Global Value Chains and International Risk Sharing

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Motivation

- Recent focus on GVCs as a "source of risk"

[e.g., Baldwin & Freeman, 2022; Acemoglu & Tahbaz-Salehi, 2023]

$\Rightarrow$ Debate around extent to which risk of GVC disruption offsets diversification benefits

[e.g., Caselli et al., 2020; D'Aguanno et al., 2021]

- Underlying this debate is a fundamental question:

How do GVCs affect international transmission when accounting for their general equilibrium effects on demand, supply and relative prices (terms of trade)?

- To what extent, and through which mechanisms, can GVCs drive income risk and the degree of international risk sharing?

This Paper

Address this question through the lens of open-macro theory

- Focus on **supply-side links** and international transmission of productivity shocks

  [Cole & Obstfeld, 1991; Corsetti, Dedola & Leduc, 2008; Corsetti, Dedola & Lloyd, 2025]

- Highlight novel "**global cost dependence**" channel linking TOT and marginal costs
- Derive implications for **equilibrium dynamics**, **risk** and **risk sharing**, as a function of
  - structure of cross-border financial markets
  - trade elasticities (input/good complementarity)
  - openness

Results

With incomplete fin. mkts., global cost dependence does not necessarily diversify risk

- GVCs diversify risk when domestic and foreign inputs/goods are sufficiently substitutable
  - When not strong complements, productivity gains lower intnl. price of inputs and goods
  - GVCs lower input prices/production costs abroad (while raising foreign income in real terms)
- GVCs exacerbate risk if goods/inputs are strong complements
  - Home terms of trade appreciate in response to productivity gains
  - Higher prices raise production costs abroad (while lowering foreign real income and demand)

  $\Rightarrow$ GVCs magnify production risk independent of 'disruption risk'

Global production cost dependence can create "fragmentation trap"

- Effects can be non-monotonic
- While GVC deepening globally desirable, delinking' can be welfare-enhancing on margin

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Model

Two-Country, Two-Good Setup with Roundabout Production

- Consumption in Home (H) and Foreign (F, $*$) a CES bundle:

$$C_t = \left(a_H^{\frac{1}{\phi_C}} C_{H,t}^{\frac{\phi_C - 1}{\phi_C}} + a_F^{\frac{1}{\phi_C}} C_{F,t}^{\frac{\phi_C - 1}{\phi_C}} \right)^{\frac{\phi_C}{\phi_C - 1}}$$

  ϕ_C is trade elasticity for final goods

- Firms produce using share $\alpha \in (0,1)$ intermediate inputs and (fixed) value added:

$$Y_{H,t} = \left(A_t \overline{L}^{(1-\alpha)} \right) X_t^{\alpha} \quad \text{where} \quad X_t = \left(b_H^{\frac{1}{\phi_X}} X_{H,t}^{\frac{\phi_X - 1}{\phi_X}} + b_F^{\frac{1}{\phi_X}} X_{F,t}^{\frac{\phi_X - 1}{\phi_X}} \right)^{\frac{\phi_X}{\phi_X - 1}}$$

  ϕ_X is trade elasticity for intermediate inputs, b_F imported share

- Define terms of trade: $\mathcal{T}_t = P_{F,t}/P_{H,t}$ (increase is a deterioration)

Equilibrium

Core transmission boils down to:

Relative Supply (RS):

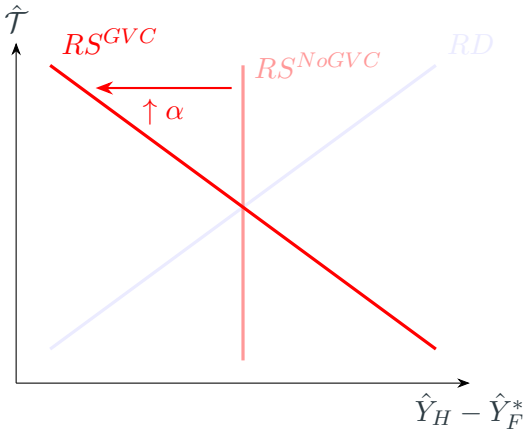
$$\widehat{Y}_{H,t} - \widehat{Y}^*_{F,t} = \left(\widehat{A}_t - \widehat{A}^*_t\right) - 2\frac{\alpha}{1-\alpha} b_F \widehat{\mathcal{T}}_t$$

