Trade (Dis-)Integration and the Trade Balance

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The views expressed are those of the authors and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

Motivation

How do trade barriers affect trade imbalances?

Does a permanent increase in trade barriers reduce a trade deficit ($NX < 0$)?

Scarcity of formal analyses exploring theoretical mechanisms, empirical validity, and quantitative relevance.

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...because of strong interest due to Trump's tariffs of April 2025 and the associated CEA note.

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Simple (neoclassical) model in which both transitory (short-run) fluctuations and structural (permanent) factors may affect the trade balance.

Transfer effect: with home-biased consumption patterns, $NX < 0$ leads to better terms of trade; this effect increases with the level of trade barriers.

Transitory fluctuations: $NX < 0$ raises deficit-country's real interest rate. $\Rightarrow$ Higher trade barriers reduce the *standard deviation* of NX/GDP.

Structural factors: $NX < 0$ raises deficit-country's relative size. $\Rightarrow$ Real interest rate gets closer to its autarky rate. $\Rightarrow$ Higher trade barriers reduce NX/GDP.

At current levels of trade barriers, and in the presence of traded intermediate inputs, these mechanisms do not bite.

$\Rightarrow$ Need near-autarky barriers for them to elicit a relevant response of NX/GDP.

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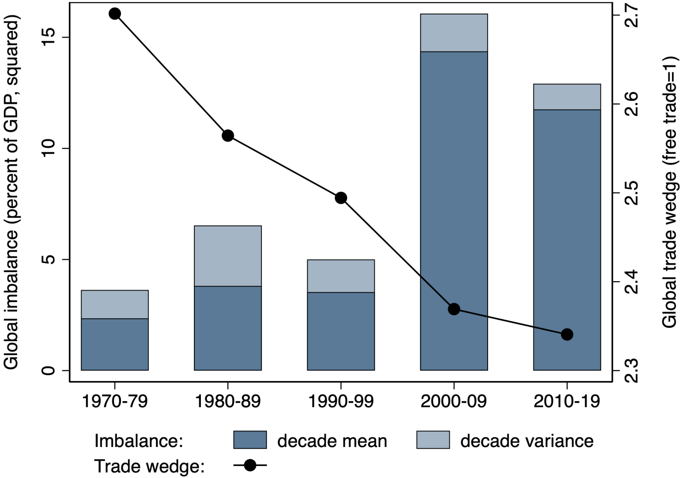
Trade globalization and trade imbalances



$$\frac{1}{T}\sum_t nx_t^2 = \bar{nx}^2 + Var_t\left(nx_t\right), \quad \bar{nx} \equiv \frac{1}{T}\sum_t nx_t;$$

GDP-weighted average across 24 major economies

Details

Some related literature

1. **Trade barriers and imbalances**
   Obstfeld and Rogoff (2001), Kraay and Ventura (2002), Dekle et al. (2007, 2008), Reyes-Heroles (2016), Eaton et al. (2016a), Alessandria et al. (2024), Cuñat and Zymek (2024, 2025), Aguiar et al. (2025), Costinot and Werning (2025), Ignatenko et al. (2025), Itskhoki and Mukhin (2025)

2. **Gains from trade in dynamic models with international asset markets**
   Eaton et al. (2016b), Ravikumar et al. (2019, 2024), Kleinman et al. (2024), Baqaee and Malmberg (2025)

3. **Economic fluctuations and the trade balance in RBC models**
   Backus et al. (1994), Corsetti et al. (2008), Alessandria and Choi (2021)

4. **Shocks to trade barriers as a source of economic fluctuations**
   Bergin and Corsetti (2020), Alessandria and Choi (2021), Barattieri et al. (2021), Barattieri (2022), Erceg et al. (2022), Auray et al. (2023), Ghironi et al. (2024), Auclert et al. (2025), Auray et al. (2025), Bianchi and Coulibaly (2025), Kalemli-Özcan et al. (2025)

Model

Time lasts forever: $t = 0, 1, 2, \ldots$ Two economies: Home, Foreign (*).

