Concentration and Markups in International Trade

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  - $\rightarrow$ **Std Models**: (i) trade in final goods (B2C) (ii) price-taking buyers
  - $\rightarrow$ **Prod Networks**: (i) trade in intermediate goods (B2B) (ii) bilateral market power

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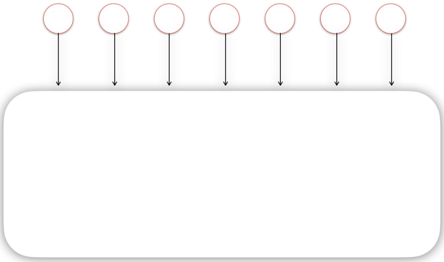

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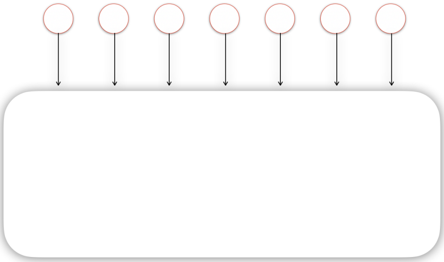

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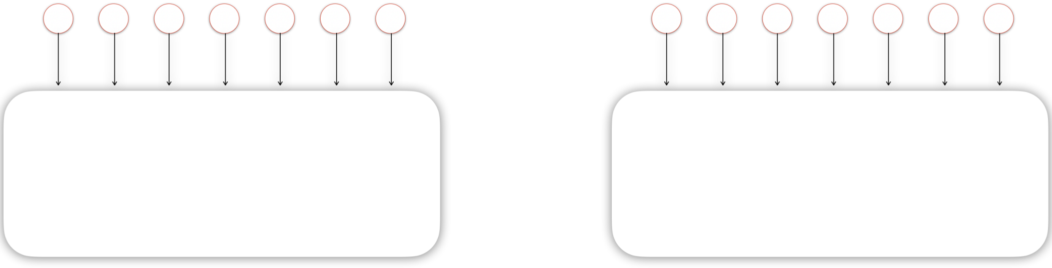

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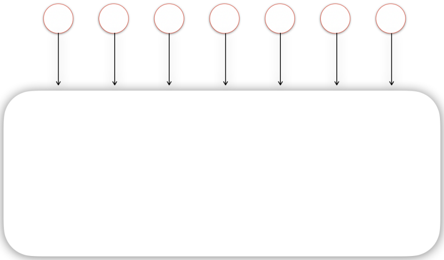

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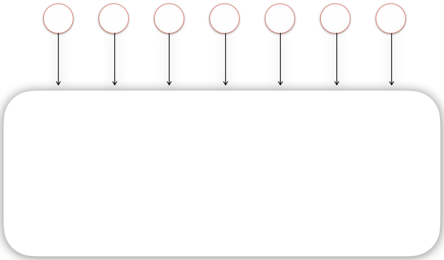

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$\rightarrow$ Conclude both competitive

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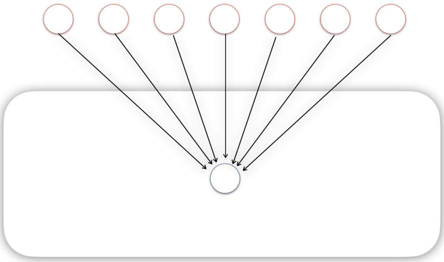

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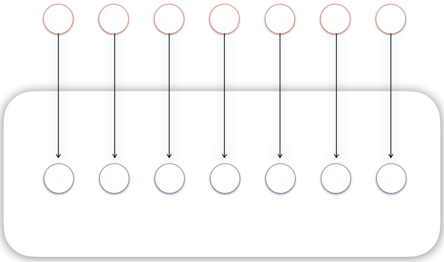