Relative Demand (RD):

$$\widehat{Y}_{H,t} - \widehat{Y}^*_{F,t} = D_i \widehat{\mathcal{T}}_t \quad \text{where } i = \{CM, FA\}$$

where, $D_{CM} > 0$:

$$D_{FA} = D_{FA}(\alpha, b_F; \phi_C, \phi_X) \gtreqless 0$$



GVCs impact slope of schedules

- RS always negatively sloped with GVCs ($\alpha > 0$ and $b_F > 0$)
- RD has either sign under FA, so shifts in productivity impact $\mathcal{T}$ in either direction

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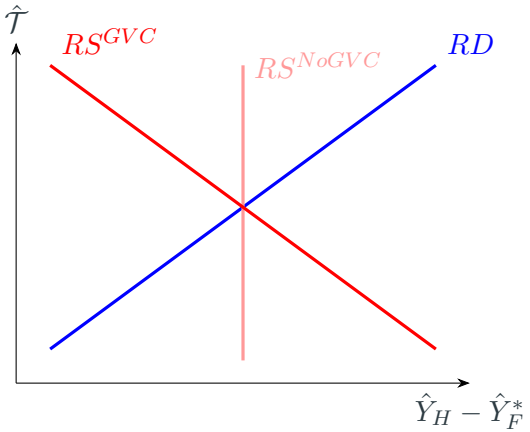

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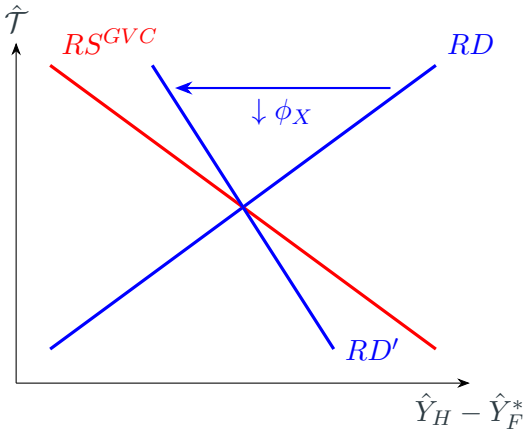

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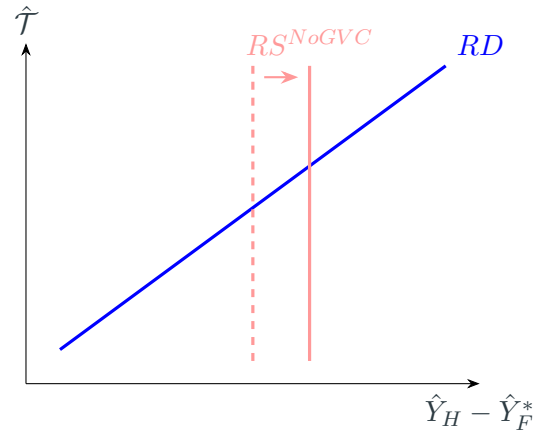
International Transmission

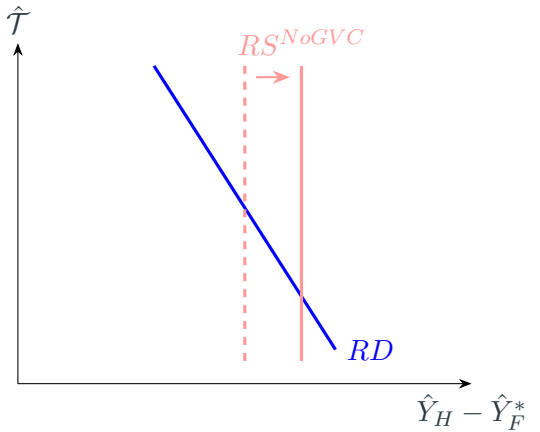
International Transmission: Specific Cases

CM or FA with Enough Substitutability



GVC cost diversification moderates $\mathcal{T}$ dep.