1. **Incomplete asset markets**
   - Only international asset is a riskless bond.
   - Blanchard-Yaari OLG structure with constant populations L, L^*; each t, agents die with prob. $\xi = \xi^* \in (0, 1)$ and ξL, ξL^* are born; no bequests, but actuarily fair life insurance is available.

   $\Rightarrow$ **Unique steady state independent of initial conditions.**

2. **Open economies with differentiated goods and production linkages**
   - Goods differentiated by origin (Armington).
   - Production uses intermediate inputs in "roundabout" fashion.

   $\Rightarrow$ **Bilateral trade compatible with structural gravity.**

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Agents born in Home in period t' maximise:

$$\mathbb{E}_{t'}\left[\sum_{t=t'}^{\infty}\beta^{t-t'}\ln C_t\left(t'\right)\right], \qquad \beta \equiv \frac{1-\xi}{1+\rho}, \qquad \rho^* \geq \rho \Leftrightarrow \beta \geq \beta^*$$

$$P_t C_t\left(t'\right) + B_{t+1}\left(t'\right) = W_t + \frac{R_t B_t\left(t'\right)}{1-\xi}, \qquad B_{t'}\left(t'\right) = 0$$

Euler equation:

$$\frac{1}{C_t\left(t'\right)} = \frac{1}{1+\rho}\mathbb{E}_t\left[\frac{R_t P_t}{P_{t+1}}\frac{1}{C_{t+1}\left(t'\right)}\right]$$

Aggregation:

$$\mathcal{X}_t = \sum_{t'=-\infty}^{t}\xi\left(1-\xi\right)^{t-t'}\mathcal{X}_t\left(t'\right)L, \qquad \mathcal{X}\in\{B,C\}$$

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Firms produce Home variety using:

$$Q_t = \left(\frac{A_t L_t}{1-\mu}\right)^{1-\mu} \left(\frac{J_t}{\mu}\right)^{\mu}, \qquad \mu, \mu^* \in (0,1)$$

J_t: use of intermediates; $\quad A_t = A\gamma^t e^{\tilde{a}_t}, \quad \tilde{a}_t = \delta_a \tilde{a}_{t-1} + \varepsilon_{at}, \quad \gamma = \gamma^* \geq 1$

Firms combine Home and Foreign varieties to make an "all-purpose" good:

$$X_t = \left(X_{Qt}^{\frac{\theta}{1+\theta}} + X_{Q^*t}^{\frac{\theta}{1+\theta}}\right)^{\frac{1+\theta}{\theta}}, \qquad C_t + J_t = X_t$$

All markets are perfectly competitive.

Iceberg trade barriers apply to imports by Home from Foreign (τ), and imports by Foreign from Home (τ^*).

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Goods trade

Home imports from Foreign: $M_{FHt} = \underbrace{\left(\frac{\tau P^*_{Qt}}{P_t}\right)^{-\theta}}_{\equiv 1 - V_t} P_t \left(C_t + J_t\right)$

$$P_t \equiv \left[\left(\tau P^*_{Qt}\right)^{-\theta} + P_{Qt}^{-\theta}\right]^{-\frac{1}{\theta}}, \qquad P_{Qt} = \left(\frac{W_t}{A_t}\right)^{1-\mu} P_t^{\mu}$$

Terms of trade: $S_t \equiv P_{Qt}/P^*_{Qt} = 1/S^*_t$

Home share in own expenditure: $V_t = \frac{\tau^\theta}{\tau^\theta + S_t^\theta}$

Labour productivity

From firms' profit maximisation: $Z_t \equiv \frac{Q_t}{L_t} = \frac{A_t}{1-\mu} V_t^{-\frac{1}{\theta}\frac{\mu}{1-\mu}}$

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Equilibrium

Equilibrium: sequence $\{R_t, S_t, V_t^*, V_t\}_{t=0}^{\infty}$ satisfying optimality, aggregation, and market-clearing conditions for Home and Foreign for all t, for given:

- initial condition B_0;
- exogenous processes for productivity A_t, A_t^*.

