Supply chain uncertainty and diversification

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Supply chain disruption risk and firms' sentiments

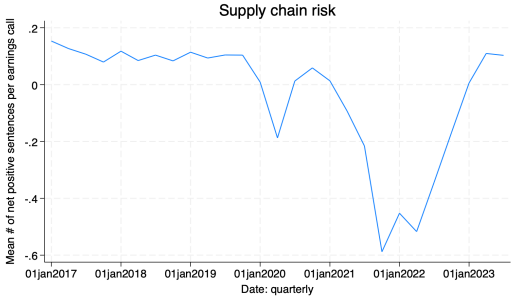


Figure 1: Average sentiment

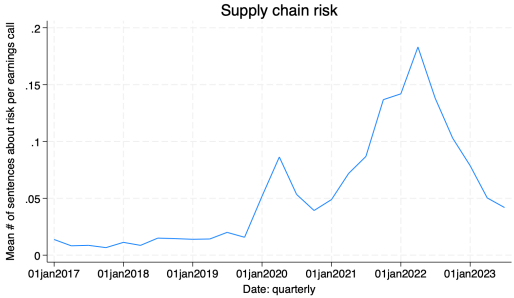


Figure 2: Average risk

- Hassan et al.2023): Text-based measures on earning calls dedicated to the event of interest: *"Supply chain risk"*
  - Sentiment: perceived impact on the **mean** of the firm's economic outlook
  - Risk: perceived impact on the **variance** of the firm's economic outlook

Research question and results

- How does supply chain uncertainty affect firms' sourcing decision?
  - Are firms sourcing from foreign countries to diversify against risk? Or are they re-shoring?
  - Would firms import from cheaper or less risky countries?

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- Preview of the results:
  - Theoretically, ambiguous effect of risk – four channels of expected profits:
    - ▷ *Option value* effect: risk raises the variance of sourcing capability, Oi-Hartman-Abel effect $(+)$
    - ▷ *Hedging* effect: covariance between sourcing capability & market demand $(-)$
  - Increase in uncertainty rises foreign sourcing: option value effect dominates the hedging effect, but aggregate ex-ante profits fall
  - Post-Covid-19: trade-cost *risk* (SD) rose – especially China and the world – driving entry into importing and a reallocation toward China

Related Literature

- Sourcing models
  - Antràs and Helpman2004), Antràs and Helpman2006), Antràs, Fort, and Tintelnot2017), Bernard and Moxnes2018)
    - Study supply chain disruption risk in multi-country sourcing model
- Uncertainty in trade
  - Theory: Grossman, Helpman, and L'Huillier2023), Grossman, Helpman, and Sabal2023), Gervais2021, 2018)
    - Multi-country model allows for sourcing interdependencies and to separate effect of cost and uncertainty, aggregate and idiosyncratic.
    - Structural estimation with micro data and counterfactual analysis
  - Tariff policy uncertainty: Handley et al.2020), Handley and Limão2017), Charoenwong et al.2023)
    - General framework for policy, supply-chain risk, and trade shocks
  - Trade disruption shocks Carreras-Valle2021), Castro-Vincenzi2022), Lafrogne-Joussier et al.2022)
    - Analyze uncertainty and firm's sourcing choice using structural model
  - Empirical literature on propagation through trade networks: Caselli et al.2020), Boehm et al.2019), Carvalho et al.2021), LaBelle et al.2021), D'Aguanno et al.2021)
    - Study of firms' joint sourcing and diversification decision

Stylized facts: supplier diversification after Covid-19

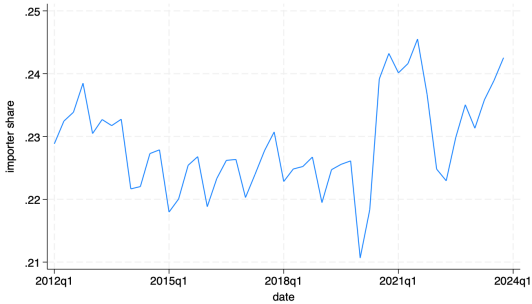


Figure 3: Share of importers among all firms

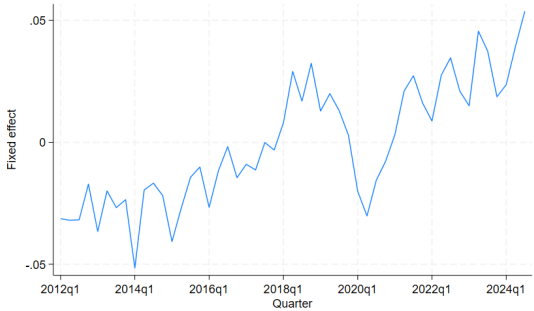


Figure 4: Number of sourcing origins per firm-product pair

- Chilean Customs $\times$ tax data, 2012–2023 (quarterly): ≈ 50 origins, $\approx 23\%$ of firms import
- Time fixed effects δ_t from $\log N_{fpt} = \alpha_{fp} + \delta_t + \epsilon_{fpt}$ (f firm, p HS6 product, t quarter)
  Stable until 2017, rises for 2018–19 trade war, falls during Covid-19, then recovers *above* past levels

