\alpha} r_{nt}^{k\alpha} w_{nt}^{1-\alpha}$$

Shocks

- Productivity

$$\ln z_{nt} = \ln \bar{z}_n + \ln z_{ct} + \ln z_{dnt}$$

$$\ln z_{ct} = \rho_{zc} \ln z_{ct-1} + \sigma_{zc}\varepsilon_{zct} \qquad \text{Global}$$

$$\ln z_{dnt} = \rho_{zd} \ln z_{dnt-1} + \sigma_{zd}\varepsilon_{zdnt} \qquad \text{Local}$$

- Interest premium

$$\ln \phi_{nt} = \rho_{\phi} \ln \phi_{nt-1} + \sigma_{\phi}\varepsilon_{\phi nt} \qquad \text{Local}$$

- Debt elasticity

$$\ln F_t = (1 - \rho_F) \ln \bar{F} + \rho_F \ln F_{t-1} + \sigma_F \varepsilon_{Ft} \qquad \text{Global}$$

- Trade cost between country n, m

$$\ln \tau_{nm,t} = \ln \xi_{ct} + 0.5 \ln \xi_{nm,t}$$

$$\ln \tau_{mn,t} = \ln \xi_{ct} - 0.5 \ln \xi_{nm,t}$$

$$\ln \xi_{ct} = \rho_{\xi c} \ln \xi_{ct-1} + \sigma_{\xi c}\varepsilon_{\xi ct} \qquad \text{Global}$$

$$\ln \xi_{nm,t} = \rho_{\xi} \ln \xi_{nm,t-1} + \sigma_{\xi t}\varepsilon_{\xi t} \qquad \text{Bilateral}$$

Calibration

- Annual model
- 4 asymmetric countries (US, Europe, China, ROW)
- Discipline trade and financial frictions with
  - Range of gross trade
  - Regression coefficients of TBY and X/M dispersion to TRY
  - Business cycle moments
  - Short-run and long-run trade elasticities
- Solve and simulate by 2nd-order approximation

Endogenously Chosen Parameters

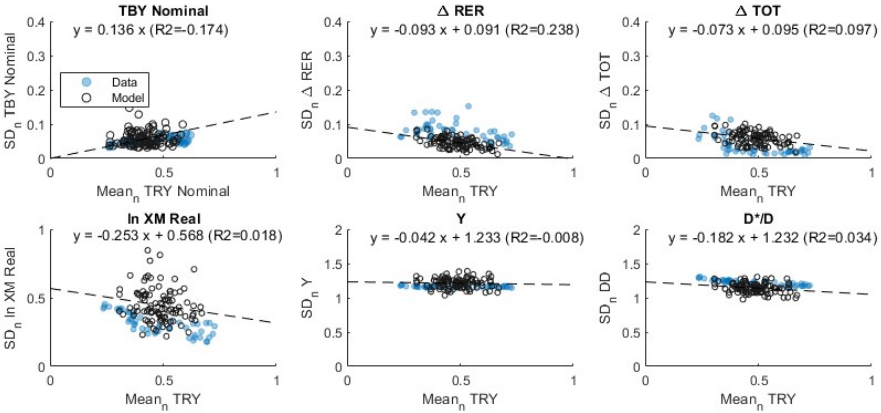
	Parameter	Value		Parameter	Value
γ	Armington elasticity	3.2	F	Debt-elasticity of interest rate	1.42
δ	Habit in import demand	0.94	σ_F	Debt-elasticity shock volatility	0.001
θ	RER-elasticity of PCM	0.14	ρ_F	Debt-elasticity shock persistence	0.76
ψ	Capital adjustment cost	6.77	σ_ϕ	Interest rate shock volatility	0.04
			ρ_ϕ	Interest rate shock persistence	0.99
σ_{z_d}	Differential productivity volatility	0.04	σ_{ξ_c}	Common trade cost shock volatility	0.03
σ_{z_c}	Common productivity volatility	0.02	σ_{ξ_d}	Differential trade cost shock volatility	0.03

Exogenous

Moments: Data and Model

	Data	Baseline		Data	Baseline
Business cycle moments			**Dispersion regressions**		
sd Δy (%)	3.68	3.92	tby slope	0.11	0.14
sd Δc/sd Δy	1.01	1.08	xm slope	-0.39	-0.25
sd Δi/sd Δy	3.16	3.16	xm const	0.50	0.57
auto corr tby	0.80	0.93	Δ rer slope	-0.09	-0.09
corr(tby,Δy)	-0.04	-0.05	Δ rer const	0.12	0.09
corr(x/m,Δy)	-0.05	-0.04	Δ tot slope	-0.13	-0.07
corr($\Delta(c - c^*), \Delta rer$)	-0.21	-0.20	Δ tot const	0.10	0.09
corr($\Delta y, \Delta y^*$)	0.21	0.21	d^*/d slope	-0.22	-0.18
Trade elasticity			d^*/d const	1.33	1.23
LR elasticity	3.22	3.26	y slope	-0.01	-0.04
SR elasticity	0.23	0.20	y const	1.17	1.23