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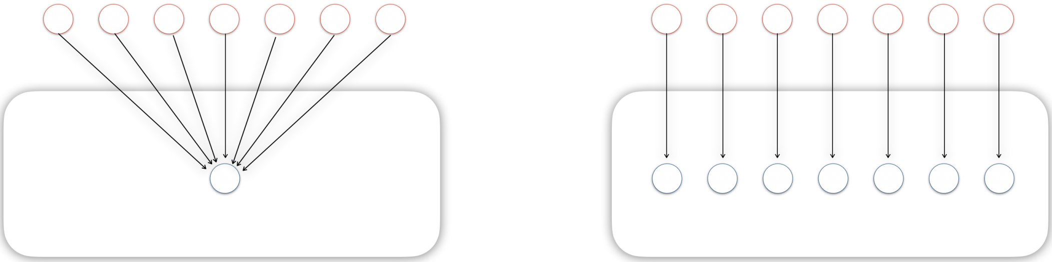

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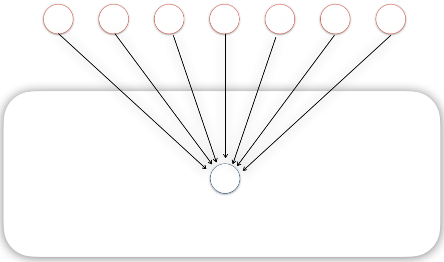

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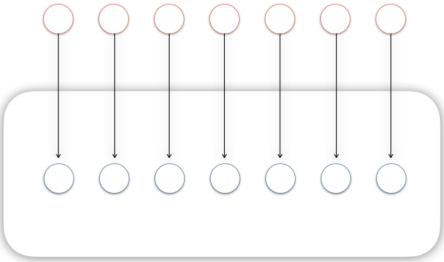

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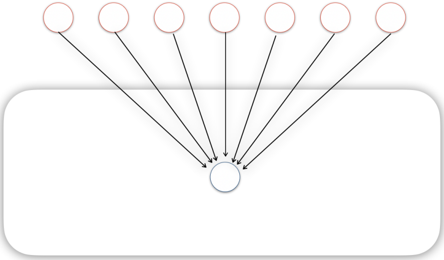
- Taking the network structure of trade into account:
  - Industry 1 still looks **competitive**: each seller competing against the others
  - Industry 2 now looks **highly concentrated**: each buyer only buys from one seller

1. What is the Right Market Definition?



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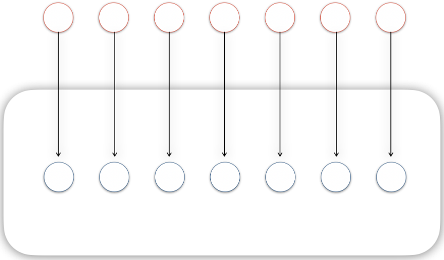

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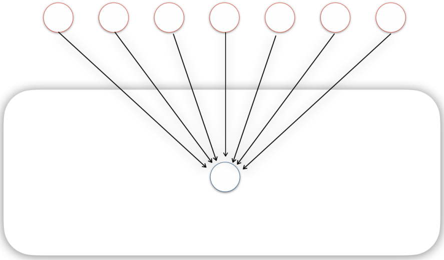

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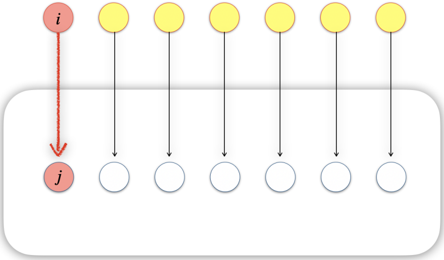

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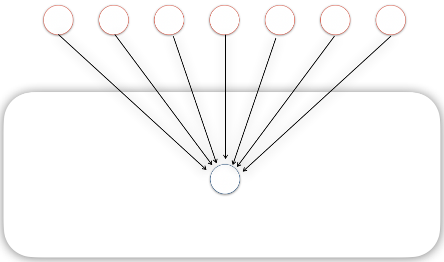

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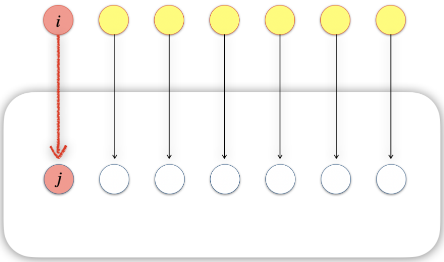

