The Pro-competitive Effects of Trade Agreements

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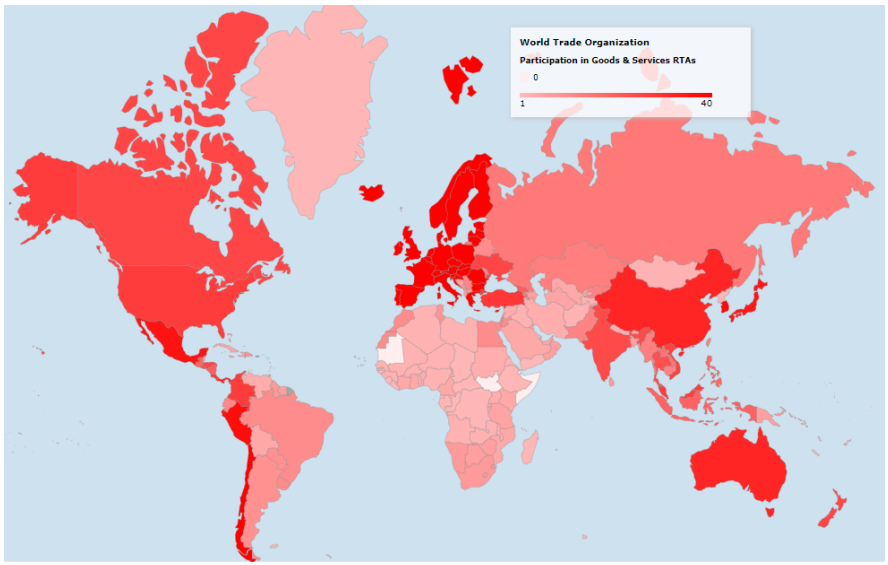
Introduction

A WTO member belongs to 13 Preferential Trade Agreements (PTAs) on average.



- Darkest Red $\Rightarrow$ 40 PTAs
- Lightest Pink $\Rightarrow$1 PTA

Questions:

- How do PTAs affect market competition, and exporters' market power and markups?
- How does the distribution of markups change under a PTA and what does this imply about global allocative efficiency?

Our approach

Empirical: Using product-level exports from 582k firms located in 11 emerging and low-income countries to 165 destinations, we examine 257 PTAs to estimate impacts on

- number of firms participating in a market,
- market shares and markups.

Theoretical: We build a GE trade model featuring oligopolistic competition from multiple origins and variable markups.

- Estimate model parameters using SMM and conduct counterfactual policy analysis
- How do markups from multiple exporting countries change under a preferential trade liberalization that only benefits a subset?

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Empirical findings

We document an empirical puzzle in light of the workhorse model of international pricing from Atkeson and Burstein (2008).

In response to a 10% cut in a tariff, we find:

- an exporting firm's import market share in a destination $\uparrow$ 18%
- an exporting firm's markup $\downarrow$ 4%.

According to the AB (2008) model, firms face a variable demand elasticity in which:

firm's market share $\uparrow \Rightarrow$ more market power $\Rightarrow$ markup $\uparrow$

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Theoretical contribution

To reconcile our empirical findings with economic theory, we extend Atkeson and Burstein (2008):

1. introduce multiple origins competing in multiple destinations
2. introduce an additional nest to CES consumption to allow for more intense competition among firms from the same origin

$\Rightarrow$ Two different market shares - **origin** AND **firm within origin** - enter demand elasticity

$\Rightarrow$ Tariff cut **raises** the market power of the origin in the destination, but **reduces** the market power of individual firms among compatriots.

$\Rightarrow$ Markups can (theoretically) rise or fall depending upon which force dominates.

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- **Trade policy:** De Loecker, Goldberg, Khandelwal & Pavcnik 2016; Fitzgerald & Haller 2018; Amiti, Redding & Weinstein 2019; Fajgelbaum, Goldberg, Kennedy & Khandelwal 2019; Kikkawa, Mei, Santamarina 2019
- **Exchange rates:** Fitzgerald & Haller 2014; Amiti, Itskhoki, and Konings 2014, 2019; Corsetti, Crowley, Han & Song 2021; Corsetti, Crowley & Han 2022

Our contribution $\Rightarrow$
Exporters cut markups after a trade liberalization

- **crucial to examine multiple origins** to understand how and why

Theoretical: Macro models of international pricing

- Atkeson & Burstein (2008); Edmond, Midrigan, and Xu (2015)

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Extend to show **two market share reallocation effects** – across origins AND across firms within an origin – impact a firm's elasticity of demand and its markup.

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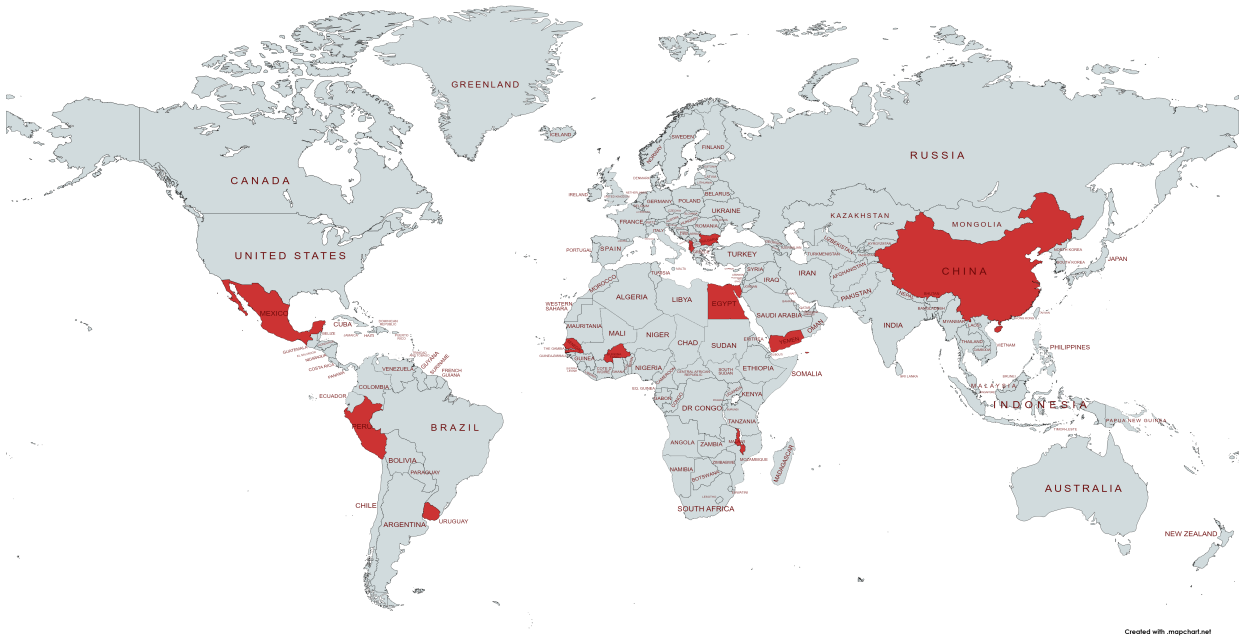
Firms' product-level exports from 11 origin countries