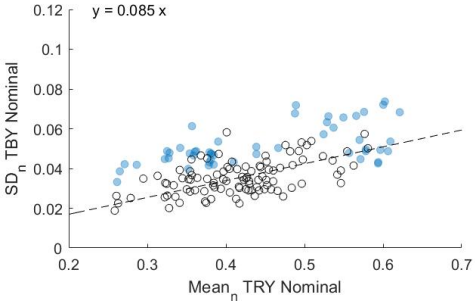
Net Trade and Gross Trade Flows

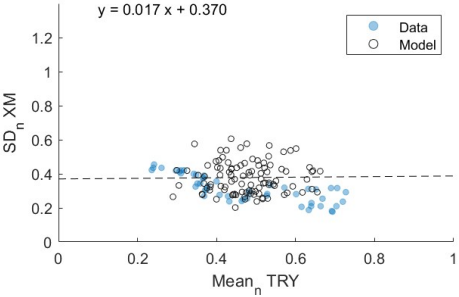


▸ Sensitivity: more countries

No Financial Integration

Turning off interest rate shocks $\sigma_F = \sigma_\phi = 0$



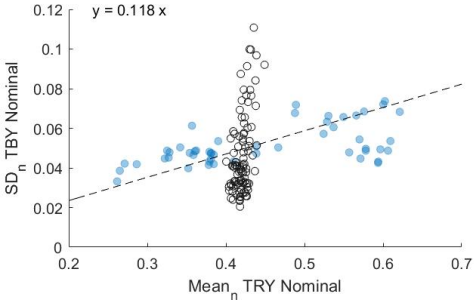


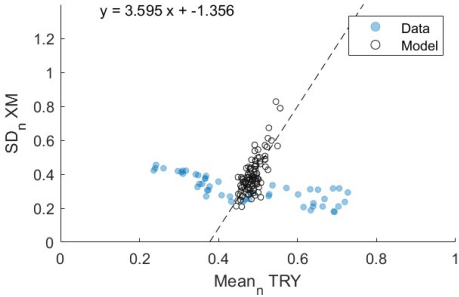
- Gross trade flows changes little
- Slopes become weaker

More

No Trade Integration

Turning off common trade cost shock $\sigma_{\xi_c} = 0$





- Without changes in trade frictions, cannot generate the variation in gross trade

More

Conclusion

- We provide new perspective of looking at the increase in net trade flows
- Net & gross trade flows have grown substantially over the past 50 years
- Decline in trade costs is consistent with the changes in different aspects of the distribution of global economic activity with trade

Appendix

Decomposition of Export-Import Ratio – Data

Country i's trade ratio with ROW $(-i)$:

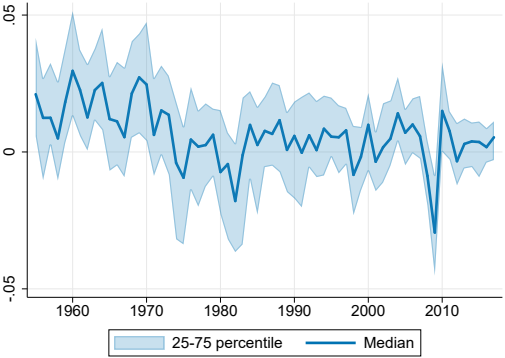
$$\ln \frac{X_i}{M_i} = -\gamma(tot_i - rer_i) + (d_{-i} - d_i) + (\tau_{-i} - \tau_i)$$

- $\frac{X_i}{M_i}$: Net merchandise exports (PWT)
- tot_i: Ratio of export price to import price
- rer_i: Trade-weighted real exchange rate
- d_i: Real domestic absorption.
- d_{-i}: Trade-weighted foreign domestic absorption.
- Focus on a panel of 37 countries with BIS real exchange rate data.
- Estimate γ to fit model, recover **trade wedge gap** $\tau_{-i} - \tau_i$

Back

More volatile shocks?

- Relative prices and quantities less dispersed across over time and with trade.
- Similar finding with tfp growth.