FA with Strong Complementarity



Sufficient complementarity eliminates $\mathcal{T}$ app.

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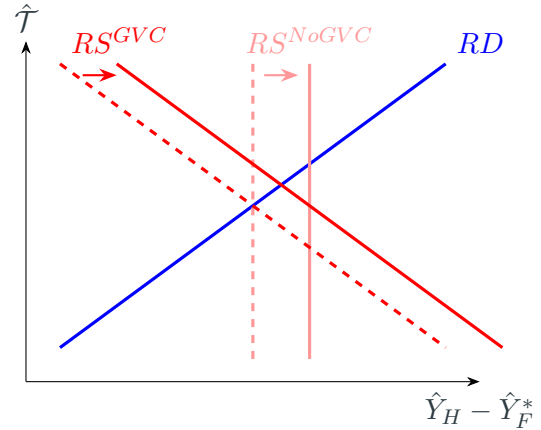

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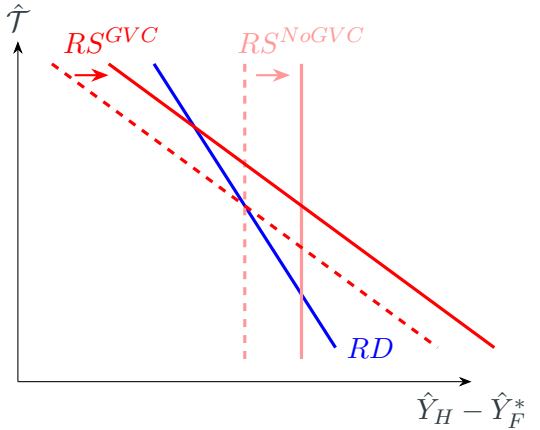

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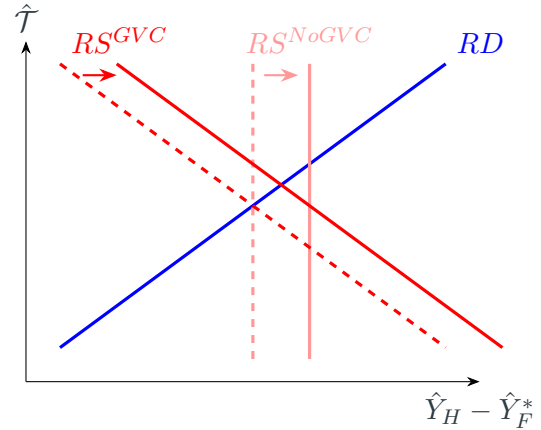

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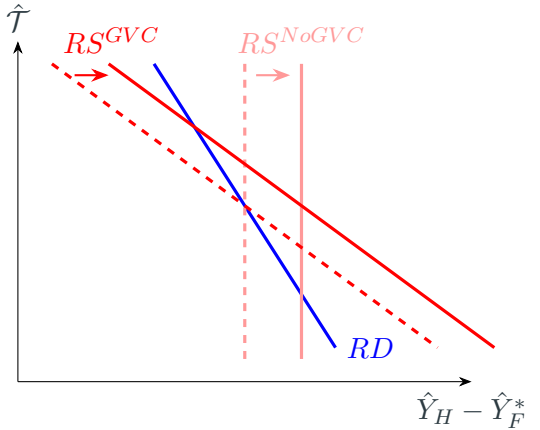