Stylized facts: entry into importing and substitution across origins



Figure 5: Share of importers from the US

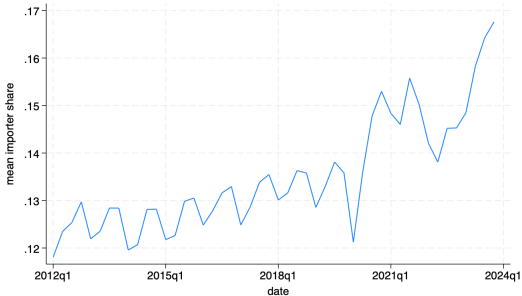


Figure 6: Share of importers from China

- Entry: share of importers trends down before 2020, then turns *up* – including among below-median-sales firms
- Substitution: the US share trends *down* while China's trends *up* – firms replace one origin for the other (avg. shares: US 0.098, China 0.128)

Model: Set-up and timeline

- Multi-country sourcing model inspired from Antràs, Fort, and Tintelnot2017)
  - I countries. Origin: i, Destination: j.
  - Final-good producers in j: productivity φ, produce a single variety with monopolistic competition using intermediate inputs
  - Sourcing from set of countries $\mathcal{I}_j(\varphi)$
  - Trade from intermediate good firms in countries $i \in \mathcal{I}_j(\varphi)$, perfect competition, productivity follows Fréchet distribution with shape θ: $\mathbb{P}(a_i(\nu, \varphi) \geq a) = e^{-T_i a^{\theta}}$

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  - Supply chain risk from i to j (firm φ): world-level, country-level, and firm (idiosyncratic) shock

$$p_{ij}(\nu,\varphi) \equiv \tau_{ij} \underbrace{\bar{\gamma}_j \, \hat{\gamma}_{ij} \, \tilde{\gamma}_{ij(\varphi)}}_{\equiv \gamma_{ij}} \, w_i$$

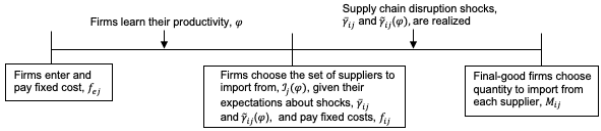
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  - Household consumes final goods as a CES bundle with elasticity σ

- Three-stages firm decision:



Model: Firm Behavior Conditional on Sourcing Strategy, $\mathcal{I}_j(\varphi)$

- Share of intermediate input purchases for realized shocks:

$$\mathcal{X}_{ij}(\varphi, \boldsymbol{\gamma}) = \frac{T_i(\tau_{ij}\,\bar{\gamma}_j\,\hat{\gamma}_{ij}\,\tilde{\gamma}_{ij(\varphi)}\,w_i)^{-\theta}}{\Theta_j(\varphi, \gamma)} \text{ if } i \in \mathcal{I}_j$$

$\Rightarrow$ $\xi_i \equiv T_i(\tau_{ij}\bar{\gamma}_j\hat{\gamma}_{ij}\tilde{\gamma}_{ij(\varphi)}w_i)^{-\theta}$: *sourcing potential* of country i from the point of view of firm φ in country j

$\Rightarrow$ $\Theta_j(\varphi, \gamma) \equiv \sum_{k \in \mathcal{I}_j(\varphi)} T_k(\tau_{kj}\bar{\gamma}_j\hat{\gamma}_{kj}\tilde{\gamma}_{kj(\varphi)}w_k)^{-\theta}$: *sourcing capability* of firm φ in country j

$\Rightarrow$ *Ex-post* Eaton and Kortum, within the firm

Model: Choice of Set of Countries to Import from, $\mathcal{I}_j(\varphi)$

- Choice of $\mathcal{I}$ using ex-ante profits, with $\mathcal{I}_j(\varphi) = \{i : \mathbb{1}_{ij} = 1\}$:

$$\max_{\mathbb{1}_{ij} \in \{0,1\}^I_{i=1}} \mathbb{E}(\pi_j(\varphi,\gamma)) = \mathbb{E}\left(\underbrace{\varphi^{\sigma-1}}_{\text{prod}} \underbrace{\left(\eta \sum_{i=1}^{I} \mathbb{1}_{ij} T_i \left(\tau_{ij} \bar{\gamma}_j \hat{\gamma}_{ij} \tilde{\gamma}_{ij(\varphi)} w_i \right)^{-\theta} \right)}_{\text{sourcing capability } \Theta_j(\varphi,\gamma(\varphi))}^{\frac{\sigma-1}{\theta}} \underbrace{B_j(\bar{\gamma},\hat{\gamma})}_{\text{market demand}} \right) - w_j \sum_{i=1}^{I} \mathbb{1}_{ij} f_{ij}$$

- With market demand in j defined as

$$B_j(\bar{\gamma},\hat{\gamma}) \equiv \frac{1}{\sigma} \left(\frac{\sigma}{\sigma-1} \right)^{1-\sigma} E_j P_j(\bar{\gamma},\hat{\gamma})^{\sigma-1}$$

$\Rightarrow$ Effect through price index Price index

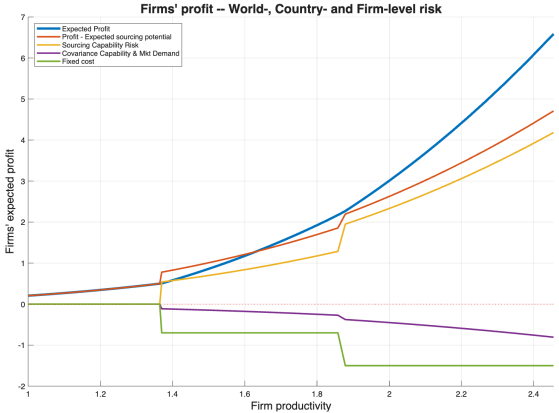
Decomposition: What determines profits?