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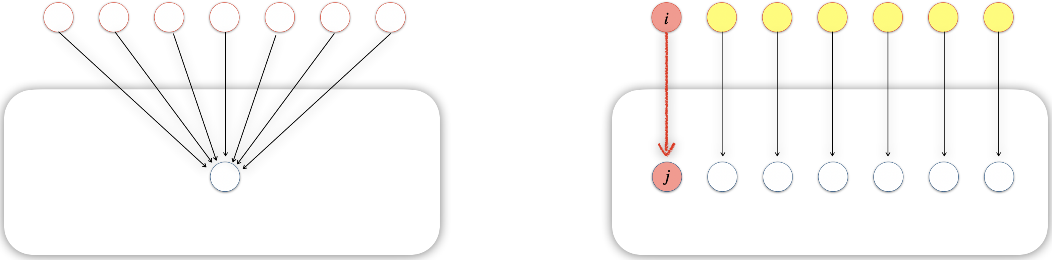

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- Here: **Lock-in effects** shield *i* from competition from *out-of-network* suppliers of firm *j*

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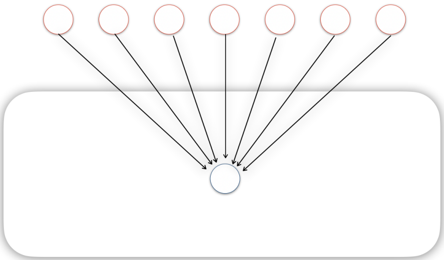

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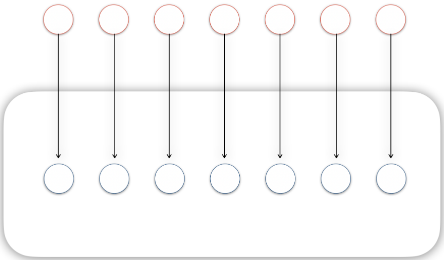

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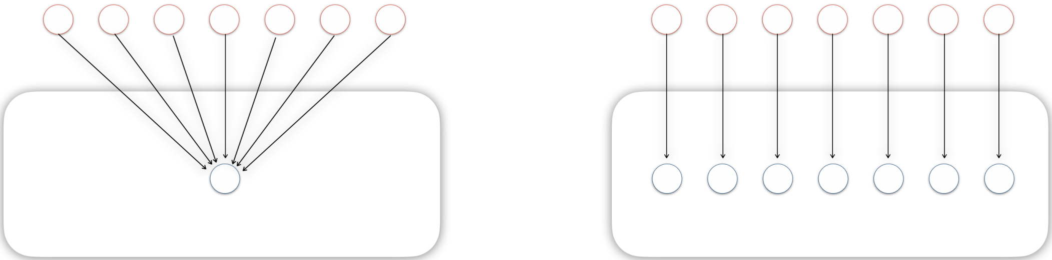

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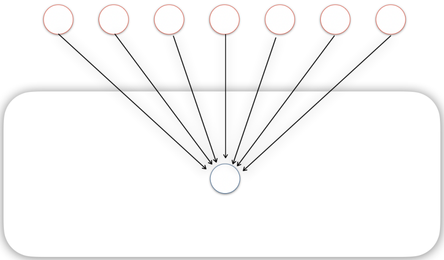

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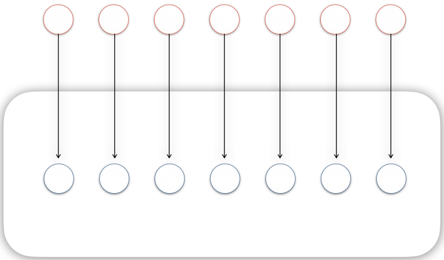

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2. Which concentration is relevant?