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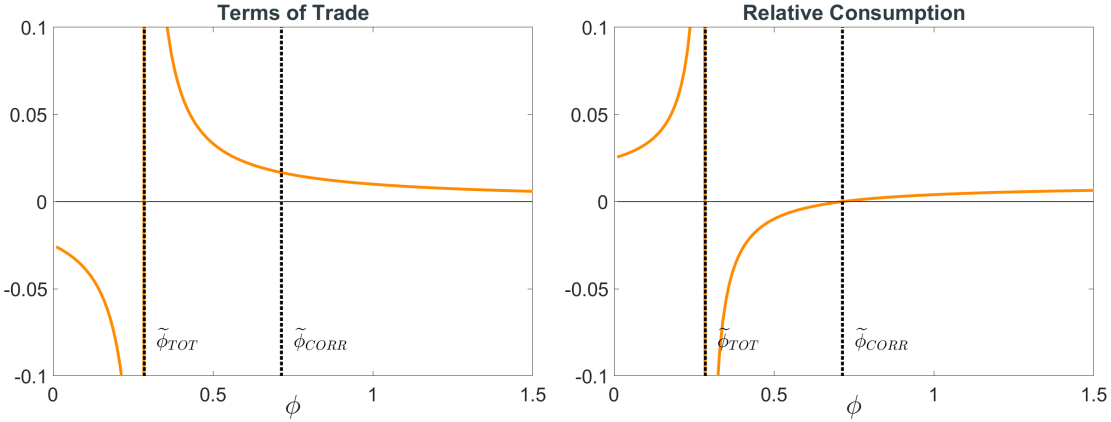
Impact Responses of $\mathcal{T}$ and C/C^* to Home Productivity Gains

No GVCs ($\alpha = 0$), Corsetti et al. 2008

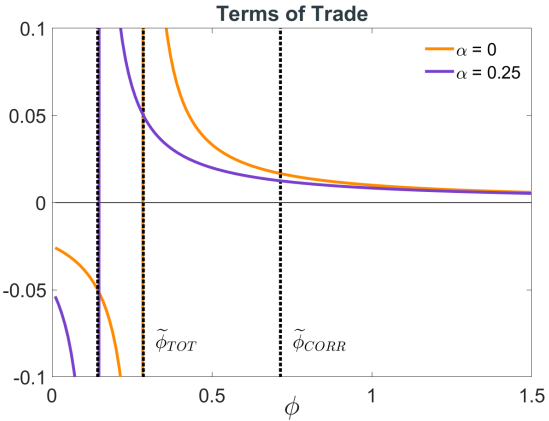


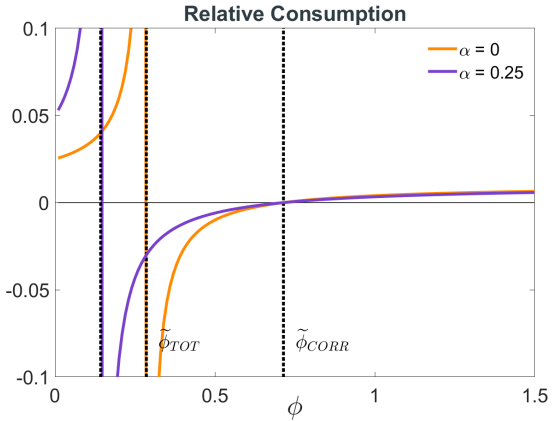
Note: Impact responses to a positive shock to A_t with $a_H = 0.7$, under FA.

$\phi \leq 1$: appreciation drives inefficient income effects and production risk exacerbation

Impact Responses of $\mathcal{T}$ and C/C^* to Home Productivity Gains

Intermediate GVCs integation ($\alpha \Rightarrow .25$)