Steady state: "static block"

Long-run path of the economy under $\tilde{a}_t = \tilde{a}_t^* = 0$.

$$y \equiv W_t / \left(\gamma^t P\right) = V^{-\frac{1}{\theta(1-\mu)}} A, \qquad c \equiv C_t / \left(\gamma^t L\right) = y\left(1 - nx\right)$$

Goods and factor market clearing:

$$\left(\frac{V}{1-V^*}\right)^{-\frac{1}{\theta}} \frac{\left(1-V^*\right)\left[\left(1-\mu^*\right)\left(1-nx^*\right)+\mu^*\right]}{1-V\left[\left(1-\mu\right)\left(1-nx\right)+\mu\right]} = \frac{ZL}{Z^*L^*}$$

Foreign share in own expenditure (from profit and utility maximisation):

$$V^* = \frac{\left(\tau\tau^*\right)^{\theta}\left(1-V\right)}{V+\left(\tau\tau^*\right)^{\theta}\left(1-V\right)}$$

For given $nx \equiv 1 - PC_t/W_tL$, the equations above are sufficient to analyse changes in steady-state outcomes from changes in τ, τ^*.

$$\lim_{\tau,\tau^* \to \infty} V, V^* \to 1; \qquad \lim_{\tau,\tau^* \to 1} 1 - V = V^* = \frac{P_Q^* Q_t^*}{P_Q Q_t + P_Q^* Q_t^*}$$

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For given $nx \equiv 1 - PC_t / W_t L$, the equations above are sufficient to analyse changes in steady-state outcomes from changes in τ, τ^*.

$$\lim_{\tau,\tau^* \to \infty} V, V^* \to 1; \qquad \lim_{\tau,\tau^* \to 1} 1 - V = V^* = \frac{P_Q^* Q_t^*}{P_Q Q_t + P_Q^* Q_t^*}$$

Steady state: "dynamic block"

Asset market clearing:

$$R = \frac{1-\xi}{\beta\left(1-\mathcal{B}^{*}\right)+\beta^{*}\mathcal{B}^{*}}\gamma \equiv \frac{1-\xi}{\bar{\beta}}\gamma$$

$\mathcal{B}^{*} \in (0,1)$: positive function of Foreign's relative GDP size N^{*}.

$$N^{*} \equiv \frac{W_t^{*}L^{*}}{W_tL+W_t^{*}L^{*}} = \frac{\frac{1-V}{1-\mu}+\left[V-\left(1-V^{*}\right)\right]nx}{\frac{1-V}{1-\mu}+\frac{1-V^{*}}{1-\mu^{*}}+\left[V-\left(1-V^{*}\right)\right]nx}$$

Higher $\tau, \tau^{*} \Rightarrow$ larger transfer effect and deficit-country's relative size

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$$N^* \equiv \frac{W_t^* L^*}{W_t L + W_t^* L^*} = \frac{\frac{1-V}{1-\mu} + \left[V-(1-V^*)\right] nx}{\frac{1-V}{1-\mu} + \frac{1-V^*}{1-\mu^*} + \left[V-(1-V^*)\right] nx}$$

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Higher $\tau, \tau^* \Rightarrow$ larger transfer effect and deficit-country's relative size

Steady state: "dynamic block"

Inter-temporal utility maximisation and aggregation:

$$b \equiv RB_t/W_tL = \frac{1-\xi}{1-\bar{\beta}}\frac{\beta-\bar{\beta}}{\bar{\beta}-\beta(1-\xi)}, \qquad nx = \left(\frac{\gamma}{R}-1\right)b$$

- No structural imbalances: $\beta = \beta^* \Rightarrow b = nx = 0$
- Structural imbalances: $\beta > \beta^* \Rightarrow b > 0$
  - Dynamic efficiency: $\gamma < R \Rightarrow nx < 0$
  - Dynamic inefficiency: $\gamma > R \Rightarrow nx > 0$

Higher $\tau, \tau^* \Rightarrow$ larger transfer effect and deficit-country's relative size $\Rightarrow R$ approaches deficit-country's autarky rate. $\Rightarrow$ GDP share of trade deficit shrinks.