- Expected profit decomposes into **four channels**:

$$\mathbb{E}\big[\pi_H(\varphi,\gamma)\big] = \varphi^{\sigma-1}\Big(\underbrace{\Theta_H(\varphi,\mathbb{E}[\gamma])^{\frac{\sigma-1}{\theta}}}_{\text{(i) Sourcing capability for expected cost}} + \underbrace{\mathbb{E}\big[\Theta_H(\varphi,\gamma)^{\frac{\sigma-1}{\theta}} - \Theta_H(\varphi,\mathbb{E}[\gamma])^{\frac{\sigma-1}{\theta}}\big]}_{\text{(ii) Option value (risk effect on capability)}} \Big) \times \underbrace{\mathbb{E}\big(B_H(\bar{\gamma},\hat{\gamma})\big)}_{\text{(i-ii) Expected market demand}}$$

$$+ \varphi^{\sigma-1} \underbrace{\mathbb{C}\mathrm{ov}\big(\Theta_H(\varphi,\gamma)^{\frac{\sigma-1}{\theta}}, B_H(\bar{\gamma},\hat{\gamma})\big)}_{\text{(iii) Hedging effect (covariance)}} - \underbrace{w_H \sum_{i\in\mathcal{I}(\varphi)} f_{iH}}_{\text{(iv) Fixed cost of sourcing}}$$

Profit Decomposition – 3 Countries Example



- Three countries, ξ_0=1, ξ_1=0.8, ξ_2=0.3, $(\sigma-1)/\theta = 1.58$.
  World, origin and firm shocks Bernoulli: γ=1 w.p. 90%, γ=5 w.p. 10%
- Total (blue) = expected cost + option value + hedging − fixed cost, staggered by the pecking order.
  Expected cost dominates: option value > hedging

Firms' sourcing strategies and the extensive margin

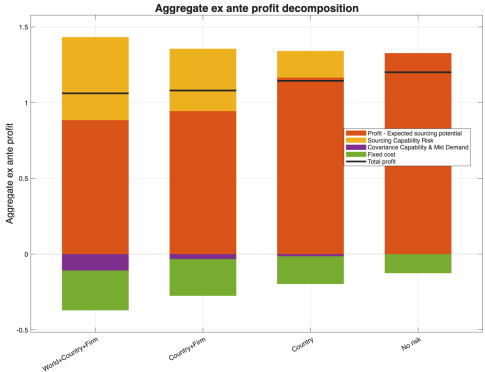


Figure 7: (a) Ex-ante profit decomposition

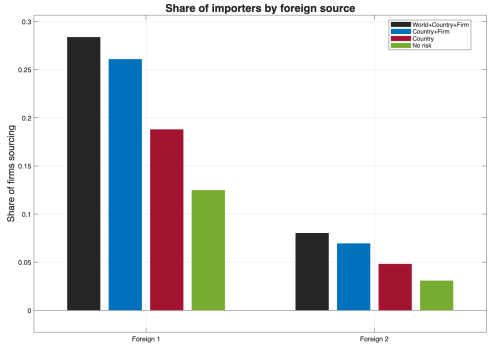
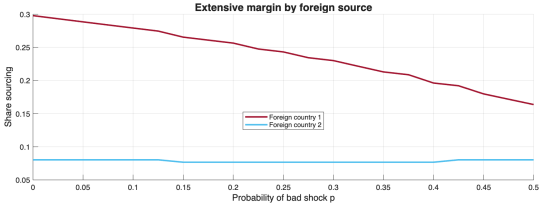


Figure 8: (b) Share of importers by source

- Across risk scenarios (baseline = world + origin + firm risk → no risk), more risk ⇒ more selection into importing: diversify to capture option values
- Aggregate ex-ante profit *falls* with risk: option-value gain < expected cost + hedging effect + fixed costs

Extensive margin and profit vs. risk



- Increase probability p of high-cost shock (raises both mean and variance of γ)
- Share importing from Foreign 1 falls in p (mean effect)
  aggregate profit roughly flat: expected cost ↓ and option value ↑ offset by hedging ↓ and fixed cost

Data Description

- Proprietary administrative data from the Central Bank of Chile:
  - **Customs** country-to-firm level data: import unit values, quantities, origin countries, and product categories
  - **Tax Form 29:** sales and materials purchases
  - **Unemployment Funds:** employer-employee level data.
  - Quarterly panel from 2012 to 2023.
- Publicly available data (yearly):
  - (i) CEPII gravity data set (population weighted distance, and common language): 2003-2021.
  - (ii) World Bank WGI (control of corruption): 2003-2021.