Back

Estimating Trade Elasticity – SR and LR

	(1) Level	(2) Diff	(3) ECM
SR price	-0.107***	0.223***	0.228***
	(0.0196)	(0.0351)	(0.0351)
LR price			3.221***
			(1.523)
Adjustment			0.006***
			(0.002)
Observations	1800	1764	1764
R-squared	0.026	0.273	0.281

Error correction model (ECM): $\Delta \ln X_t/M_t = \beta + \gamma_{SR}\Delta p_t^r + \Delta d_t^r - \alpha(\ln X_{t-1}/M_{t-1} - \gamma_{LR}p_{t-1}^r - d_{t-1}^r)$.
Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Back

Household

$$\max\ E_0 \sum_{t=0}^{\infty} \beta^t u(c_{nt}, \bar{h}_n - h_{nt})$$

$$\text{s.t. } c_{nt} + i_{nt} + e_{nt} q_{nt} b_{nt+1} = w_{nt} h_{nt} + r^k_{nt} k_{nt} + e_{nt} b_{nt} + \Pi_{nt}$$

$$k_{nt+1} = (1-\delta) k_{nt} + i_t - \Phi(k_{nt+1}, k_{nt})$$

$$1/q_{nt} = r_t + e^{F_t}\left(e^{-(b_{nt} - \bar{b}_n)} - 1\right) + \left(e^{\phi_{nt} - 1} - 1\right)$$

- Bonds are in terms of country 1 goods, exchange rate $e_{nt} = P_{1t}/P_{nt}$
- Preference

$$u(c_{nt}, \bar{h}_n - h_{nt}) = \frac{[c_{nt}^{\mu}(\bar{h}_n - h_{nt})^{1-\mu}]^{1-\sigma}}{1-\sigma}$$

- Capital adjustment cost

$$\Phi(k_{nt+1}, k_{nt}) = \frac{\psi}{2}\left(\frac{k_{nt+1}}{k_{nt}} - 1\right)^2 k_{nt}$$

Final good producers

- Produce with intermediate goods from world using a CES production function
- Trade adjustment dynamics with external habit (Ravn, Schmitt-Grohe, Uribe, 2010)

$$D_{nt} = \left\{ \sum_{m=1}^{N} \omega_{nm}^{\frac{1}{\gamma}} \left[\frac{a_{nmt}}{\left(a_{nm,t-1}/D_{nt-1}\right)^{\frac{\delta}{(1-\delta)}\frac{1}{(1-\gamma)}}} \right]^{\frac{\gamma-1}{\gamma}} \right\}^{\frac{\gamma}{\gamma-1}}$$

  - a_{nm}: country m good imported by n
  - δ governs trade adjustment, $\delta = 0$ standard CES

- Optimization

$$\max \; P_{nt} D_{nt} - \sum_{m=1}^{N} p_{nmt} \tau_{nmt} a_{nmt}$$

- Implied demand function

$$\ln \frac{a_{nmt}}{D_{nt}} = (1-\delta) \left[\ln \omega - \gamma \ln \left(\frac{p_{nmt}}{P_{nt}} \tau_{nmt} \right) \right] + \delta \ln \frac{a_{nm,t-1}}{D_{nt-1}}$$

Intermediate good producers

$$\max_{h_{mnt},k_{mnt},p_{mnt},a_{mnt}} \quad \frac{p_{mnt}}{P_{nt}}\tau_{mnt}a_{mnt} - w_{nt}h_{mnt} - r^k_{nt}k_{mnt}$$

$$\text{s.t.} \quad \tau_{mnt}a_{mnt} = z_{nt}k^{\alpha}_{mnt}h^{1-\alpha}_{mnt}$$

$$\ln\frac{a_{mnt}}{D_{mt}} = (1-\delta)\left[\ln\omega - \gamma\ln\left(\frac{p_{mnt}}{P_{mt}}\tau_{mnt}\right)\right] + \delta\ln\frac{a_{mn,t-1}}{D_{mt-1}}$$

- Assume destination specific markup that depends on the real exchange rate (Alessandria, 09, Alessandria & Kaboski, 11)