Steady state: "dynamic block"

Inter-temporal utility maximisation and aggregation:

$$b \equiv RB_t/W_t L = \frac{1-\xi}{1-\bar{\beta}} \frac{\beta - \bar{\beta}}{\bar{\beta} - \beta(1-\xi)}, \qquad nx = \left(\frac{\gamma}{R} - 1\right) b$$

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Short-run dynamics with no steady-state imbalances ($\beta = \beta^*$)

Define $\tilde{b}_t \equiv \frac{R_t B_t}{W_t L}$, $\tilde{nx}_t \equiv \ln \frac{W_t L}{P_t C_t}$.

Steady-state imbalances

- *Law of motion of net foreign assets:*

$$E_t\left(\tilde{b}_{t+1}\right) = (1+\rho)\left(\tilde{b}_t + \tilde{nx}_t\right)$$

- *Net exports schedule (NX):*

$$\tilde{nx}_t = N^*(1-\beta)\left[\sum_{s=0}^{\infty}\beta^s\left\{\tilde{z}_t - E_t\left(\tilde{z}_{t+s}\right) - \left[\tilde{z}_t^* - E_t\left(\tilde{z}_{t+s}^*\right)\right] + \tilde{s}_t - E_t\left(\tilde{s}_{t+s}\right)\right\} - \tilde{b}_t\right]$$

- *Market clearing condition (MC):*

$$\tilde{s}_t = \frac{1}{1+\theta\left(V+V^*\right)}\left\{\tilde{z}_t^* - \tilde{z}_t - \frac{\left[V^*-(1-V)\right](1-\mu)}{1-V}\tilde{nx}_t\right\}$$

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◂ Steady-state imbalances

- *Law of motion of net foreign assets:*

$$E_t \left(\tilde{b}_{t+1} \right) = (1 + \rho) \left(\tilde{b}_t + \tilde{nx}_t \right)$$

- *Net exports schedule (NX):*

$$\tilde{nx}_t = N^* (1 - \beta) \left[\sum_{s=0}^{\infty} \beta^s \left\{ \tilde{z}_t - E_t \left(\tilde{z}_{t+s} \right) - \left[\tilde{z}_t^* - E_t \left(\tilde{z}_{t+s}^* \right) \right] + \tilde{s}_t - E_t \left(\tilde{s}_{t+s} \right) \right\} - \tilde{b}_t \right]$$

- *Market clearing condition (MC):*

$$\tilde{s}_t = \frac{1}{1 + \theta \left(V + V^* \right)} \left\{ \tilde{z}_t^* - \tilde{z}_t - \frac{\left[V^* - (1 - V) \right] (1 - \mu)}{1 - V} \tilde{nx}_t \right\}$$

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Define $\tilde{b}_t \equiv \frac{R_t B_t}{W_t L}$, $\tilde{nx}_t \equiv \ln \frac{W_t L}{P_t C_t}$.

◂ Steady-state imbalances

- *Law of motion of net foreign assets:*

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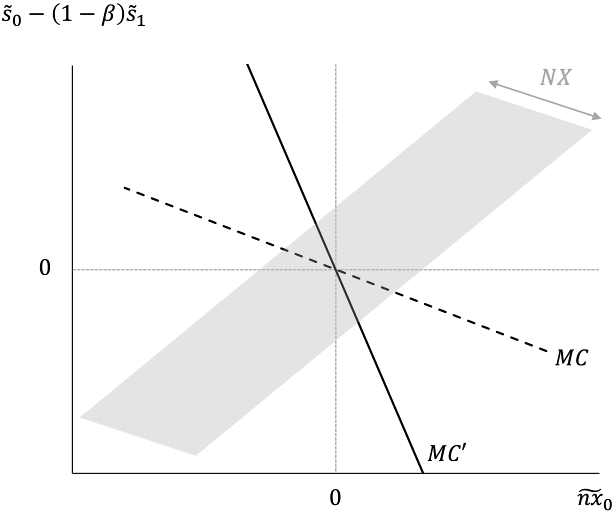
$$\tilde{nx}_t = N^*(1-\beta)\left[\sum_{s=0}^{\infty}\beta^s\left\{\tilde{z}_t - E_t\left(\tilde{z}_{t+s}\right) - \left[\tilde{z}_t^* - E_t\left(\tilde{z}_{t+s}^*\right)\right] + \tilde{s}_t - E_t\left(\tilde{s}_{t+s}\right)\right\} - \tilde{b}_t\right]$$