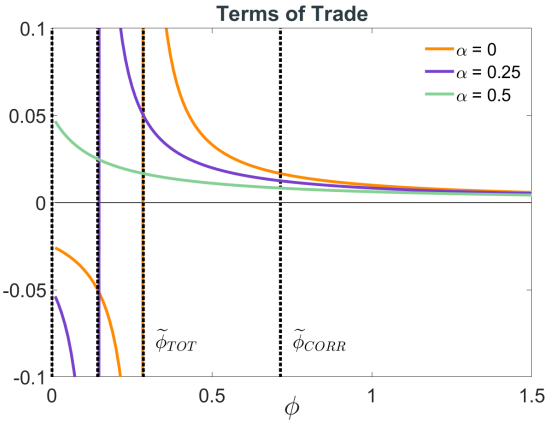


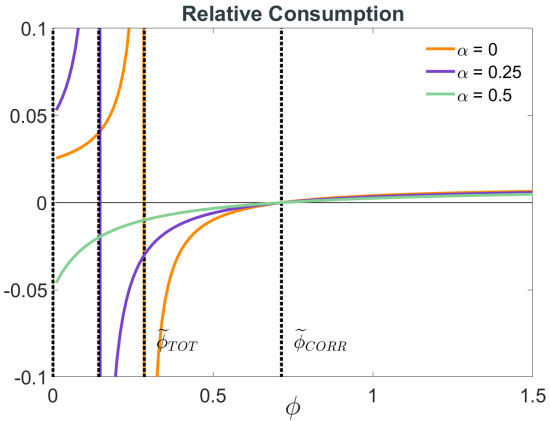
Note: Impact responses to a positive shock to A_t with $a_H = 0.7$, under FA.

GVCs moderate $\mathcal{T}$ dep. with sufficient substitutability, exacerbate app. with complementarity

Impact Responses of $\mathcal{T}$ and C/C^* to Home Productivity Gains

Higher GVCs integation $\alpha \Rightarrow .5$





Note: Impact responses to a positive shock to A_t with $a_H = 0.7$, under FA.

When α sufficiently large, asymptote disappears and no $\mathcal{T}$ appreication

Risk Sharing and Risk

Measuring Impact of GVCs on Risk and Risk Sharing

Risk Sharing

- Welfare-relevant wedge capturing deviations from perfect risk sharing under CM
- The 'wealth gap':

$$\mathcal{W}_t \equiv \frac{SDF^*_{\tau,t}}{SDF_{\tau,t}} \frac{1}{RER_{\tau,t}} - 1$$

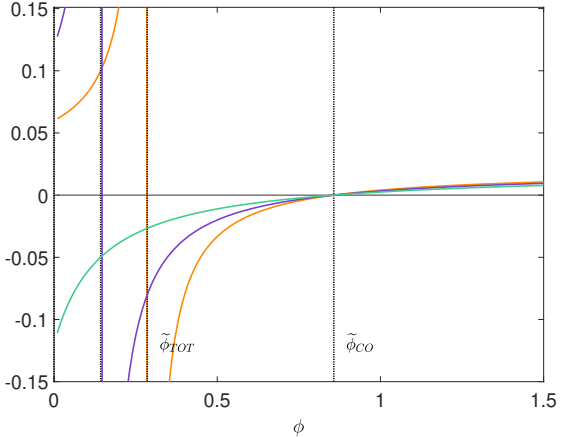
where:

$$\widehat{\mathcal{W}}^{CM}_t = 0 \quad \text{and} \quad \widehat{\mathcal{W}}^{FA}_t = \sigma \left(\widehat{C}_t - \widehat{C}^*_t \right) - (2a_H - 1)\, \widehat{TOT}_t$$

Macroeconomic Risk:

- Volatilities of stochastic discount factors SDF and SDF^*: capture total risk

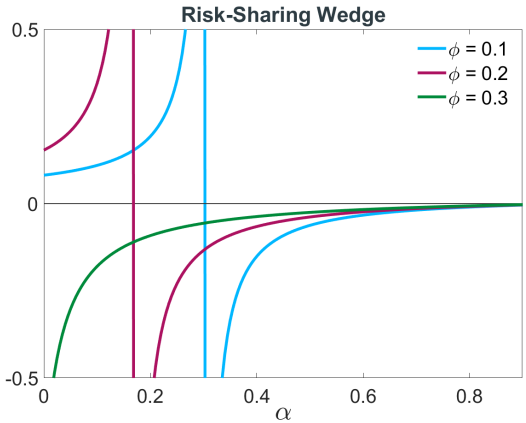
GVCs and International Risk Sharing



Note: Impact responses to a positive shock to A_t with $a_H = b_H = 0.7$ and $\sigma = 2$, under FA.