26.3 million firm-product-origin-destination-year observations



Albania	2004-2012	Egypt	2005-2013	Senegal	2000-2012
Burkina Faso	2005-2012	Malawi	2006-2012	Uruguay	2001-2012
Bulgaria	2001-2006	Mexico	2000-2012	Yemen	2008-2012
China	2000-2006	Peru	2000-2013		

HS06 product-level tariff data for 165 destinations from WTO

- MFN, pref. and/or unilateral tariff imposed on each origin by destinations
- Follow Feenstra and Romalis procedure to fill in missing data and phase-ins

Impact of trade policy changes

$$\text{Outcome}_{fiodt} = \beta_1 \cdot \text{PTA}_{odt} + \beta_2 \cdot \text{Tariff}_{iodt} + \text{Fixed Effects} + \zeta_{fiodt}$$

with f, i, o, d, t denoting firm, HS06 product, origin, destination, and year.

where Outcome_{fiodt} is:

- export value, used to estimate elast. of firm's mkt share in the destin. ω_{fiodt}
- FOB unit value used to estimate elasticity of the markup μ_{fiodt}

Fixed effects:

- δ_{fiot}: firm-product-origin-year fixed effects (control for e.g. marginal cost)
- δ_{idt}: product-destination-year fixed effects (e.g. changes in demand)
- δ_{od}: origin-destination fixed effects (e.g. gravity variables)

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Impacts of PTAs on Firm's Market Share in the Destination

	Firm's mkt share in dest. ω_{fiodt}
PTA_{odt}	0.01
	(0.024)
$Tariff_{iodt}$	-1.78***
	(0.242)
Observations	15,853,618
Fixed Effects	
Firm-prod-origin-year	✓
Product-destin-year	✓
Origin-destination	✓

PTA effects come via tariff cuts

10% cut in tariff $\Rightarrow$

- MS $\uparrow$ 18%

- The preferential tariff cut increases the market access of firms from the preferred origin (at the expense of firms from other origins and domestic firms).

How *should* markups adjust?

Predictions from Atkeson-Burstein (2008) Nested CES Model

The markup of firm f selling product i from origin o in destination d is:

$$\mu_{fiodt} = \frac{\varepsilon(\omega_{fiodt})}{\varepsilon(\omega_{fiodt}) - 1}$$

where the demand elasticity is a function of the firm's market share in the destination ω_{fiodt}, the elasticity of substitution within product ρ, and across products η:

$$\varepsilon(\omega_{fiodt}) = \rho - (\rho - \eta)\omega_{fiodt}$$

when $\rho >> \eta$.

Implication: If a bilateral tariff cut leads the firm's market share to increase, then it will face a less elastic demand curve and its markup will increase.

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PTA_{odt}	0.01	-0.02***
	(0.024)	(0.009)
$Tariff_{iodt}$	-1.78***	**0.40*** **
	(0.242)	(0.073)
Observations	15,853,618	15,793,386
Fixed Effects		
Firm-prod-origin-year	✓	✓
Product-destin-year	✓	✓
Origin-destination	✓	✓

Signing a PTA ⇒

- Markups ↓ 2%

10% cut in tariff ⇒

- Mkt shares ↑ 18%
- Markups ↓ 4%

Puzzle: Markups fall as market power (firm's mkt sh in the destin) increases!
Findings contradict the predictions of an oligopolistic comp. model.

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Decomposing market share changes

$$\text{Mkt share measures} = \beta_1 \cdot \text{PTA}_{odt} + \beta_2 \cdot \text{Tariff}_{iodt} + \text{Fixed Effects} + \zeta_{fiodt}$$

1. Firm's within-origin mkt share

$$ms_{fiodt} = \frac{v_{fiodt}}{\sum_{f \in \mathcal{F}_{iodt}} v_{fiodt}}$$

2. Origin's mkt share in destination-product market

$$ms_{iodt} = \frac{v_{iodt}}{\sum_{o} v_{iodt}}$$

- A firm's market share in a destination is $\omega_{fiodt} = ms_{fiodt} * ms_{iodt}$

f, i, o, d, t = firm, HS06 product, origin, destination, and year

Understanding market share changes

	Origin's mkt share ms_{iodt}	Firm's within-origin mkt share ms_{fiodt}
PTA_{odt}	0.03	0.01
	(0.026)	(0.029)
$Tariff_{iodt}$	**-3.29*** **	**2.85*** **
	(0.271)	(0.322)
Observations	1,067,240	15,853,618
Fixed Effects		
Firm-prod-origin-year		✓
Product-origin-year	✓	
Product-destin-year	✓	✓
Origin-destination	✓	✓

10% cut in tariff $\Rightarrow$

- Origin's mkt share $\uparrow$ 33%
- Average within-origin mkt share $\downarrow$ 28%

Firm's market share in destination is

$\omega_{fiodt} = ms_{fiodt} ms_{iodt}$

Tariff cut **raises** the market power of the origin in the destination, but **reduces** the within-origin market power of individual firms.

Understanding market share changes

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$Tariff_{iodt}$	-3.29***	**2.85*** **	**-2.20*** **
	(0.271)	(0.322)	(0.162)
Observations	1,067,240	15,853,618	2,750,833
Fixed Effects			
Firm-prod-origin-year		✓	
Product-origin-year	✓		✓
Product-destin-year	✓	✓	✓
Origin-destination	✓	✓	✓

- A 10% tariff cut $\Rightarrow$ 22% $\uparrow$ in number of exporters.
- Entry from one's own origin drives the decline in firms' within-origin market shares.