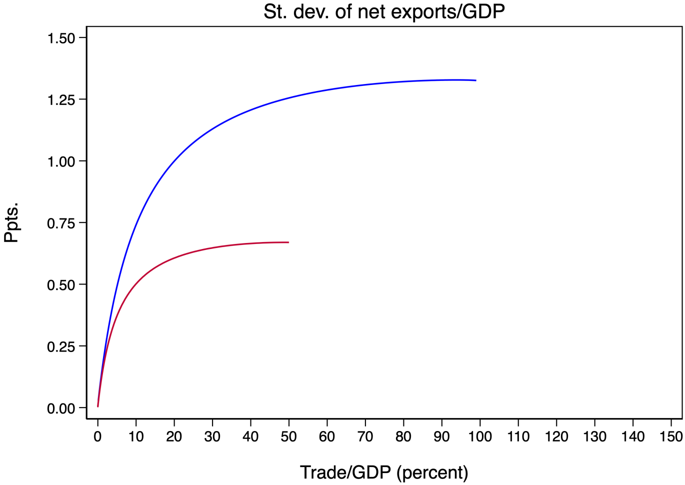
- *Market clearing condition (MC):*

$$\tilde{s}_t = \frac{1}{1+\theta\left(V+V^*\right)}\left\{\tilde{z}_t^* - \tilde{z}_t - \frac{\left[V^*-(1-V)\right](1-\mu)}{1-V}\tilde{nx}_t\right\}$$

Productivity shocks, the trade balance and openness



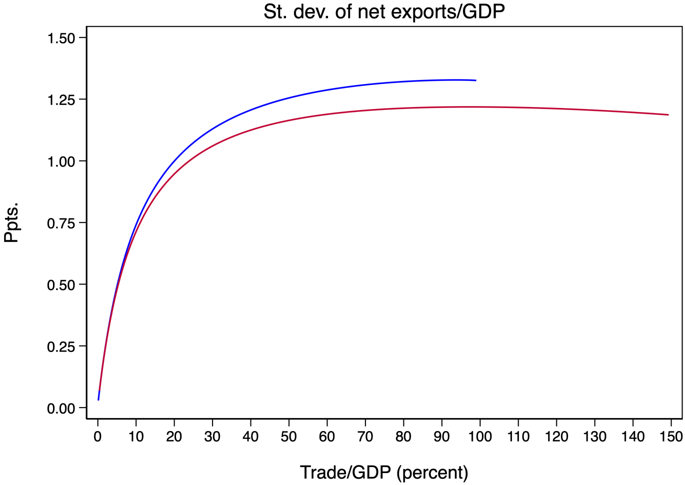
Net exports volatility and openness: Home small ($N^* = .99$), large ($N^* = .50$)



Parameters: $\theta = 4$, $\xi = .014$, $\beta = .97$, $\mu = \mu^* = 0$,
$\sigma_a, \sigma_{a^*} = .01$, $\delta_a, \delta_{a^*} = .60$

Details

Net exports volatility and openness: Home no inputs ($\mu = 0$), inputs ($\mu = .50$)



Parameters: $\theta = 4$, $\xi = .014$, $\beta = .97$, $\mu = \mu^*$,
$\sigma_a, \sigma_{a^*} = .01$, $\delta_a, \delta_{a^*} = .60$