Structural Estimation: Step 1, Average Sourcing Potential

We estimate the parameters and shocks $\bar{\gamma}_{j,t}, \hat{\gamma}_{ij,t}, \tilde{\gamma}^n_{ij,t}, f^n_{ij}$.

- Take θ and σ from Antràs et al.2017): $\theta = 1.789$, $\sigma = 3.85 \Rightarrow (\sigma - 1)/\theta = 1.583 > 1$
- Recall sourcing potential: $\xi^n_i \equiv T_i(\tau_{ij}\gamma^n_{ijt}w_i)^{-\theta}$
  & import share: $\mathcal{X}^n_{ijt} = T_i(\tau_{ij}\gamma^n_{ijt}w_i)^{-\theta}/\Theta^n_{jt}$ if $i \in \mathcal{I}^n_j$
- Average component of sourcing potential: $\bar{\xi}_i \equiv T_i(\tau_{ij}w_i)^{-\theta}$
- Compare each firm's import share to its domestic share and estimate an origin fixed effect:

$$\log \mathcal{X}^n_{ijt} - \log \mathcal{X}^n_{jjt} = \alpha_i + u_{int}, \qquad \alpha_i \mapsto \log \bar{\xi}_i$$

- Normalize $\xi_j = 1$ (no domestic disruptions). OLS on ≈ 50 origins using imports, wage bill, and input usage

Results

Structural Estimation: Step 2, Estimating Shocks

- Treat changes in relative import shares as changes in effective sourcing costs. The 4-quarter difference of log relative shares decomposes into three components:

$$\Delta_4\left[\log \mathcal{X}^n_{ij,t} - \log \mathcal{X}^n_{jj,t}\right] = \underbrace{\bar{\lambda}_t}_{-\theta\,\Delta_4 \log \bar{\gamma}_{j,t}} + \underbrace{\hat{\lambda}_{it}}_{-\theta\,\Delta_4 \log \hat{\gamma}_{ij,t}} + \underbrace{e^n_{it}}_{-\theta\,\Delta_4 \log \tilde{\gamma}^n_{ij,t}}$$

- OLS with time FE (world $\bar{\gamma}_j$), origin $\times$ time FE (origin $\hat{\gamma}_{ij}$), and a firm–origin residual (idiosyncratic $\tilde{\gamma}^n_{ij}$)
- Recover levels assuming: log shocks follow a random walk. Initial value $= 1$ (no shock), log-normal $\Rightarrow$ mean and variance per component

Results, Chile-China/US

Structural Estimation: Step 3, Fixed Costs Estimation

- Use average 2012q1-2019q4 data: SMM for 13 countries (incl. Chile)
- Firm–origin fixed cost depends on gravity variables and control of corruption
  - $\log f_{ij}^n = \beta_c^f + \beta_d^f \log \text{dist}_{ij} + \beta_l^f \text{lang}_{ij} + \beta_C^f \text{corruption}_i + \nu_{ij}^n, \quad \nu_{ij}^n \sim \mathcal{N}(0, (\beta_{\text{disp}}^f)^2)$
  - We set $f_{jj}^n = 0$.
- SMM to estimate

$$\delta = [E, \beta_c^f, \beta_d^f, \beta_l^f, \beta_C^f, \beta_{\text{disp}}^f]$$

- Drawing shocks: Monte Carlo
  - Draw world, origin and firm shocks γ from log-Normal distributions (Quasi–Monte Carlo / Sobol sequences)
  - Draw firm productivity φ from a Pareto distribution.
  - Draw firm-level fixed costs f_{ij}^n from Normal distribution.

SMM

- Moment selection: m_k data, $\hat{m}_k(\delta)$ simulated
  1. Share of importers for all firms.
  2. Share of importers with firm sales below the median.
  3. Share of firms that import from each country.
     - $(I-1) \times 1$ vector of moments.
  4. Share of firms whose input purchases from Chile are less than the median input purchases from Chile in the data.

- Model solution:
  - Equilibrium Price *Fixed point*,
    $\Rightarrow$ for each aggreg. shock (Monte Carlo) world $\bar{\gamma}_j$ + country $\hat{\gamma}_{ij}$, solve for $P(\bar{\gamma}, \hat{\gamma})$
  - Firm sourcing: high dimensionality *combinatorial* discrete choice problem
    $\Rightarrow$ For each firm φ, use Jia (2008)'s algorithm, in expectations (MC draws) to find $\mathcal{I}_j^n(\varphi)$

- Minimize $\hat{\delta} = \arg\min_\delta \ \hat{y}(\delta)^\top \ \mathbf{W} \ \hat{y}(\delta)$
  - We use $\hat{y}(\delta) = (\mathbf{m}/\hat{\mathbf{m}}(\delta) - 1)$ and assume $\mathbb{E}(\hat{y}(\delta_0)) = 0$ for the true parameter δ_0.