- In trade in production networks, both sides of the market are concentrated
- If buyers have pricing power, **buyer concentration** also matters for markups

[Berger, Herkenhoff, Mongey (2022), Hendricks, Mcafee (2010)]

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- Ignoring 1. and 2. can lead to significant biases

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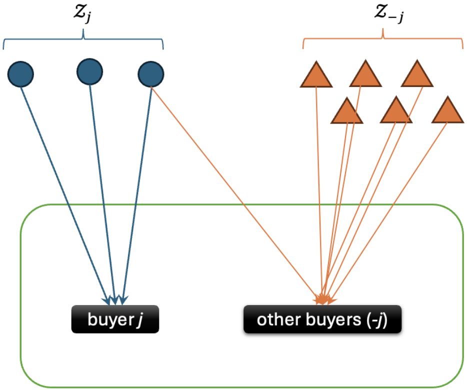

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  - i's (j's) outside option: trade with all other existing counterparts except j (i)
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- Market power on both sides of the transaction

Environment: Importer j

- Produces differentiated variety of a final good using nested-CES technology:

$$q_j = \varphi_j \prod_{h \in \Omega_j} \left(q_j^h\right)^{\gamma_h}, \quad \text{with} \quad \sum_h \gamma_h = 1$$

$$q_j^h = \Bigg(\sum_{i \in \mathcal{Z}_j^h} \varsigma_{ij} \, \left(q_{ij}^h\right)^{\frac{\rho-1}{\rho}} \Bigg)^{\frac{\rho}{\rho-1}}, \quad \text{with} \quad \rho > 1.$$

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- Importer's demand function (from cost minimization, taking $\{p_{ij}^h\}_{i \in \mathcal{Z}_j^h}$ as given):

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- Final good market: MC + CES demand

$$q_j = p_j^{-\nu} D_j$$

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$$c_i \equiv MC(q_i) = k_i \cdot (q_i)^{\frac{1-\theta}{\theta}}, \quad \text{with} \quad \theta \leq 1 \tag{1}$$

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  - DRS with $\theta < 1$, in which case $c_i > AC(q_i) \equiv \theta c_i$, with $MC' > 0$

Nash Bargaining Problem

$$\max_{p_{ij}} \left[GFT_{ij}^{i}(p_{ij})\right]^{1-\phi} \left[GFT_{ij}^{j}(p_{ij})\right]^{\phi}$$

- GFT: profits from all **existing** counterparts - profits from all counterparts except i (j):

$$GFT_{ij}^{k} \equiv \pi^{k}(p_{ij}) - \tilde{\pi}_{ij}^{k}, \; k = \{i, j\}$$

- $\phi \in (0, 1)$: importer's bargaining power

- **Nash-in-Nash** Bargains: take negotiate outcomes elsewhere in the network as given

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- Note: i's supplier market share only depends on "in-network" competitors ($k \in \mathcal{Z}_j^h$)

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- $x_{ij} = \frac{q_{ij}}{\sum_{\ell \in \mathcal{Z}_i^h} q_{\ell j}}$ is the buyer's **bilateral** market share Details

Equilibrium (II)

- **Case 2**: price-taking suppliers (i.e., $\phi \to 1$)
- Equilibrium price:

$$p_{ij} = \mu_{ij}^{oligopsony} \cdot c_i$$

$$\mu_{ij}^{oligopsony} = \theta \left(\frac{1 - (1 - x_{ij})^{\frac{1}{\theta}}}{x_{ij}} \right) \leq 1$$

- $x_{ij} = \frac{q_{ij}}{\sum_{\ell \in \mathcal{Z}_i^h} q_{ij}}$ is the buyer's **bilateral** market share Details

- Note: j's buyer market share only depends on "in-network" competitors ($\ell \in \mathcal{Z}_i^h$)

Equilibrium (III): AFKM, 2023

Proposition

For $\phi \in (0,1)$, the bilateral markup is:

$$\mu_{ij} = (1 - \omega_{ij}) \cdot \mu_{ij}^{oligopoly} + \omega_{ij} \cdot \mu_{ij}^{oligopsony},$$

where

$$\omega_{ij} \equiv \frac{\frac{\phi}{1-\phi}\lambda_{ij}}{1 + \frac{\phi}{1-\phi}\lambda_{ij}} \in (0,1).$$

where $\lambda_{ij} \geq 1$ depends on endogenous factors influencing the importer's negotiation strength.

