The Pro-competitive Effects of Trade Agreements

Meredith Crowley
Cambridge and CEPR

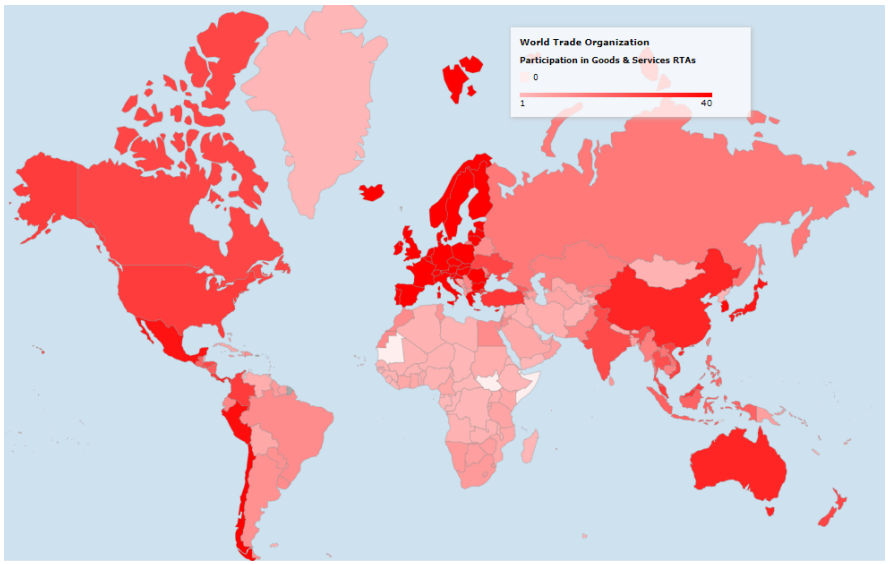
Lu Han
Bank of Canada and CEPR

Thomas Prayer
Cambridge

DIEW, Aarhus
May 23, 2023

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 83 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?

Our approach

Empirical: Using product-level exports from 582k firms located in 11 emerging and low-income countries to 165 destinations, we examine 83 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?

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 $\uparrow$ 8%
- 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 $\uparrow$

Findings contradict markup predictions of AB (2008) model.

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 $\uparrow$ 8%
- 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 $\uparrow$

Findings contradict markup predictions of AB (2008) model.

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 $\uparrow$ 8%
- 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 $\uparrow$

Findings contradict markup predictions of AB (2008) model.

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.

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.

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.

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.

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.

Literature

Empirical: Price and Markup Responses to ...

- **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)

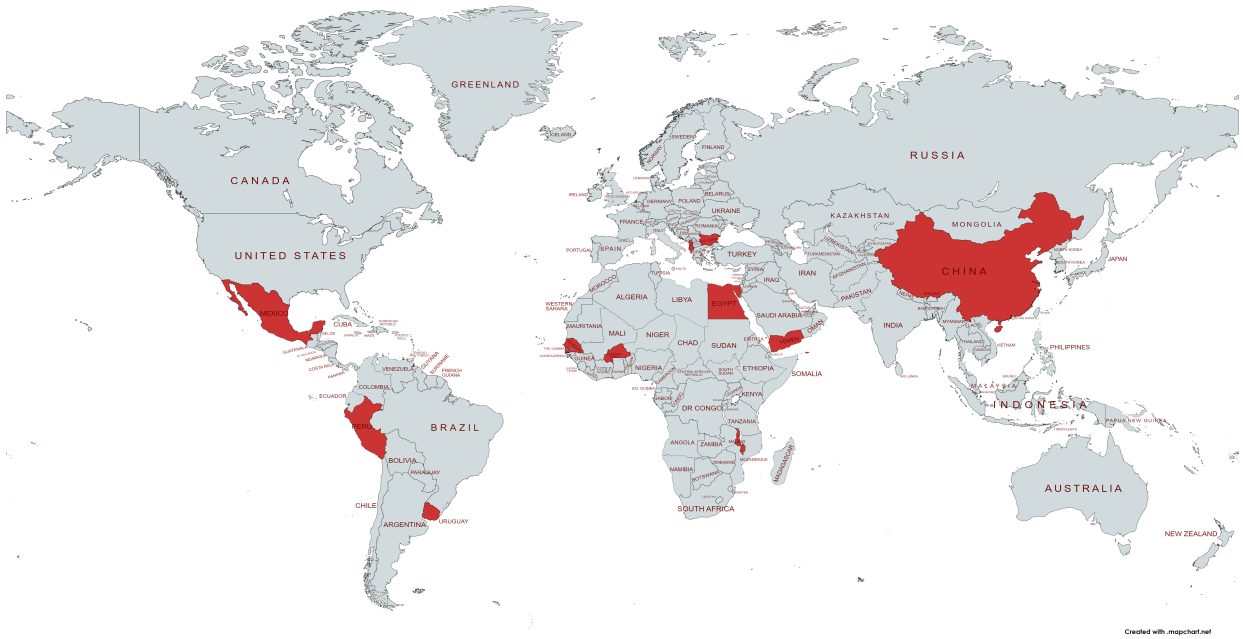
Our contribution $\Rightarrow$
Extend to show **two market share reallocation effects** – across origins AND across firms within an origin – impact a firm's elasticity of demand and its markup.