Model Fit Jia's

Estimated supply-chain disruption shocks

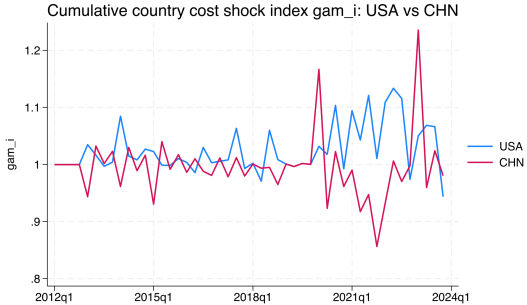


Figure 9: Source-specific shock $\hat{\gamma}_{ij,t}$: USA vs. China

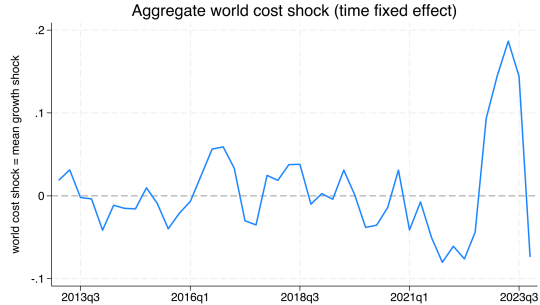


Figure 10: Global (world) shock $\bar{\gamma}_t$

- Higher $\hat{\gamma} \Rightarrow$ harder to source: post Covid, costlier to source from US and less from China
- World shock: trade became *easier* post pandemic (2021), then 2022 bottlenecks + Russia–Ukraine war raised costs

Aggregate shocks: mean and risk by period

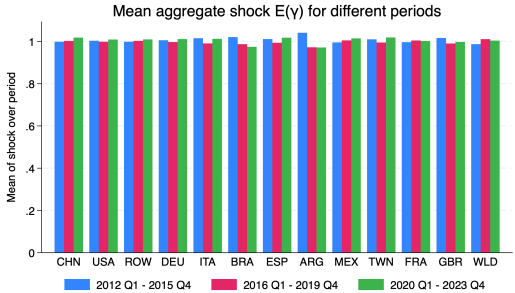


Figure 11: Mean $\mathbb{E}[\bar{\gamma}_t]$, $\mathbb{E}[\hat{\gamma}_{jt}]$

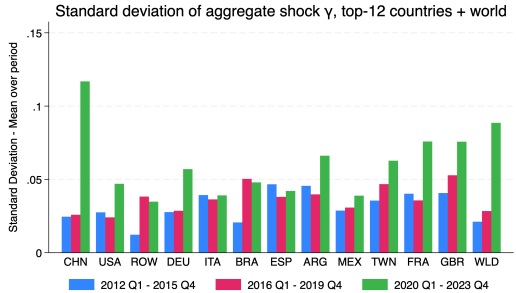


Figure 12: Std. dev. $\sigma(\bar{\gamma}_t)$, $\sigma(\hat{\gamma}_{jt})$

- Periods: 2012q1–15q4, 2016q1–19q4, 2020q1–23q4. Means rise modestly (China, US, world, trade-war peak in 2016–19)
- Post-Covid **risk (SD) rises markedly**, especially for China and the world – the key input to the counterfactual

Counterfactual exercise

- Estimate the model on 2012q1–2019q4 data: baseline sourcing and entry (**State 1**)

- Apply 2020q1–2023q4 trade-cost moments in three cumulative steps:
  - **State 2**: change the *means* $\mathbb{E}[\gamma_{ij}]$
  - **State 3**: add the change in *idiosyncratic* risk $\sigma(\tilde{\gamma}_{ij})$
  - **State 4**: add the change in *aggregate* risk $\sigma(\hat{\gamma})$, $\sigma(\bar{\gamma})$

- Evaluate effects on entry into importing and sourcing by country, and decompose aggregate ex-ante profits into the four channels

Post-Covid-19 uncertainty: firms' reactions

Table 1: Counterfactual states (2020–23 moments applied cumulatively)

State	Importer share	Origins/firm	China share	U.S. share
1: Baseline	0.1968	2.956	0.1430	0.0999
2: + Mean shock	0.1956	2.968	0.1404	0.0990
3: + Idiosyncratic risk	0.2095	2.832	0.1665	0.0958
4: + Aggregate risk	0.2135	2.815	0.1717	0.0963

- Risk (States 3–4) raises the **importer share**: more firms enter into importing
- Origins per firm falls: new importers source from a *single* foreign origin
- **China share rises**, U.S. share falls then partly recovers – reallocation toward China