Model outline

Goal: Develop a model of oligopolistic competition in which markups $\Downarrow$ when a firm's mkt share in the destination $\Uparrow$

$\Rightarrow$ Decompose the conventional mkt share channel into two opposing effects

Key elements:

- Multi-country GE with heterogeneous products and firms
- Limited number of firms at product-origin-destination level
- Firms re-optimize exporting decisions after a trade policy shock
- Variable markups which depend on market structure

  $\Rightarrow$ allow for different degree of competition for firms from the same origin versus those from other origins

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Market structure

A triple nested CES demand structure with limited number of firms within each origin to incorporate imperfect competition

Across products
$$Y_{dt} = \left(\int_i y_{idt}^{\frac{\eta-1}{\eta}} di \right)^{\frac{\eta}{\eta-1}},$$

Within product, across origins
$$y_{idt} = \left(\sum_o y_{iodt}^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho}{\rho-1}},$$

Across firms within an origin
$$y_{iodt} = \left(\sum_{f \in \mathcal{F}_{iodt}} y_{fiodt}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}},$$

allowing for $\sigma \neq \rho$.

Notation: f (firm), i (product), o (origin), d (destination), t (time)

Markups and demand elasticities

The triple nested market structure implies two distinct market shares that matter for demand elasticity ε_{fiodt} and markup μ_{fiodt}:

$$\varepsilon_{fiodt} = \sigma - ms_{fiodt}\left[\sigma - \rho + (\rho - \eta)\, ms_{iodt}\right]$$

$$\mu_{fiodt} = \frac{\varepsilon_{fiodt}}{\varepsilon_{fiodt} - 1}$$

where

- ms_{fiodt}: firm f's market share **among all firms from origin** o selling product i in destination d at time t
- ms_{iodt}: origin o's market share of product i in destination d at time t

Implication: A bilateral tariff reduction leads to $\Uparrow ms_{iodt}$ and $\Downarrow ms_{fiodt}$

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Market structure and demand elasticities

General case: oligopolistic competition within origin and industry

$$\varepsilon_{fiodt} = \sigma - ms_{fiodt}[\sigma - \rho + (\rho - \eta)ms_{iodt}]$$

Special cases:

1. **Monopolistic competition** (e.g. Melitz 2003)
   when N_{iodt} is large and/or $\sigma = \rho = \eta$:

   $$\text{Constant markup:} \quad \frac{\varepsilon_{fiodt}}{\varepsilon_{fiodt} - 1} = \frac{\sigma}{\sigma - 1}$$

2. **Oligopolistic competition within industry** (e.g. Atkeson and Burstein 2008)
   when $\sum_o N_{iodt}$ is finite and $\sigma = \rho > \eta$:

   $$\varepsilon_{fiodt} = \rho - (\rho - \eta)ms_{fiodt}ms_{iodt}$$

3. **Oligopolistic competition within origin**
   when N_{iodt} is finite but $\sum_o N_{iodt}$ is large:

   $$\varepsilon_{fiodt} \to \sigma - ms_{fiodt}(\sigma - \rho)$$

Note: Elasticity of substitution within origin (σ), across origins (ρ), across products (η)

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   when N_{iodt} is large and/or $\sigma = \rho = \eta$:

$$\text{Constant markup:} \quad \frac{\varepsilon_{fiodt}}{\varepsilon_{fiodt} - 1} = \frac{\sigma}{\sigma - 1}$$

2. **Oligopolistic competition within industry** (e.g. Atkeson and Burstein 2008)
   when $\sum_o N_{iodt}$ is finite and $\sigma = \rho > \eta$:

$$\varepsilon_{fiodt} = \rho - (\rho - \eta)ms_{fiodt}ms_{iodt}$$

3. **Oligopolistic competition within origin**
   when N_{iodt} is finite but $\sum_o N_{iodt}$ is large:

$$\varepsilon_{fiodt} \to \sigma - ms_{fiodt}(\sigma - \rho)$$

Note: Elasticity of substitution within origin (σ), across origins (ρ), across products (η)

Markup adjustments to a trade policy change

Markup adjustments can be decomposed into two channels:

$$\widehat{\mu}_{fiodt} = \underbrace{A(\sigma, \rho, \eta, ms_{fiodt}, ms_{iodt}) \cdot \widehat{ms}_{fiodt}}_{\text{Within-origin reallocation effect}} + \underbrace{B(\sigma, \rho, \eta, ms_{fiodt}, ms_{iodt}) \cdot \widehat{ms}_{iodt}}_{\text{Cross-origin reallocation effect}}$$

- When $\sigma = \rho$, $A(.) = B(.) > 0 \Rightarrow$ Direction of markup adj. depends solely on the sign of $\widehat{ms}_{fiodt} + \widehat{ms}_{iodt}$
  - $\widehat{\mu}_{fiodt} > 0$ iff $\widehat{ms}_{fiodt} + \widehat{ms}_{iodt} > 0$
- When $\sigma > \rho$, $A(.) > B(.) > 0 \Rightarrow$ Direction of markup adj. also depends on the magnitude of $A(.)$ and $B(.)$ More details

Recall empirically: $\widehat{ms}_{fiodt} \Downarrow$ and $\widehat{ms}_{iodt} \Uparrow$ after a bilateral tariff cut

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Quantitative model

- Simulate a model of 5 countries with 4000 products
- SMM: vary parameters to match empirical estimates

Tariff elasticity estimates	Data	Model
Markup (μ_{fiodt})	0.40	0.47
Firm's mkt share in dest. (ω_{fiodt})	-1.78	-1.85
Firm's within-origin mkt share (ms_{fiodt})	2.85	2.60
Origin's mkt share in dest. (ms_{iodt})	-3.29	-3.59

Key estimated parameters	Value
Within-origin elasticity of substitution σ	3.30
Cross-origin elasticity of substitution ρ	2.33
Cross-product elasticity of substitution η	1.52
Productivity dispersion (inverse)	11.83

Counterfactual analysis: Bilateral tariff reduction

Simulate the model for two years:

1st year: Model reaches its competitive equilibrium where there is a 10% tariff for all products among all trade partners

2nd year: Countries 1 & 2 sign a trade agreement, which reduces the bilateral tariff to zero for all products