Roadmap

- Data and empirical findings
- Theoretical model
- Counterfactuals and aggregate implications

Firms' product-level exports from 11 origin countries

25.2 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)

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)

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)

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)

Identifying market share elasticities

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

When $Outcome_{fiodt}$ is:

- ln(export value) and *idt* fixed effects are included $\Rightarrow$

  β_2 is elast. of a firm's mkt share in the destin. to tariff.

$$\omega_{fiodt} = sales_{fiodt} / Consumption_{idt}$$

$$\ln(v_{fiodt}) = \ln(\omega_{fiodt}) + \underbrace{\ln(\sum_{f,o} v_{fiodt})}_{\text{absorbed by } idt \text{ fixed effects}}$$

Identifying markup elasticities

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

When $Outcome_{fiodt}$ is:

- ln(FOB unit value) and *fiot* fixed effects are included $\Rightarrow$

  β_2 is the elasticty of a firm's markup to the tariff.

$$\ln(p_{fiodt}) = \ln(\mu_{fiodt}) + \underbrace{\ln(mc_{fiot})}_{\text{absorbed by } fiot \text{ fixed effects}}$$

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

	Firm's mkt share in dest. ω_{fiodt}
PTA_{odt}	0.02
	(0.021)
$Tariff_{iodt}$	-0.79***
	(0.243)
Observations	15,793,386
Fixed Effects	
Firm-prod-origin-year	✓
Product-destin-year	✓
Origin-destination	✓

PTA effects come via tariff cuts

10% cut in tariff $\Rightarrow$

- MS $\uparrow$ 8%

- 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.

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.

Impacts of PTAs on Markups

	Firm's mkt share in dest. ω_{fiodt}	Markups FOB μ_{fiodt}
PTA_{odt}	0.02	-0.02***
	(0.021)	(0.008)
$Tariff_{iodt}$	-0.79***	**0.41*** **
	(0.243)	(0.073)
Observations	15,793,386	15,793,386
Fixed Effects		
Firm-prod-origin-year	✓	✓
Product-destin-year	✓	✓
Origin-destination	✓	✓

Signing a PTA $\Rightarrow$

- Markups $\downarrow$ 2%

10% cut in tariff $\Rightarrow$

- Mkt shares $\uparrow$ 8%
- Markups $\downarrow$ 4%

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

Impacts of PTAs on Markups

	Firm's mkt share in dest. ω_{fiodt}	Markups FOB μ_{fiodt}
PTA_{odt}	0.02	-0.02***
	(0.021)	(0.008)
$Tariff_{iodt}$	-0.79***	**0.41*** **
	(0.243)	(0.073)
Observations	15,793,386	15,793,386
Fixed Effects		
Firm-prod-origin-year	✓	✓
Product-destin-year	✓	✓
Origin-destination	✓	✓

Signing a PTA $\Rightarrow$

- Markups $\downarrow$ 2%

10% cut in tariff $\Rightarrow$

- Mkt shares $\uparrow$ 8%
- Markups $\downarrow$ 4%

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

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}	-0.04	0.06**
	(0.031)	(0.027)
$Tariff_{iodt}$	**-3.67*** **	**2.87*** **
	(0.428)	(0.322)
Observations	15,793,386	15,793,386
Fixed Effects		
Firm-prod-origin-year	✓	✓
Product-destin-year	✓	✓
Origin-destination	✓	✓

10% cut in tariff $\Rightarrow$

- Origin's mkt share $\uparrow$ 37%
- Average within-origin mkt share $\downarrow$ 29%