Details

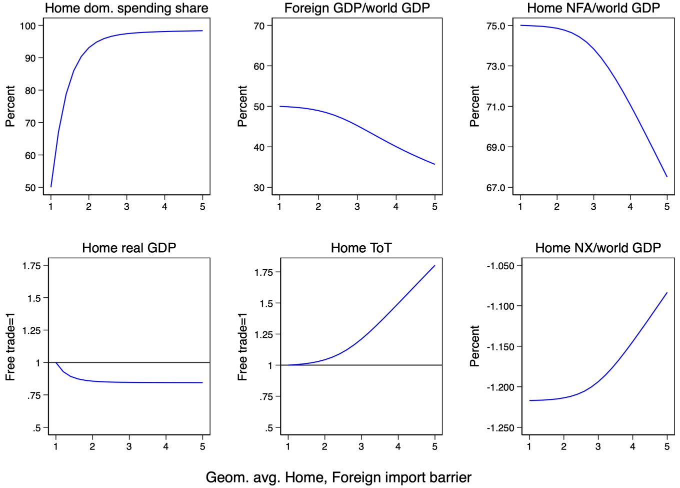
Net exports volatility and openness in the data

Dep. variable: Δ sd(NX/GDP)	(1)	(2)	(3)	(4)
Δ Trade/GDP	0.1512 ***			
	(0.035)			
Δ Trade/GDP | Trade/GDP [0,0.1)		0.3937 ***	0.3972 ***	0.4236 ***
		(0.125)	(0.116)	(0.118)
Δ Trade/GDP | Trade/GDP ∈ [0.1,0.2)		0.1651 ***	0.156 ***	0.1578 ***
		(0.032)	(0.035)	(0.039)
Δ Trade/GDP | Trade/GDP ∈ [0.2,0.4)		0.1604 ***	0.1592 ***	0.1587 ***
		(0.047)	(0.049)	(0.050)
Δ Trade/GDP | Trade/GDP ∈ [0.4,0.6)		0.1141	0.117	0.1122
		(0.082)	(0.084)	(0.084)
Δ Trade/GDP | Trade/GDP ∈ [0.6,∞)		0.1173	0.112	0.11
		(0.072)	(0.070)	(0.070)
Δ sd(log productivity)			0.0096 *	0.0107 *
			(0.005)	(0.006)
Δ sd(log employment)			-0.001	-0.002
			(0.017)	(0.017)
Decade F.E.s	No	No	No	Yes
Obs.	551	551	551	551
R2	0.0488	0.0588	0.0655	0.0764

Trade/GDP	Obs.
∈[0,0.1)	42
∈[0.1,0.2)	120
∈[0.2,0.4)	233
∈[0.4,0.6)	107
∈ [0.6,∞)	49
All	551

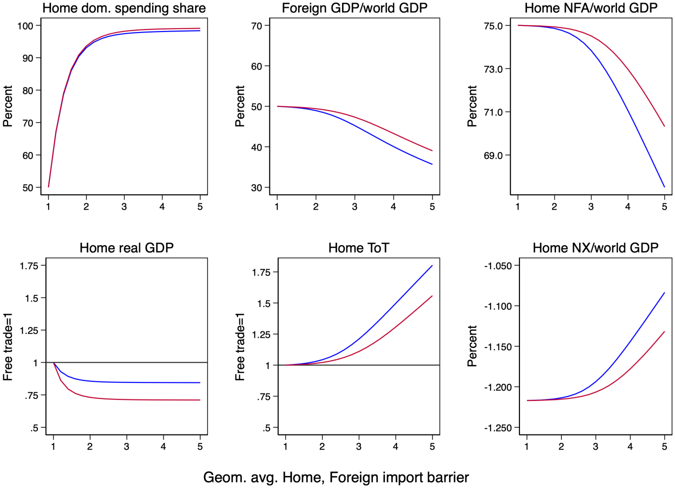
Sample: decadal changes during the 1960-2019 for 168 economies. Standard errors in parentheses clustered at economy level; *** $p<.01$; ** $p<.05$; * $p<.10$. sd(lnS)

Steady-state net exports and openness



Parameters: $\theta = 4$, $\xi = .014$, $N^* = .5$,
$\beta = .9706$, $\beta^* = .9694$, $\mu = \mu^* = 0$

Steady-state net exports and openness: no inputs ($\mu = 0$), inputs ($\mu = .50$)



Parameters: $\theta = 4$, $\xi = .014$, $N^* = .5$,
$\beta = .9706$, $\beta^* = .9694$, $\mu = \mu^*$

Conclusion

Taking our results at face value, reducing NX/GDP with increases in trade barriers is likely to be very costly in terms of foregone gains from trade.