$\Rightarrow$ Investigate changes in distributions of market shares and markups

Summary of results

10% bilateral tariff cut between 1 & 2

Focus on mkt shares and markups in country 2:
(symmetric responses in country 1)

- Origin 1's mkt share $\Uparrow$
  (positive cross-origin realloc. effect for origin 1 firms)
- Within-origin mkt share of origin 1 firms $\Downarrow$
  (negative within-origin realloc. effect)
- Markups of origin 1 firms $\Downarrow$
  (within-origin realloc. effect dominates)
- Mean markup of firms from non-PTA countries $\Uparrow$
  (due to exits of small and less competitive firms)

Aggregate productivity $\Uparrow$ globally; bigger gains in PTA countries

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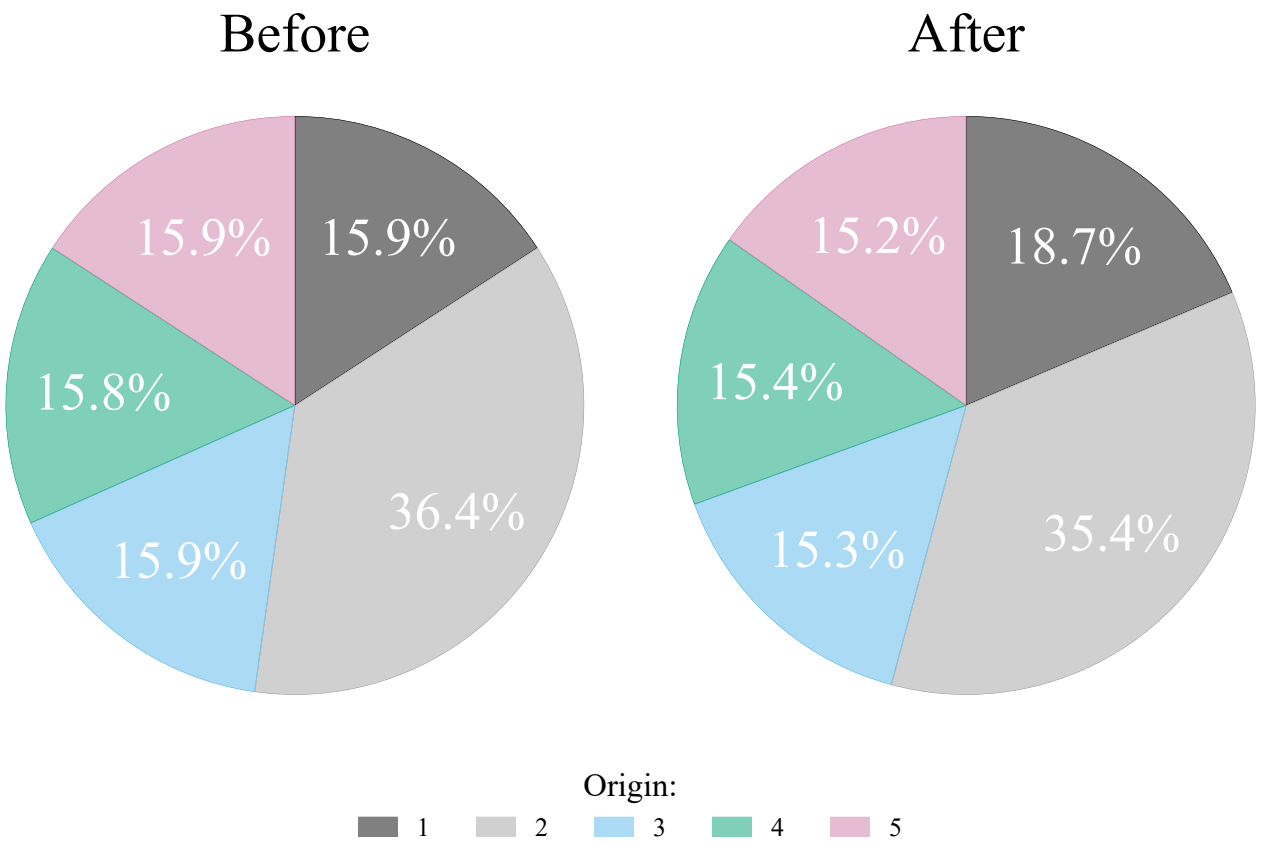
Aggregate market share in country 2

Before and after a 10% bilateral tariff cut between 1 & 2



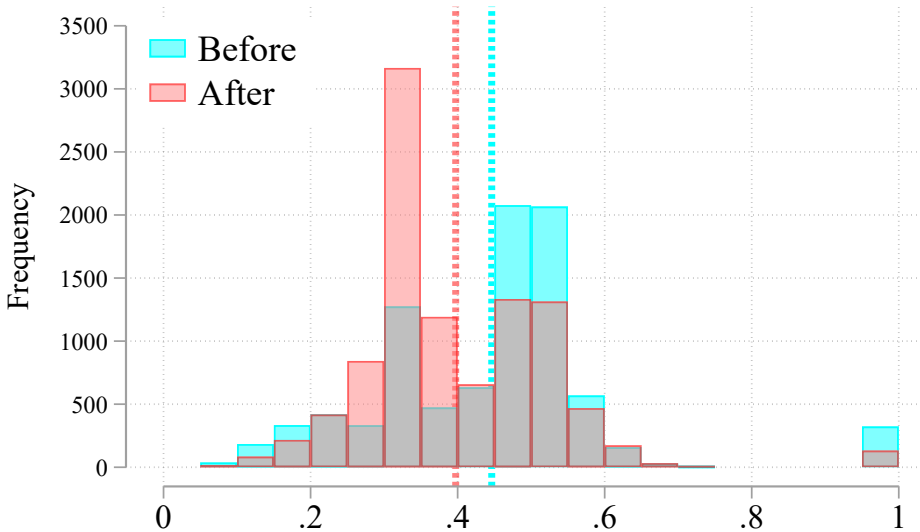
- Firms from origin 1 gain market share
- Firms from other origins lose market share

Distribution of firms' within-origin market shares over 4000 products

Before and after a 10% bilateral tariff cut between 1 & 2

Within-origin market share ms_{fiodt}

(for origin 1 firms selling to country 2)



- Within-origin market share of origin 1 firms $\Downarrow$ (left)

  $\Rightarrow$ Mainly driven by entry: no. of firms increases from 8,921 to 10,061