Profit decomposition of post-Covid-19 uncertainty

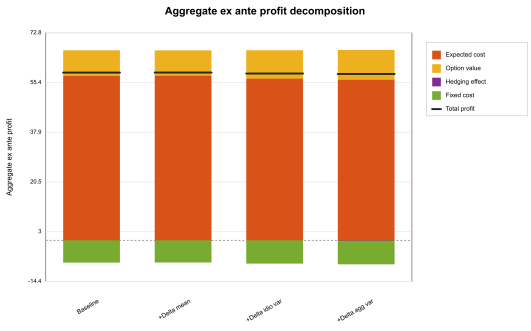


Figure 13: (a) Profit decomposition, 2020–23 uncertainty

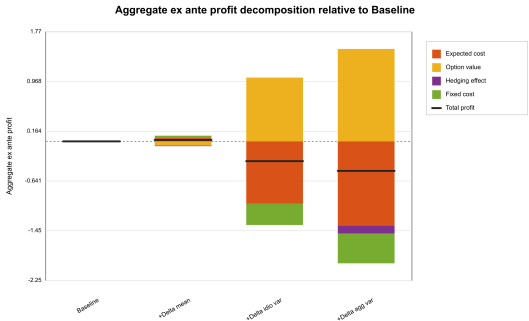


Figure 14: (b) Difference relative to baseline 2012–19

- Expected-cost contribution *falls* (GE competition as more firms import). Option value *rises* and dominates
- Hedging effect & fixed costs become more negative ⇒ aggregate ex-ante profit falls, as more firms diversify

Conclusion

- Conclusion:
  a. Uncertainty shapes sourcing through **four channels**:
     ▷ profits level is driven mainly by sourcing capability at expected costs
     ▷ risk channels (option value, hedging effect) are an order of magnitude smaller
  b. Post-Covid-19, trade-cost *risk* rose sharply (esp. China and the world) while means moved less: firms responded by entering into importing and reallocating toward China
  c. The option value effect dominates the hedging effect, so firms diversify – yet aggregate ex-ante profits still *fall* (GE competition, hedging effect, and fixed costs)

- Next steps:
  - Multi-sector model a la Caliendo Parro, with $\frac{\sigma-1}{\theta} < 1$ within sector
  - Model with adjustment cost / expost quantity frictions $\Rightarrow$ rationing
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  - Thank you! ***tb3219@columbia.edu***

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Price Index

- The price index is:

$$P_j(\bar{\gamma}) = \left(\int_{\tilde{\varphi}} \int_{\tilde{\gamma}(\varphi)} p_j(\varphi, \gamma)^{1-\sigma} d\tilde{\Psi}_j^{\varphi}(\tilde{\gamma}) dG_j(\varphi) \right)^{\frac{1}{1-\sigma}}$$

with:

$$p_j(\varphi, \gamma) = \frac{\sigma}{\sigma - 1} \underbrace{\frac{1}{\varphi} \left(\eta \Theta_j(\varphi, \gamma) \right)^{-\frac{1}{\theta}}}_{mc_j(\varphi)}$$

and $\eta = \left[\Gamma \left(\frac{\theta + 1 - \rho}{\theta} \right) \right]^{\frac{\theta}{1-\rho}}$

Back

Proposition 1

1. Higher productivity firms will increase their expected profits by sourcing more from more or "better" countries:

$$\mathbb{E}\left(\Theta_j(\mathcal{I}_j(\varphi_H, \gamma(\varphi_H))^{\frac{\sigma-1}{\theta}} B_j(\bar{\gamma})\right) > \mathbb{E}\left(\Theta_j(\mathcal{I}_j(\varphi_L, \gamma(\varphi_L))^{\frac{\sigma-1}{\theta}} B_j(\bar{\gamma})\right)$$

2. If $\sigma - 1 > \theta$, import countries are **complements** in the sourcing decisions
   - More productive firms source from more countries
   - Pecking order: Same ordering of countries if fixed costs are the same across firms

Back

Closing the model: gravity and HHI

- Outside sector, freely tradable and big enough to pin down wages
- Using free entry condition and Fubini's theorem:

$$N_j = \frac{\alpha L_j}{\sigma \left(\int_{\tilde{\varphi}_j}^{\infty} \int_{\tilde{\gamma}(\varphi)} \sum_{i \in \mathcal{I}_j(\varphi)} f_{ij} \, d\Psi_{ij}^{\varphi}(\tilde{\gamma}) dG_i(\varphi) + f_{ej} \right)}$$

- Gravity:

$$M_{ij}(\bar{\gamma}) = \frac{E_j}{P_j(\bar{\gamma})^{1-\sigma}/N_j} \frac{Q_i}{\sum_k \frac{E_k}{P_k(\bar{\gamma})^{1-\sigma}/N_k} (\tau_{ik}\bar{\gamma}_{ik})^{-\theta} \Lambda_{ik}(\bar{\gamma})} (\tau_{ij}\bar{\gamma}_{ij})^{-\theta} \Lambda_{ij}(\bar{\gamma})$$

  with $Q_i = \sum_k M_{ik}$ total production of intermediate inputs in i

- Model-implied HHI:

$$HHI_j = \sum_{i=1}^{I} \left(\frac{T_i (\tau_{ij}\bar{\gamma}_{ij} w_i)^{-\theta} \Lambda_{ij}(\bar{\gamma})}{\sum_{k=1}^{I} T_k (\tau_{kj}\bar{\gamma}_{kj} w_k)^{-\theta} \Lambda_{kj}(\bar{\gamma})} \right)^2$$