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where $\lambda_{ij} \geq 1$ depends on endogenous factors influencing the importer's negotiation strength.

- Note, to a first order approximation, the weight $\omega_{ij} \approx \phi$
- $\rightarrow$ *Bargaining power (ϕ) governs relative strength of oligopoly/oligopsony forces*

Roadmap

- Theory: Micro (AFKM, 2023)
- Theory: Macro
- Data
- Conclusion

Aggregate Markup

Aggregate industry markup:

$$\mu := \frac{\sum_i \sum_j \text{sales}_{ij}}{\sum_i \text{variable cost}_{ij}}$$

Aggregate Markup

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$$\mu := \frac{\sum_i \sum_j \text{sales}_{ij}}{\sum_i \text{variable cost}_{ij}} = \left(\sum_i \sum_j \iota_{ij} \mu_{ij}^{-1} \right)^{-1}$$

where $\iota_{ij} = \frac{\text{sales}_{ij}}{\sum_i \sum_j \text{sales}_{ij}}$

Aggregate Markup

Proposition

To a first-order approximation, the aggregate industry markup is:

$$\begin{aligned}\mu = \; & (1-\phi)\frac{\rho}{\rho-1}+\phi \\ & +(1-\phi)\left(\frac{\rho-\eta}{(\rho-1)^2}\right) HHI^{exporters,f2f} \\ & +\phi\left(-\frac{1-\theta}{2\theta}\right) HHI^{importers,f2f},\end{aligned}$$

where

- $HHI^{exporters,f2f} \equiv \sum_j \iota_j HHI_j^s$ *is an exporter concentration index, with* $HHI_j^s \equiv \sum_{i\in\mathcal{Z}_j^h} s_{ij}^2$
- $HHI^{importers,f2f} \equiv \sum_i \iota_i HHI_i^b$ *is an importer concentration index, with* $HHI_i^b \equiv \sum_{j\in\mathcal{Z}_i^h} x_{ij}^r x_{ij}$

Aggregate Markup

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Concentration and Markups: Role of Bilateral Market Power

$$\Delta\mu \simeq (1-\phi)\left(\frac{\rho-\eta}{(\rho-1)^2}\right)\Delta HHI^{exporters,f2f} + \phi\left(-\frac{1-\theta}{2\theta}\right)\Delta HHI^{importers,f2f},$$

Concentration and Markups: Role of Bilateral Market Power

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1. Industry markups increase w/ exporter conc. and decrease w/ importer conc.

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3. Bargaining power (ϕ) governs the relative weight of concentration indices
4. Scope for bilateral mkt power, captured by ρ, η and θ, scale their aggregate incidence

Concentration indices: Comparison with Std Models

- Exporter concentration index:

$$HHI^{exporters,f2f} \equiv \sum_j \iota_j HHI_j^s, \quad where \quad HHI_j^s \equiv \sum_{i \in \mathcal{Z}_j^h} s_{ij}^2$$

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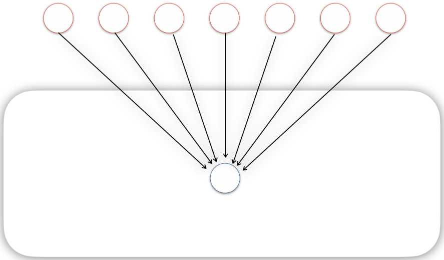
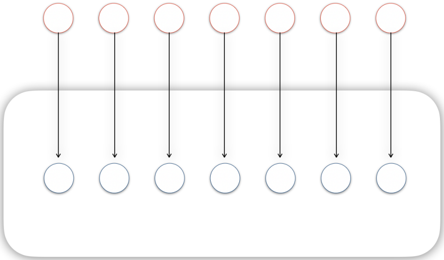
$\rightarrow$ *Differences in the two indices larger in industries w/ many importers*