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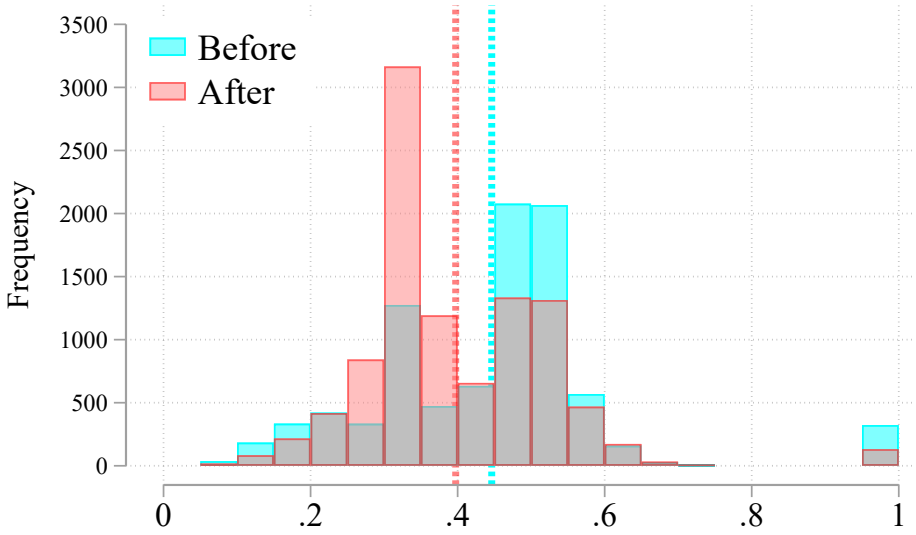
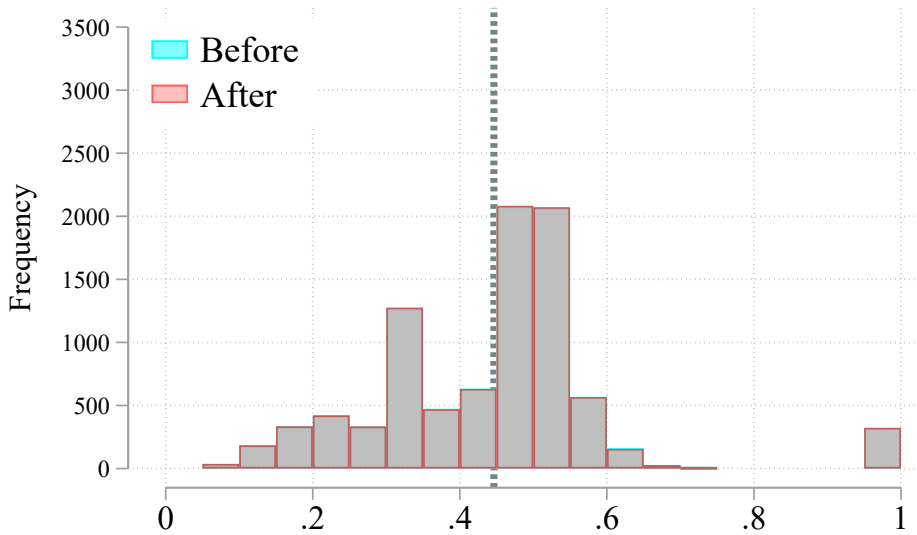


Counterfactual within-origin market share without entry/exit

(for origin 1 firms selling to country 2)



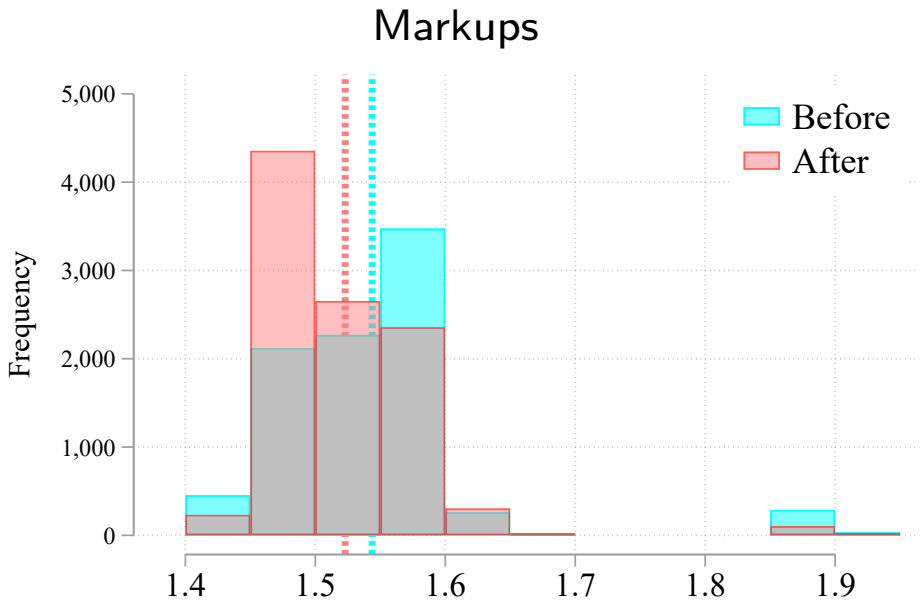
- Within-origin market share of origin 1 firms $\Downarrow$ (left)

  $\Rightarrow$ Mainly driven by entry: no. of firms increases from 8,921 to 10,061

- Virtually no within-origin reallocation if no entry & exits (right)