- For most of the parameter space, GVC integration improves risk sharing

Zooming In on Non-Monotonicity



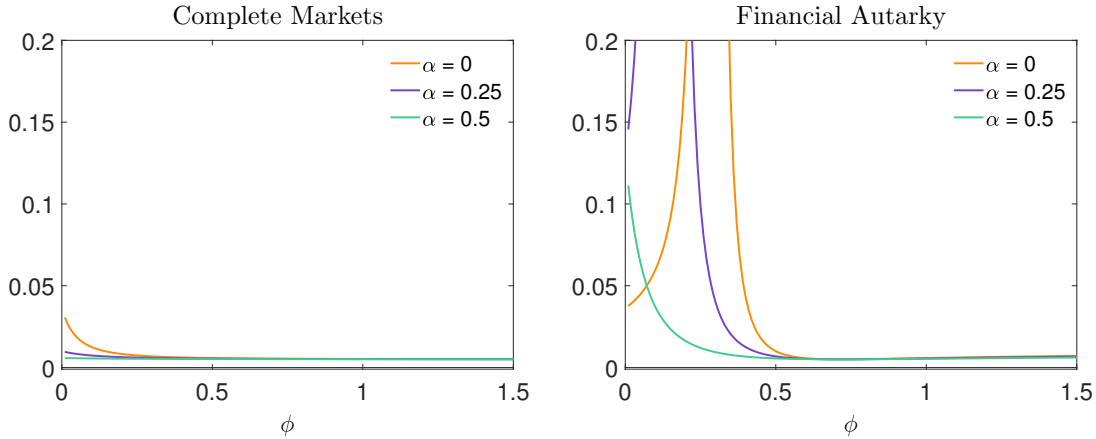
Note: Impact responses to a positive shock to A_t with $a_H = b_H = 0.7$ and $\sigma = 2$, under FA.

- High integration improves risk sharing (integration oasis)
- For $\phi < \tilde{\phi}_{TOT}$, integrating from a low point can worsen it (fragmentation trap)

Risk Non-Monotonic in GVCs when Markets are Incomplete

Volatility of SDF with symmetric i.i.d. shocks to productivity, increasing symmetrically

$\alpha = 0 \Rightarrow .25 \Rightarrow .5$



Quantitative Relevance

Two Approaches to Quantitative Analysis

#1. **Model Calibration**

- 28 advanced economies, 2000-2014 [WIOD]
- Compare countries with different degrees of integration (different α, a_F and b_F)
- Agnostic on elasticities (ϕ_C and ϕ_X)
- **Find**: For most of parameter space, more integrated countries have improved risk sharing

#2. **Regression**

- Test association between wealth gap $\mathcal{W}$ and GVC reliance
- Use empirical counterparts for α, b_F and a_F

Regression Results

	Dep. Var.: Absolute Wealth Gap $\lvert\mathcal{W}_{i,t}\rvert$							
	$\sigma = 1$				$\sigma = 2$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Int. Import Share MA	-0.03***	-0.10**	-0.11***	-0.10***	-0.02**	-0.10	-0.12*	-0.16***
	(0.010)	(0.041)	(0.035)	(0.034)	(0.010)	(0.065)	(0.061)	(0.057)
Cons. Import Share MA		-0.20*	-0.31**	-0.24		-0.12	-0.24	-0.25
		(0.119)	(0.153)	(0.214)		(0.159)	(0.161)	(0.220)
Relative GDP		-0.04*	-0.05	-0.06**		-0.06***	-0.07**	-0.08***
		(0.026)	(0.031)	(0.028)		(0.024)	(0.030)	(0.026)
VA Share MA			-0.14	-0.07			-0.15	-0.08
			(0.104)	(0.098)			(0.105)	(0.122)
Observations	286	286	286	286	286	286	286	286
Country FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time FE	No	No	No	Yes	No	No	No	Yes
Within R-squared	0.015	0.036	0.041	0.155	0.008	0.032	0.037	0.117

Conclusions

- As GVCs create supply-side linkages across borders, **global production-cost dependence** activates a new channel impinging on the international transmission mechanism
- In general, **higher GVC integration improves risk sharing**
- With input complementarity, **sufficiently high GVC integration reduces total risk (volatility of the SDF) and improves risk sharing when markets are incomplete**
- Welfare effects are however non-monotonic in GVCs when inputs are strong complements. Intermediate GVCs integration can amplify production risk
- Conclusions robust to trade in bonds, endogenous labor, and differences in short- and long-run elasticities.