Back to Our Motivating Example



(a) Industry 1



(b) Industry 2

- Standard HHI-based analysis:

$$HHI^{exporters,std} = 0.142 \qquad HHI^{exporters,std} = 0.142$$

- In our theory of F2F trade:

$$HHI^{exporters,f2f} = 0.142 \qquad HHI^{exporters,f2f} = 1$$

Roadmap

- Theory: Micro (AFKM, 2023)
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Application: Colombian Imports

- **Data:** Universe of Colombian import transactions, 2011-2020
- Mapping theory to data
  - Supplier i = (foreign) exporter; Buyer j = (Colombian) importer; Industry h = HS10 product
- For each $i - j - h$ triple:
  1. Observe unit value (p_{ij}^h) and quantity (q_{ij}^h)
  2. Construct industry-level (s_i^h) and bilateral (s_{ij}^h, x_{ij}^h) market shares
  3. Construct HHI indices at HS10-digit level, using standard and 'f2f' measures
- Calibration/Estimation of Model's Parameters
  - Fix parameters $\{\rho, \gamma, \nu, \theta\} = \{10, 0.5, 4, 0.8\}$
  - Estimate ϕ by HS2 categories, following AFKM strategy

Exporter and Importer Concentration: Summary Stats

Exporter Concentration

	Mean	St. Dev	p10	p50	p90
Nr. Exporters	67	172	2	16	164
$HHI^{exporters,std}$	.36	.30	.06	.25	.96

Importer Concentration

	Mean	St. Dev	p10	p50	p90
Nr. Importers	51	119	2	14	128
$HHI^{importers,std}$	.39	.31	.08	.29	1

Exporter and Importer Concentration: Summary Stats

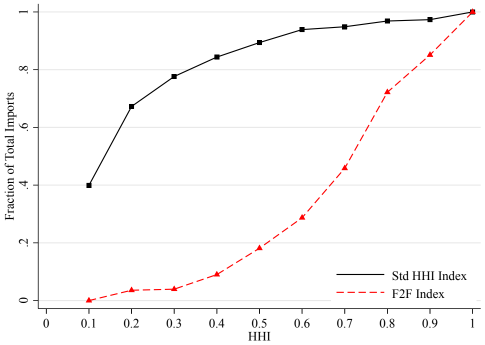
Exporter Concentration

	Mean	St. Dev	p10	p50	p90
Nr. Exporters	67	172	2	16	164
Nr. Exporters *per importer*	1.89	1.43	1	1.5	3
$HHI^{exporters,std}$	.36	.30	.06	.25	.96
$HHI^{exporters,f2f}$	.84	.17	.60	.88	1

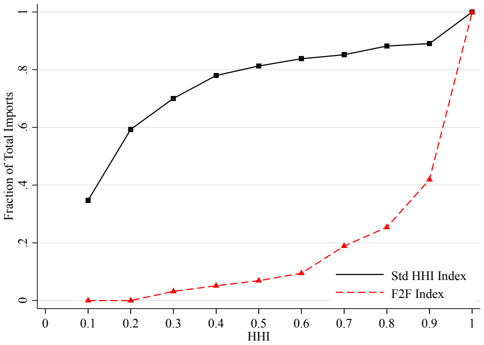
Importer Concentration

	Mean	St. Dev	p10	p50	p90
Nr. Importers	51	119	2	14	128
Nr. Importers *per exporter*	1.24	.88	1	1	2
$HHI^{importers,std}$	.39	.31	.08	.29	1
$HHI^{importers,f2f}$	.93	.11	.79	1	1