Markups of country 1 firms selling in country 2

Before and after a 10% bilateral tariff cut between 1 & 2



Mean markup: Before = 54.4%; After = 52.3%

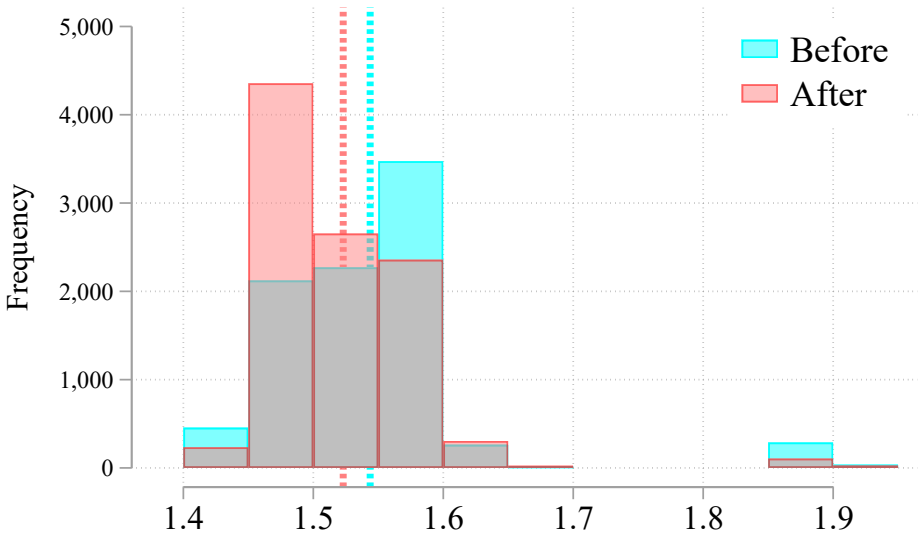
Recall: $\widehat{\mu}_{fiodt} = \underbrace{A(.) \cdot \widehat{ms}_{fiodt} \Downarrow}_{\text{Within-origin reallocation effect}} + \underbrace{B(.) \cdot \widehat{ms}_{iodt} \Uparrow}_{\text{Cross-origin reallocation effect}}$

- Within-origin reallocation effect dominates and markup drops

Markups of country 1 firms selling in country 2

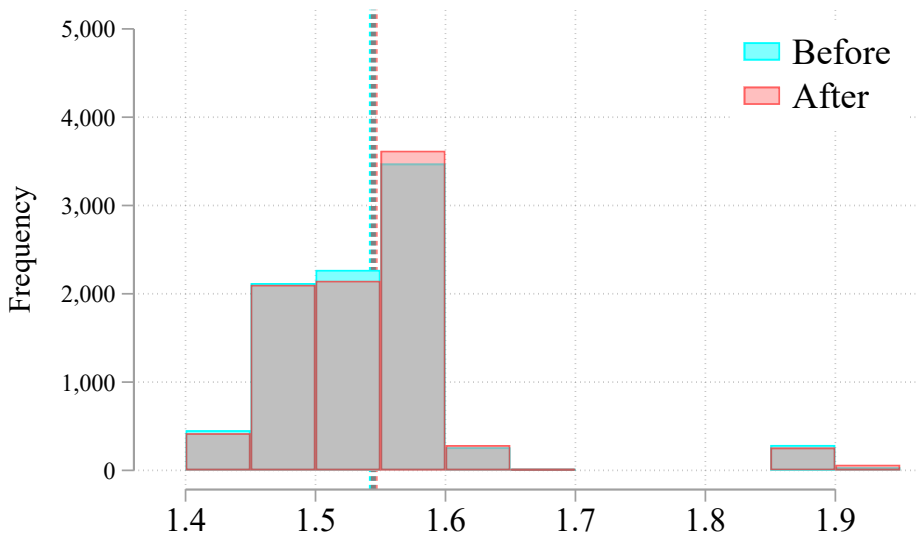
Before and after a 10% bilateral tariff cut between 1 & 2

Markups



Mean markup: Before = 54.4%; After = 52.3%

Counterfactual markups without entry/exit



Mean markup: Before = 54.4%; After = 54.5%

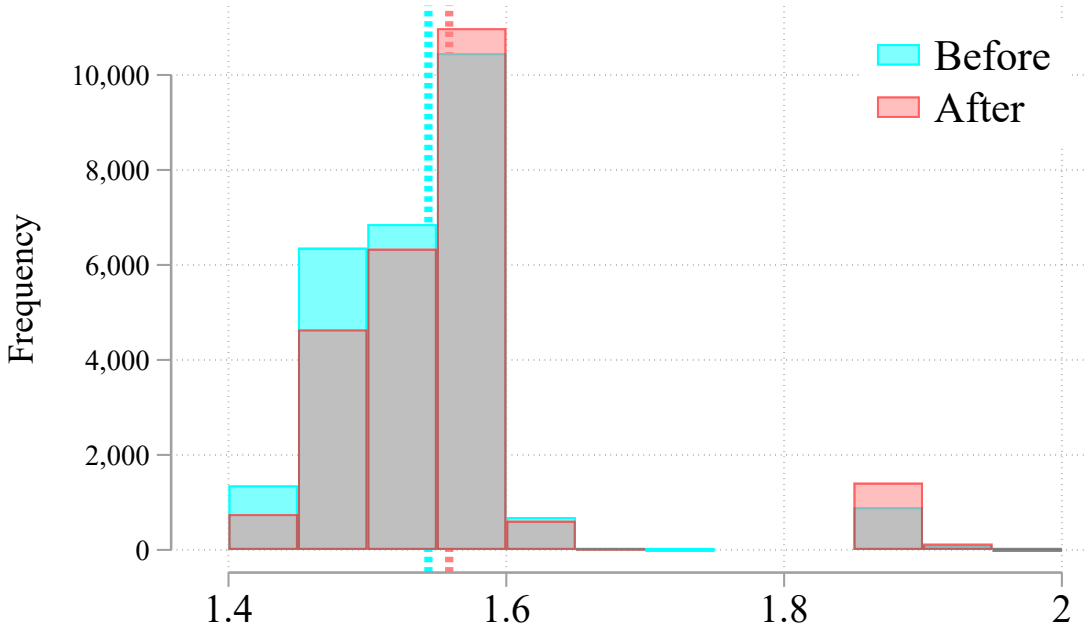
Recall: $\widehat{\mu}_{fiodt} = \underbrace{A(.) \cdot \widehat{ms}_{fiodt} \Downarrow}_{\text{Within-origin reallocation effect}} + \underbrace{B(.) \cdot \widehat{ms}_{iodt} \Uparrow}_{\text{Cross-origin reallocation effect}}$

- Within-origin reallocation effect dominates and markup drops
- Without entry/exit, much weaker within-origin reallocation and no markup adj.