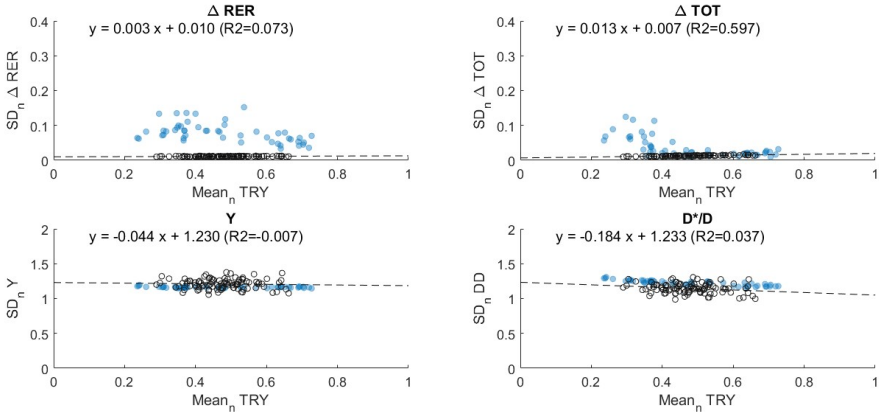
$$\frac{p_{mnt}}{P_{nt}} = \frac{\gamma\left(\frac{P_{nt}/P_{mt}}{P_n/P_m}\right)^{\theta}}{\gamma\left(\frac{P_{nt}/P_{mt}}{P_n/P_m}\right)^{\theta} - 1}\cdot\frac{1}{z_{nt}}\left(\frac{1}{\alpha}\right)^{\alpha}\left(\frac{1}{1-\alpha}\right)^{1-\alpha} r^{k\alpha}_{nt}w^{1-\alpha}_{nt}$$

Market clearing

- $D_{nt} = c_{nt} + i_{nt}$
- $h_{nt} = \sum_m h_{mn,t}$
- $k_{nt} = \sum_m k_{mn,t}$
- $\sum_n b_{nt} = 0$

Back

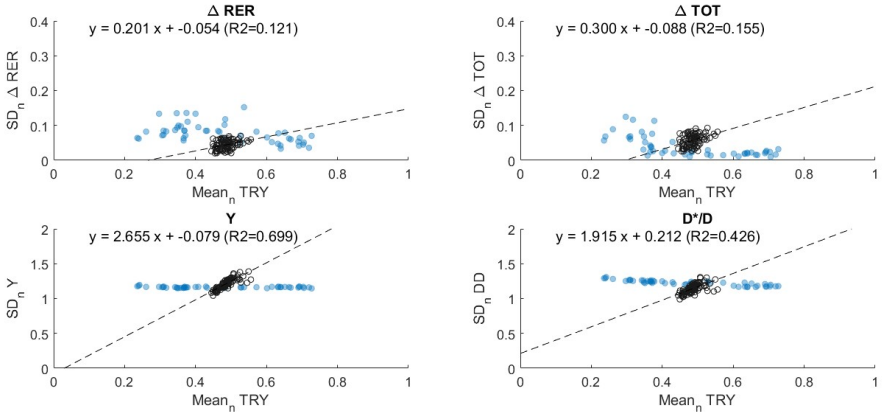
Sensitivity to Changes in Financial Frictions



- Reducing financial frictions changes little gross trade flows, X/M become more dispersed across countries

Back

Sensitivity to Changes in Trade Frictions



- No trade frictions $\sigma_{\xi_c} = 0$, financial frictions alone cannot generate the variation of global trade

Back

Parameters

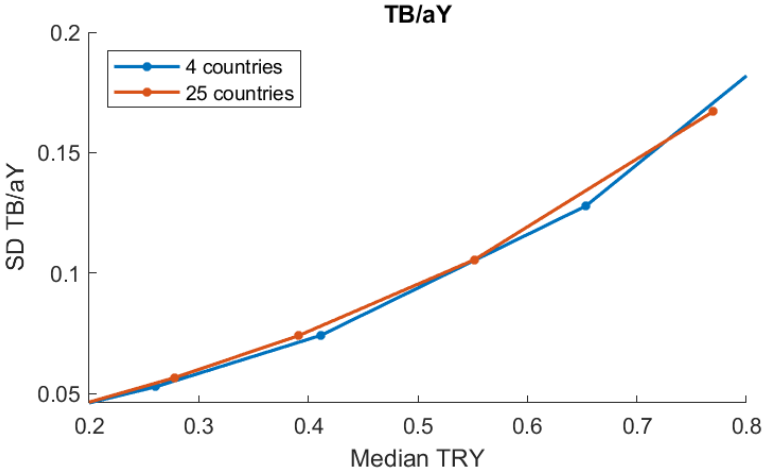
Endogenously chosen		
γ	Armington elasticity	3.2
δ	Habit in import demand	0.94
θ	RER-elasticity of PCM	0.14
ψ	Capital adjustment cost	6.77
F	Debt-elasticity of interest rate	1.42
σ_F	Debt-elasticity shock volatility	0.001
ρ_F	Debt-elasticity shock persistence	0.76
σ_ϕ	Interest rate shock volatility	0.04
ρ_ϕ	Interest rate shock persistence	0.99
σ_{ξ_c}	Common trade cost shock volatility	0.03
σ_{ξ_d}	Differential trade cost shock volatility	0.03
ρ_{ξ_d}	Differential trade cost persistence	0.95
σ_{z_d}	Differential productivity volatility	0.04
σ_{z_c}	Common productivity volatility	0.02