Back

Parameterization

Variable	Definition	Value
γ shock	Bernoulli: γ=1 (p=0.9), γ=5 (p=0.1)	$\mathbb{E}[\gamma]$=1.3
ρ	Substitutability across intermediate varieties	2.00
I	Number of countries	3.00
ξ_D	Domestic sourcing potential	1.00
ξ_{F1}	Sourcing potential Foreign 1 (China)	0.80
ξ_{F2}	Sourcing potential Foreign 2 (US)	0.30
f_D	Fixed cost of sourcing Domestic	0.00
f_{F1}	Fixed cost of sourcing Foreign 1 (China)	0.70
f_{F2}	Fixed cost of sourcing Foreign 2 (US)	0.80
Calibration for high complementarity $(\sigma-1)/\theta = 1.58$ *following* Antràs et al.2017)		
σ	Elasticity of final demand	3.85
θ	Productivity Fréchet distribution shape	1.79

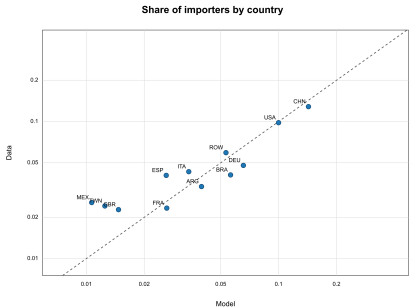
Back

Model Fit

Table 2: Targeted Moments

Moments	Data	Model
Share of importers	0.226	0.1959
Share imp. w/sales below median	0.082	0.0848
Median input purchases	124.430	112.56

Figure 15: Model fit: share of importers by country



Back

Jia's Algorithm

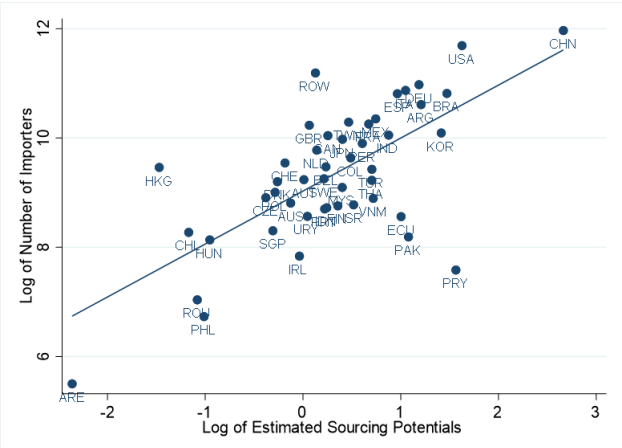
- Proposition: $\forall i$, define mapping $V_{ij}(\varphi, \mathcal{I})$ to be one whenever including country i in sourcing strategy $\mathcal{I}$ raises firm-level expected profits $\mathbb{E}(\pi_j(\varphi, \mathcal{I}))$, and a value of zero o/w. Then, when $(\sigma - 1)/\theta \geq 1$, $V_{ij}(\varphi, \mathcal{I}') \geq V_{ij}(\varphi, \mathcal{I})$ for $\mathcal{I} \subseteq \mathcal{I}'$

- Algorithm:
  1. Let $V_i^n(\mathcal{I}) = 1$ if mg. ben. of adding country i is positive and 0 o/w
  2. When starting from set $\underline{\mathcal{I}}$ (no countries), iteratively add each country to the set (lower bound set)
     - Optimal sourcing strategy: minimum # of countries s.t. $V_i^n(\mathcal{I}) = 1$
  3. Then, starting from set $\bar{\mathcal{I}}$, remove 1-by-1 and find optimal sourcing str. (upper bound set)
  4. If sets do not overlap, only consider profits of upper bound set