Markups of firms from other origins

Before and after a 10% bilateral tariff cut between 1 & 2

Markups of origin 3&4&5 firms selling in country 2

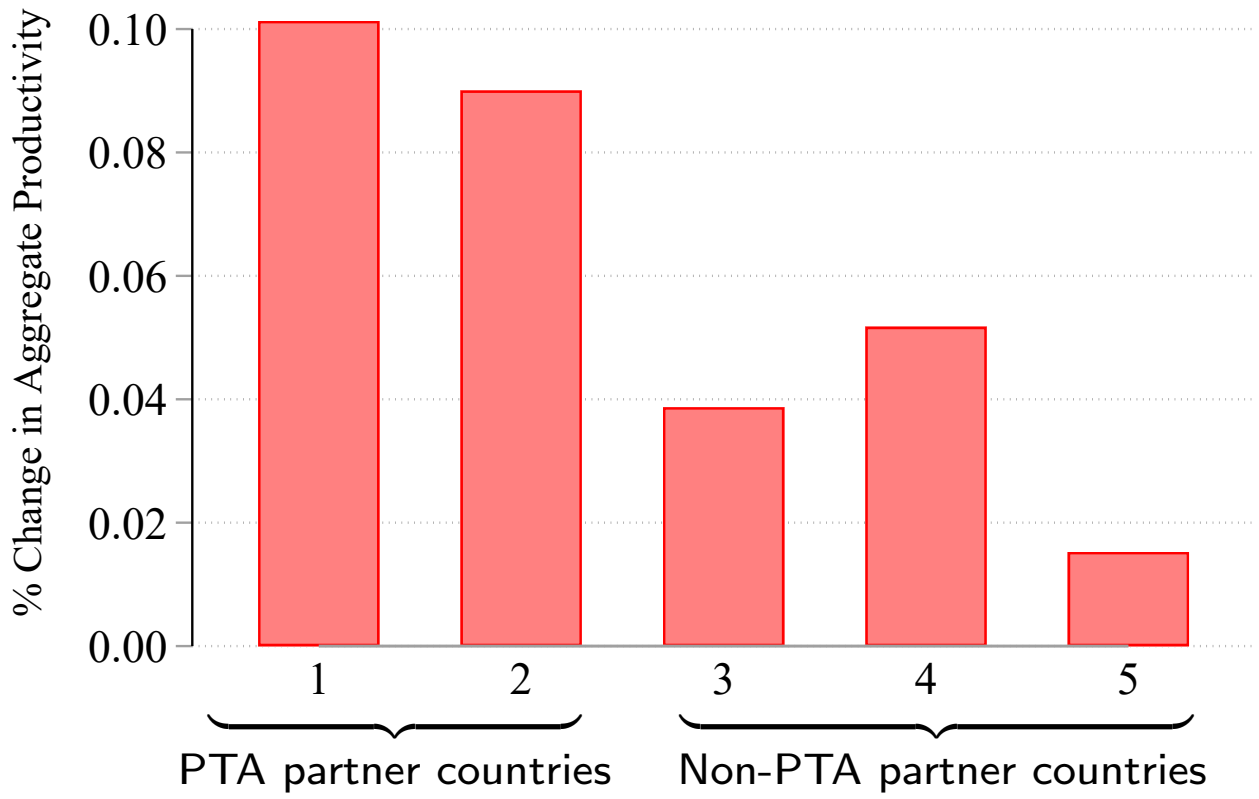


$\Rightarrow$ The mean markup increases slightly due to exits of small firms

In this case: $\widehat{\mu}_{fiodt} = \underbrace{A(.) \cdot \widehat{ms}_{fiodt} \Uparrow}_{\text{Within-origin reallocation effect}} + \underbrace{B(.) \cdot \widehat{ms}_{iodt} \Downarrow}_{\text{Cross-origin reallocation effect}}$

Changes in aggregate productivity

After a 10% bilateral tariff cut between 1 & 2



- The signing countries gain efficiency from a bilateral trade agreement, while other countries also benefit due to the increase in competitive pressure.

Conclusion

We examine the impacts of PTAs and preferential tariffs on market competition:

- PTAs and tariff reductions are in general pro-competitive

  $\Rightarrow$ Encourage entry and reduce markups

- Two opposing forces on competition after a bilateral tariff cut:

  $\Rightarrow$ Within-origin reallocation reduces markups

  $\Rightarrow$ Cross-origin reallocation increases markups

  $\Rightarrow$ Within-origin reallocation dominates when $\sigma > \eta$

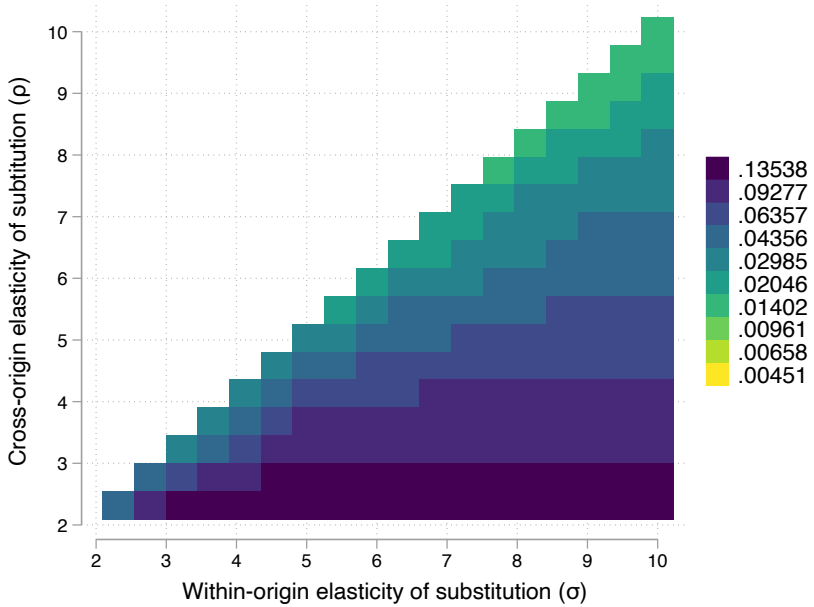
- Efficiency gains from a bilateral trade agreement for all countries