Exporter and Importer Concentration: Across Industries

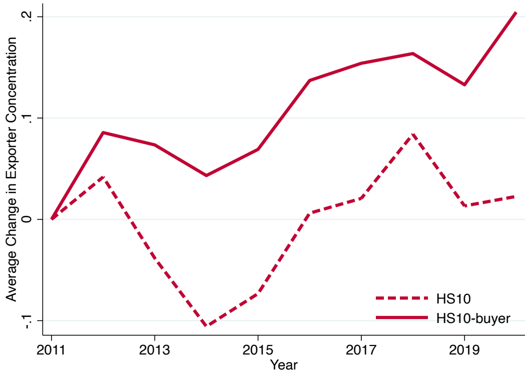


(a) Exporter Concentration

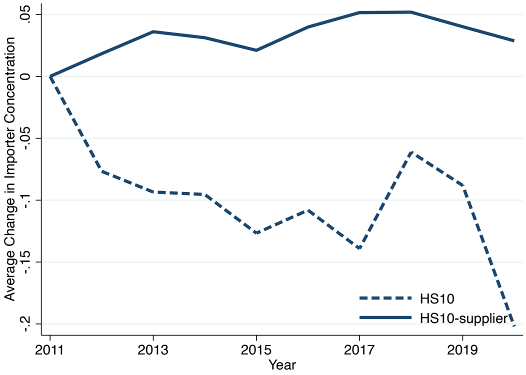


(b) Importer Concentration

Exporter and Importer Concentration: Trends



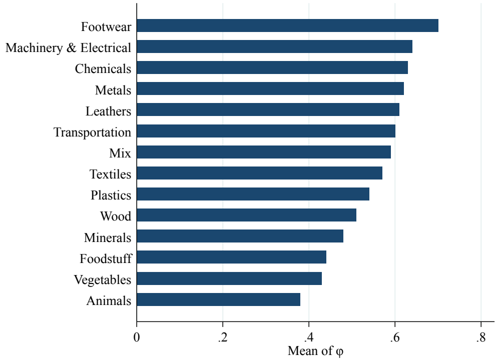
(a) Exporter Concentration



(b) Importer Concentration

→ 1. *Different models imply different evolution of concentration in GVC trade*

Does Two-Sided Market Power Matter Empirically?



Details

→ 2. *Both exporter and importer concentration matter*

What do Trends in Concentration Imply about Aggregate Markups?

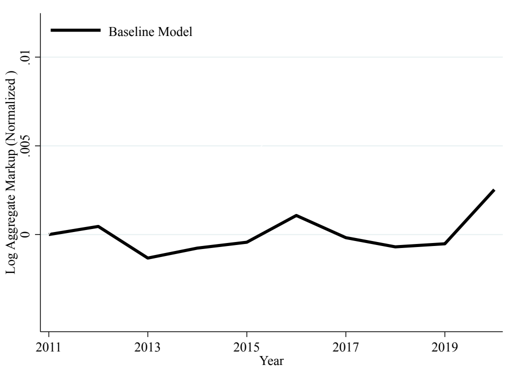


Figure: Std HHI-based Analysis

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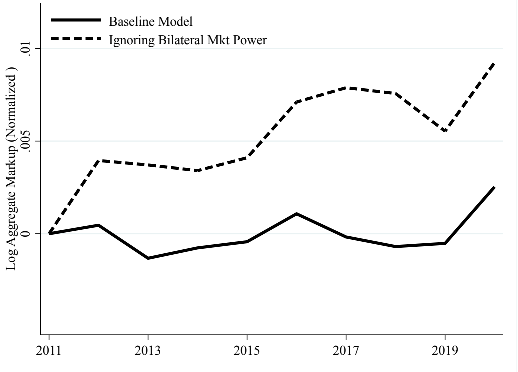


Figure: The Role of the Network (Market Definition)

What do Trends in Concentration Imply about Aggregate Markups?