Exogenously chosen		
β	Discount factor	0.96
α	Capital share	0.36
δ_k	Capital depreciation rate	0.10
$1/\sigma$	Intertemporal elasticity of substitution	0.50
μ	Weight on consumption	0.37
ω_{mn}	Weight on each foreign good	0.25
ω_{nn}	Weight on home goods	0.25
$\bar{b}_n$	Mean debt	0
$\bar{z}_n$	Mean productivity	1,1,3,4.8
ρ_{ξ_c}	Common trade cost persistence	0.97
ρ_{z_c}	Common productivity persistence	0.96
ρ_{z_d}	Differential productivity persistence	0.96

Sensitivity

1. Steady state vs sampling
2. Solution method
3. Number of countries
4. Asymmetries in countries (productivity, openness, financial frictions)
5. Elasticity
6. Pricing-to-Market
7. Shocks (uip, beta, differential trade cost)

Sensitivity to More Countries



In each graph, y-axis is the standard deviation, x-axis is trade share over output. The lines shows model results under input adjustment cost parameter $\iota = 0$.

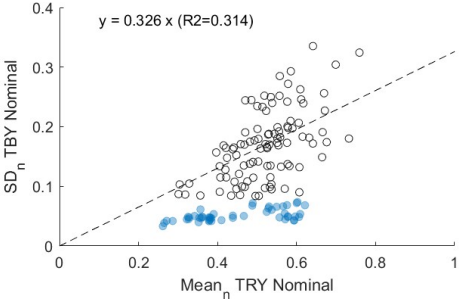
Back

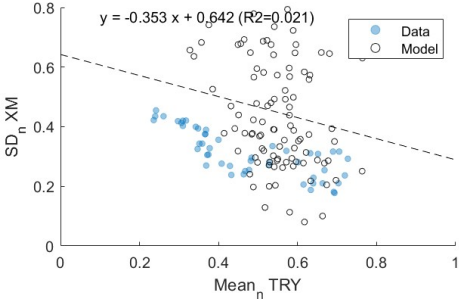
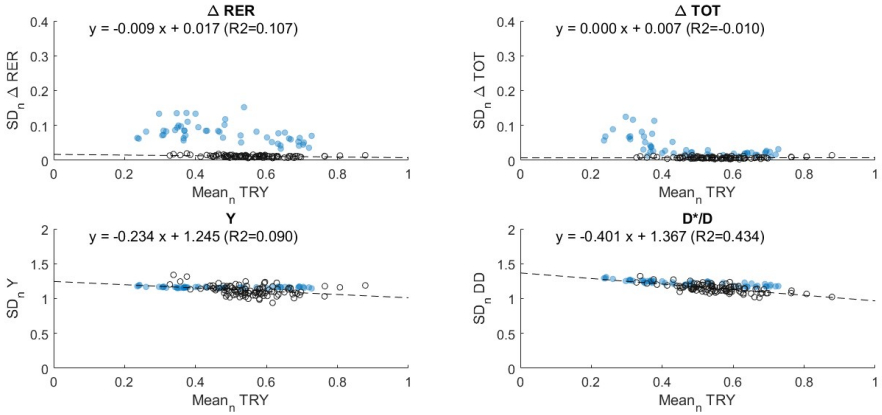
Gross Trade Flow and Dispersion in Key Aggregates

(SD)	(1) TBaY	(2) ln X/M	(3) ln RER	(4) ln TOT	(5) ln D*/D	(6) ln Y
Med TRY	0.171***	-0.175***	-0.189***	-0.264***	-0.365***	-0.178***
	(0.019)	(0.065)	(0.041)	(0.054)	(0.026)	(0.023)
Constant	0.002	0.500***	0.576***	0.243***	1.621***	1.573***
	(0.010)	(0.033)	(0.021)	(0.027)	(0.013)	(0.012)
Observations	50	50	50	50	50	50
R-squared	0.617	0.130	0.308	0.334	0.806	0.556

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Without Financial Frictions, Re-estimated

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