Replacing the Armington assumption with a comparative-advantage model of trade (e.g., Eaton and Kortum, 2002) would not alter our results.

Log utility may affect the quantitative implications of our analysis of the (rather small) transitory-fluctuations component of NX.

Potentially key considerations left out from our (highly stylised) model:

1. Trade models with fixed costs (e.g., Melitz, 2003) may provide additional insights due to the possibility of zero trade.
2. Financial frictions
3. Nominal side: sticky prices, exchange rates
4. Sources of inefficiencies that vary in relevance with the sizes of NX and τ (e.g., increasing returns).

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Appendix

Trade globalization and trade imbalances: details

Decomposition of deviation from balanced trade

$$\frac{1}{T}\sum_t nx_t^2 = \bar{nx}^2 + Var_t\left(nx_t\right), \quad \bar{nx} \equiv \frac{1}{T}\sum_t nx_t;$$

- $\bar{nx}^2$: contribution of average imbalance.
- $Var_t\left(nx_t\right)$: contribution of fluctuations in trade balance around average.

Trade wedge

$$\left(\frac{V}{1-V}\frac{V^*}{1-V^*}\right)^{\frac{1}{2\theta}} = \left(\tau\tau^*\right)^{\frac{1}{2}},$$

where V, V^* is the share of Home, RoW spending on own output, and $\theta = 4$.

Both are averaged across 24 major economies, using GDP weights:
AUS, AUT, BEL, BRA, CAN, CHN, DEU, DNK, ESP, FIN, FRA, GBR, GRC, IND, IRL, ITA, JPN, KOR, MEX, NLD, PRT, SWE, TWN, USA.

Back

Short-run dynamics ($\beta \neq \beta^*$)

- *Law of motion of net foreign assets:*

$$E\left(\tilde{b}_{t+1}\right) = \frac{1-\xi}{\bar{\beta}}\left\{\frac{\beta}{\bar{\beta}}\tilde{b}_t + \frac{1-\beta}{1-\bar{\beta}}\tilde{nx}_t + \frac{b}{1-\xi}\left[\tilde{nx}_t - \bar{\beta}E\left(\tilde{nx}_{t+1}\right)\right]\right\}$$

- *Net exports schedule (NX):*

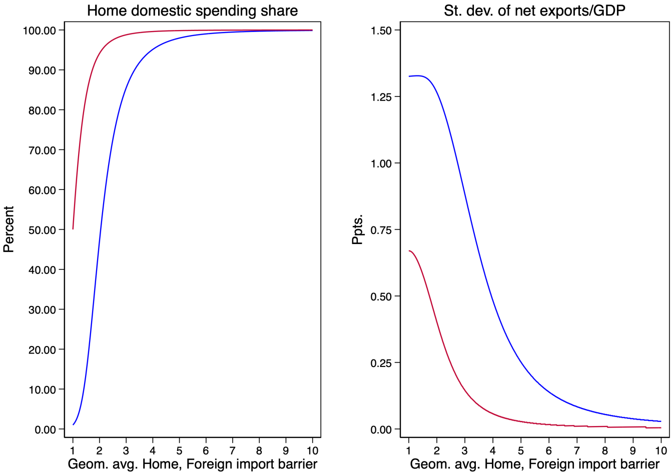
$$\tilde{nx}_t = \frac{1-\bar{\beta}}{1+\left(1-\bar{\beta}\right)b}\left\{\mathcal{N}^*\sum_{s=0}^{\infty}\bar{\beta}^s\left[\left(\tilde{z}_t - \tilde{z}_t^* + \tilde{s}_t\right) - E\left(\tilde{z}_{t+s} - \tilde{z}_{t+s}^* + \tilde{s}_{t+s}\right)\right] + \right.$$
$$\left. -\frac{\mathcal{N}^*}{N^*}\tilde{b}_t + \frac{\left(1-\mathcal{N}^*\right)\left(1-\xi-\bar{\beta}\right)}{\left(1-\xi\right)\left(1-\beta\right)}b\left(\tilde{z}_t - \tilde{z}_t^* + \tilde{s}_t\right)\right\}$$