Back

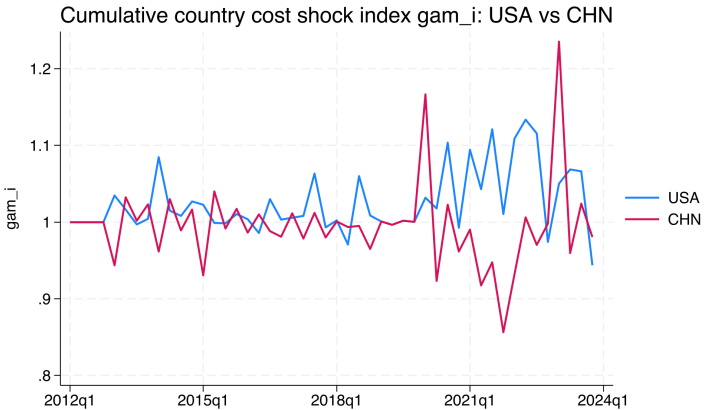
Estimated Sourcing Potential

Figure 16: Sourcing potential and extensive margin



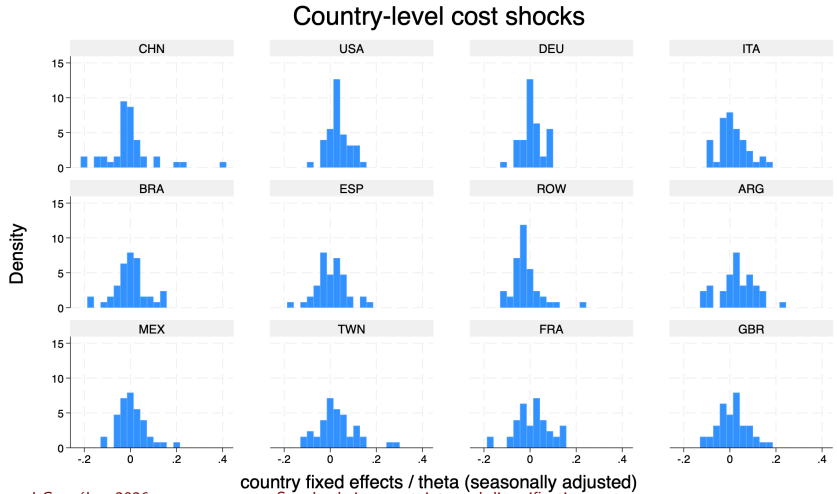
Estimated Source-Specific Supply Chain Disruption Shocks

Figure 17: Source-specific supply chain disruption shock $\hat{\gamma}_{ij,t}$: USA vs. China



Estimated Source-Specific Supply Chain Disruption Shocks

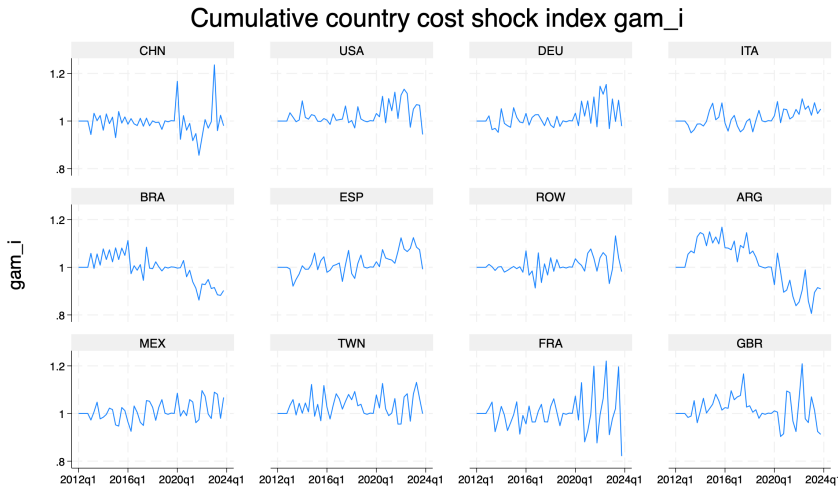
Figure 18: Source-specific supply chain disruption shock $\Delta_4 \log \hat{\gamma}_{ij,t}$



Back

Estimated Source-Specific Supply Chain Disruption Shocks

Figure 19: Source-specific supply chain disruption shock $\hat{\gamma}_{ij,t}$: all countries



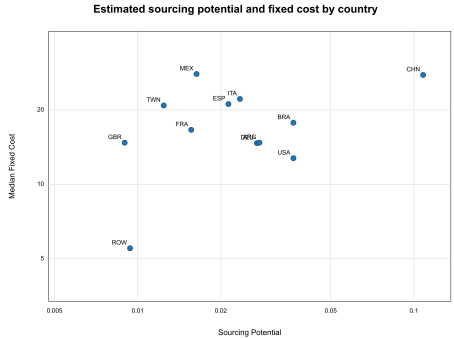
Back

Results: Fixed cost estimation

Table 3: Estimated Parameters (fixed costs in thousands USD)

E	f_{CHN}	f_{USA}	f_{ROW}	β_c^f	β_d^f	β_I^f	β_C^f	β_{disp}^f
256.6	27.72	12.76	5.51	1.73	0.277	1.122	-0.259	0.625

Figure 20: Estimated Sourcing Potential and Median Fixed Cost



Back

Pecking order (data vs. random entry)

Table 4: Strings of countries followed by importers (top-10 origins)

String of countries	Data		Random Entry	
	Firms	% Imp.	Firms	% Imp.
CHN	7,970	23.68	1,865	5.54
CHN-USA	2,201	6.54	2,034	6.04
CHN-USA-RoW	348	1.03	664	1.97
⋮				
Total following pecking order	12,005	35.67	4,855	14.42

- 35.67% of top-10 importers follow a strict pecking order, vs. 14.42% under random entry
  $\Rightarrow$ strong (but not perfect) ordering

Decomposition of average shares into margins

- Extensive margin:

$$\lambda_{ij} = \int_{\varphi} \mathbb{1}\{i \in \mathcal{I}_j(\varphi)\}\, dG(\varphi)$$

- Decomposition:

$$\bar{\chi}_{ij} \equiv \mathbb{E}_{\gamma}\left[\int_{\varphi} \chi_{ij}(\varphi,\gamma) dG_j(\varphi)\right] = \underbrace{\lambda_{ij}}_{\substack{\text{extensive}\\ \text{margin}}} \times \underbrace{\frac{\bar{\chi}_{ij}}{\lambda_{ij}}}_{\substack{\text{intensive}\\ \text{margin}}}$$

- We hence plot, for each country i, the decomposition:

$$\Delta\%\bar{\chi}_{ij} \approx \Delta\%\lambda_{ij} + \Delta\%\frac{\bar{\chi}_{ij}}{\lambda_{ij}}$$