Appendix

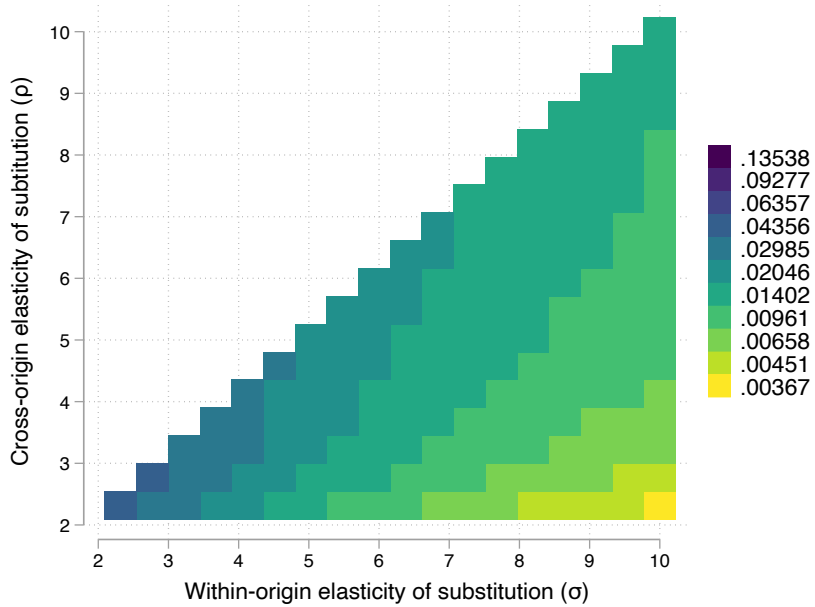
Markup adjustments to a 1% market share change (1)

A(.) and B(.) fixing $ms_{fiodt} = .5, ms_{iodt} = .2, \eta = 1.2$ and varying ρ and σ

(A) Within-origin reallocation effect
($\widehat{\mu}_{fiodt}$ when $\widehat{ms}_{fiodt} = 1\%$)



(B) Cross-origin reallocation effect
($\widehat{\mu}_{fiodt}$ when $\widehat{ms}_{iodt} = 1\%$)



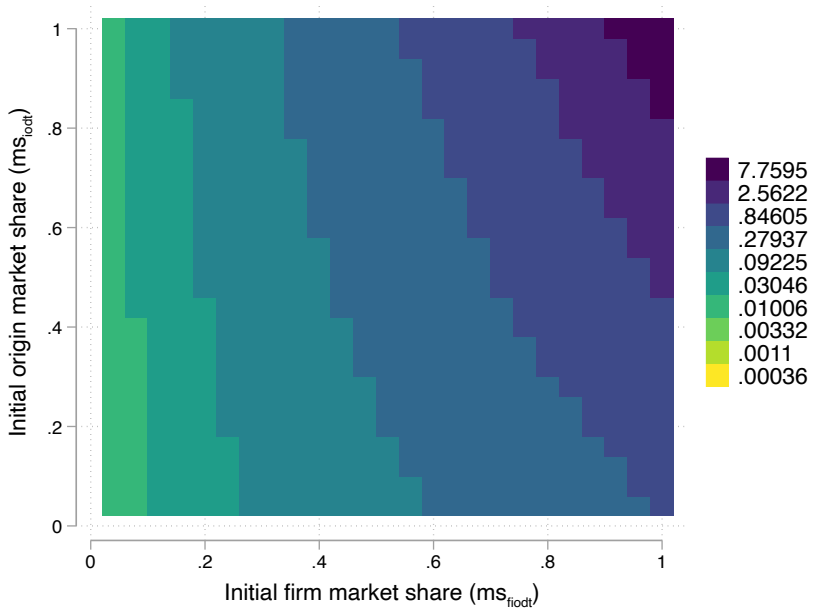
- Within-origin reallocation effect is larger in magnitude when $\sigma \neq \rho$
  e.g. $\widehat{\mu}_{fiodt} < 0$ if $\widehat{ms}_{fiodt} = -1\%$ and $\widehat{ms}_{iodt} = 1\%$

Back

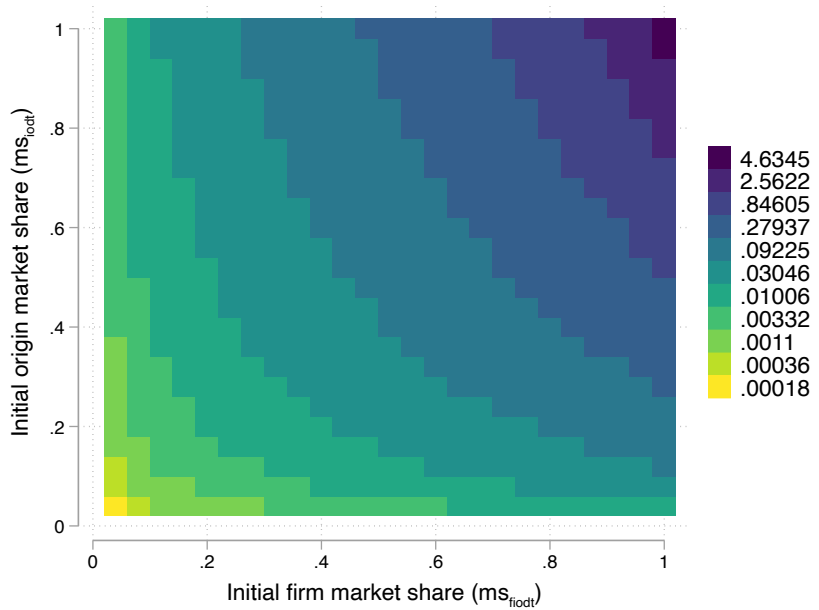
Markup adjustments to a 1% market share change (2)

A(.) and B(.) fixing $\sigma = 4.0, \rho = 2.5, \eta = 1.2$

(A) Within-origin reallocation effect
($\widehat{\mu}_{fiodt}$ when $\widehat{ms}_{fiodt} = 1\%$)



(B) Cross-origin reallocation effect
($\widehat{\mu}_{fiodt}$ when $\widehat{ms}_{iodt} = 1\%$)



- Both effects are increasing in the two initial market shares
- Within-origin reallocation effect is larger in magnitude

Back

Data Sources

Firm-Product-Level Exports

- World Bank Exporter Dynamics Database
- Chinese and Egyptian Customs Authorities

Industry-Level Imports

- UN Comtrade

Trade Agreements

- World Bank Deep Trade Agreements Database

Tariffs

- WTO
- Feenstra & Romalis 2014

Variation to identify direct and indirect trade policy impacts:

Country	Observations	... with PTA	... with Competitor PTA
China	20,043,162	1,168,391	15,107,487
Mexico	3,608,510	2,353,379	3,204,136