- *Market clearing condition (MC):*

$$\tilde{s}_t = \mathcal{M}\left\{\left[1 + \frac{\left(1-\mu\right)\bar{V}}{1-V}nx\right]\left(\tilde{z}_t^* - \tilde{z}_t\right) - \mathcal{E}\left(1-nx\right)\tilde{nx}_t\right\}$$

Back

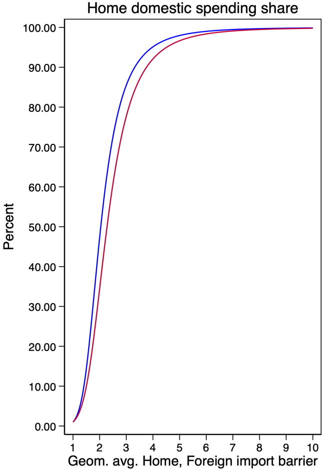
Net exports volatility and openness: Home small ($N^* = .99$), large ($N^* = .50$)

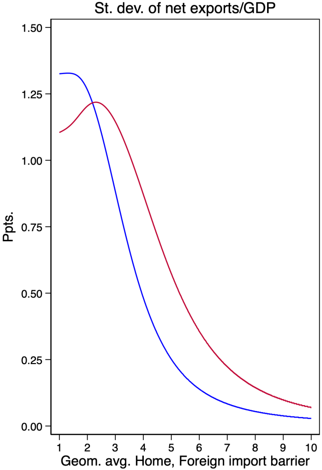


Parameters: $\theta = 4$, $\xi = .014$, $\beta = .97$, $\mu = \mu^* = 0$,
$\sigma_a, \sigma_{a^*} = .01$, $\delta_a, \delta_{a^*} = .60$

Back

Net exports volatility and openness: Home no inputs ($\mu = 0$), inputs ($\mu = .50$)





Parameters: $\theta = 4$, $\xi = .014$, $\beta = .97$, $\mu = \mu^*$,
$\sigma_a, \sigma_{a^*} = .01$, $\delta_a, \delta_{a^*} = .60$

Back

Terms of trade volatility and openness in the data

Dep. variable: Δ sd(log ToT)	(1)	(2)	(3)	(4)
Δ Trade/GDP	-0.034 (0.039)			
Δ Trade/GDP | Trade/GDP [0,0.1)		-0.176 (0.227)	-0.181 (0.227)	-0.106 (0.217)
Δ Trade/GDP | Trade/GDP ∈ [0.1,0.2)		-0.095 (0.099)	-0.101 (0.099)	-0.17 * (0.095)
Δ Trade/GDP | Trade/GDP ∈ [0.2,0.4)		-0.007 (0.050)	-0.011 (0.050)	-0.056 (0.047)
Δ Trade/GDP | Trade/GDP ∈ [0.4,0.6)		-0.022 (0.052)	-0.024 (0.051)	-0.069 (0.052)
Δ Trade/GDP | Trade/GDP ∈ [0.6,∞)		-0.034 (0.114)	-0.033 (0.110)	-0.039 (0.109)
Δ sd(log productivity)			-0.004 (0.008)	-0.004 (0.008)
Δ sd(log employment)			0.0144 (0.015)	0.0035 (0.014)
Decade F.E.s	No	No	No	Yes
Obs.	551	551	551	551
R2	0.0013	0.0037	0.0057	0.0746

Trade/GDP	Obs.
∈[0,0.1)	42
∈[0.1,0.2)	120
∈[0.2,0.4)	233
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Sample: decadal changes during the 1960-2019 for 168 economies. Standard errors in parentheses clustered at economy level; *** p<.01; ** p<.05; * p<.10.

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