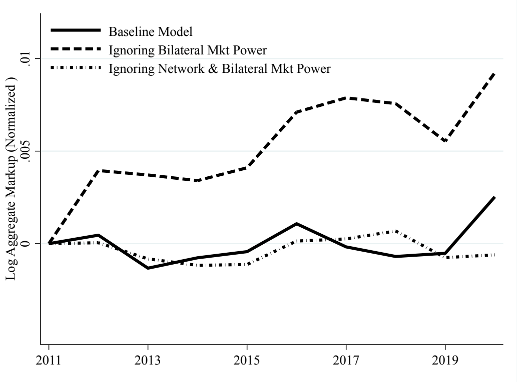
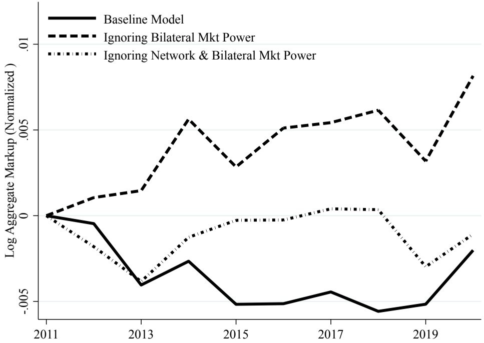
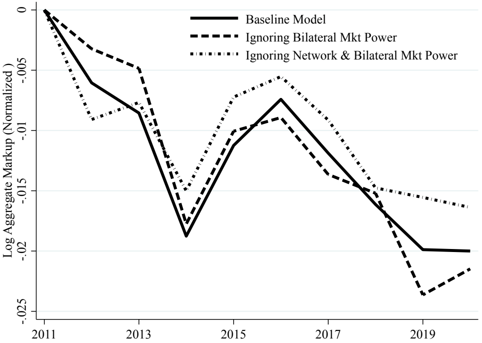


Figure: The Role of Two-Sided Market Power

Across Industries



(a) HS2=20 "Vegetables"



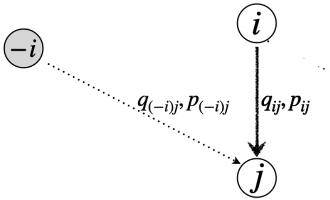
(b) HS2=2 "Meat"

Concluding Remarks

- Global production networks have led to expansion of intermediate input markets and:
  1. firm-to-firm trade $\longleftrightarrow$ pricing-to-market
  2. bilateral market power $\longleftrightarrow$ price-taking buyers

- We explore the implications of rise of GVC for role of conc. in intl trade. Main results:
  1. Concentration suff. stats. for aggregate markups in these settings $\rightarrow$ policy tool
  2. Both supplier and buyer concentration matter, with relative bargaining power as weight
  3. Sparse trade network leads to significant biases in std HHI measures

Bilateral Concentration

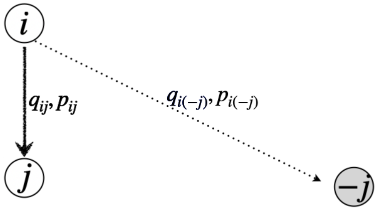


Supplier's Share – $s_{ij} = \frac{p_{ij} q_{ij}}{\sum_{i \in \mathcal{Z}_j^h} p_{ij} q_{ij}}$

: share of i's sales of j's imports of input h

Back

Bilateral Concentration



Buyer's Share – $x_{ij} = \frac{q_{ij}}{\sum_{j \in \mathcal{Z}_i^h} q_{ij}}$

: share of j's units of i's total production of input h

Back

Estimation Strategy: ϕ (AFKM, 2023)

- Log bilateral price:

$$\ln p_{ijt} = \ln \mu\left(\phi; s_{ijt}, x_{ijt}\right) + \ln c_{it}$$

- **Identifying assumption**: *marginal cost constant across buyers:* $c_{ijt} = c_{ikt} = c_{it} \quad \forall\, j, k \in \mathcal{Z}_i$
- Yields moment condition:

$$\begin{aligned} & g_{ijkt}\left(\phi\right) \equiv \left(\ln p_{ijt} - \ln p_{ikt}\right) - \left(\ln \mu\left(\phi; s_{ijt}, x_{ijt}\right) - \ln \mu\left(\phi; s_{ikt}, x_{ikt}\right)\right) \\ \implies \quad & \mathbb{E}\left[g_{ijkt}\left(\phi\right)\right] = 0 \end{aligned}$$

- Given instrument vector $\mathbf{Z}$, GMM estimates solve:

Back

$$\min_{\phi} g\left(\phi\right) Z^{'} W Z\left(\phi\right)^{'}$$