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

	Origin's mkt share ms_{iodt}	Firm's within-origin mkt share ms_{fiodt}
PTA_{odt}	-0.04	0.06**
	(0.031)	(0.027)
$Tariff_{iodt}$	**-3.67*** **	**2.87*** **
	(0.428)	(0.322)
Observations	15,793,386	15,793,386
Fixed Effects		
Firm-prod-origin-year	✓	✓
Product-destin-year	✓	✓
Origin-destination	✓	✓

10% cut in tariff $\Rightarrow$

- Origin's mkt share $\uparrow$ 37%
- Average within-origin mkt share $\downarrow$ 29%

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

	Origin's mkt share ms_{iodt}	Firm's within-origin mkt share ms_{fiodt}	No. of Firms (PPML)
PTA_{odt}	-0.04	0.06**	-0.05***
	(0.031)	(0.027)	(0.009)
$Tariff_{iodt}$	-3.67***	**2.87*** **	**-2.21*** **
	(0.428)	(0.322)	(0.162)
Observations	15,793,386	15,793,386	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

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

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}:

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

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

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 $\Downarrow ms_{fiodt}$

$\Rightarrow$ Demand facing a firm could become more or less elastic, depending on which of the two forces dominates

$\Rightarrow$ Markups may rise or fall

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}:

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

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

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 $\Downarrow ms_{fiodt}$

$\Rightarrow$ Demand facing a firm could become more or less elastic, depending on which of the two forces dominates

$\Rightarrow$ Markups may rise or fall

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)

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 $\sigma = \rho = \eta$:

   Constant markup: $\dfrac{\varepsilon_{fiodt}}{\varepsilon_{fiodt} - 1} = \dfrac{\sigma}{\sigma - 1}$

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)

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)

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)

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 $\widehat{\omega}_{fiodt} = \widehat{ms}_{fiodt} + \widehat{ms}_{iodt}$
  - $\widehat{\mu}_{fiodt} < 0$ iff $\widehat{\omega}_{fiodt} < 0$
- When $\sigma > \rho$, $A(.) > B(.) > 0 \Rightarrow$ Direction of markup adj. also depends on the magnitude of $A(.)$ and $B(.)$
  - $\widehat{\mu}_{fiodt} < 0$ even if $\widehat{\omega}_{fiodt} \geq 0$ (what we observed empirically)

Recall empirically: after a bilateral tariff cut

- $\widehat{ms}_{fiodt} < 0$ and $\widehat{ms}_{iodt} > 0$
- $\widehat{\mu}_{fiodt} < 0$ and $\widehat{\omega}_{fiodt} > 0$

The entry effect

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 $\widehat{\omega}_{fiodt} = \widehat{ms}_{fiodt} + \widehat{ms}_{iodt}$
  - $\widehat{\mu}_{fiodt} < 0$ iff $\widehat{\omega}_{fiodt} < 0$
- When $\sigma > \rho$, $A(.) > B(.) > 0 \Rightarrow$ Direction of markup adj. also depends on the magnitude of $A(.)$ and $B(.)$
  - $\widehat{\mu}_{fiodt} < 0$ even if $\widehat{\omega}_{fiodt} \geq 0$ (what we observed empirically)

Recall empirically: after a bilateral tariff cut

- $\widehat{ms}_{fiodt} < 0$ and $\widehat{ms}_{iodt} > 0$
- $\widehat{\mu}_{fiodt} < 0$ and $\widehat{\omega}_{fiodt} > 0$

The entry effect

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 $\widehat{\omega}_{fiodt} = \widehat{ms}_{fiodt} + \widehat{ms}_{iodt}$
  - $\widehat{\mu}_{fiodt} < 0$ iff $\widehat{\omega}_{fiodt} < 0$
- When $\sigma > \rho$, $A(.) > B(.) > 0 \Rightarrow$ Direction of markup adj. also depends on the magnitude of $A(.)$ and $B(.)$
  - $\widehat{\mu}_{fiodt} < 0$ even if $\widehat{\omega}_{fiodt} \geq 0$ (what we observed empirically)

Recall empirically: after a bilateral tariff cut

- $\widehat{ms}_{fiodt} < 0$ and $\widehat{ms}_{iodt} > 0$
- $\widehat{\mu}_{fiodt} < 0$ and $\widehat{\omega}_{fiodt} > 0$

The entry effect

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})	0.41	0.47
Firm's mkt share in dest. (ω_{fiodt})	-0.79	-0.85
Firm's within-origin mkt share (ms_{fiodt})	2.87	2.60
Origin's mkt share in dest. (ms_{iodt})	-3.67	-3.45

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

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

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

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

Summary of results

10% bilateral tariff cut between 1 & 2

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

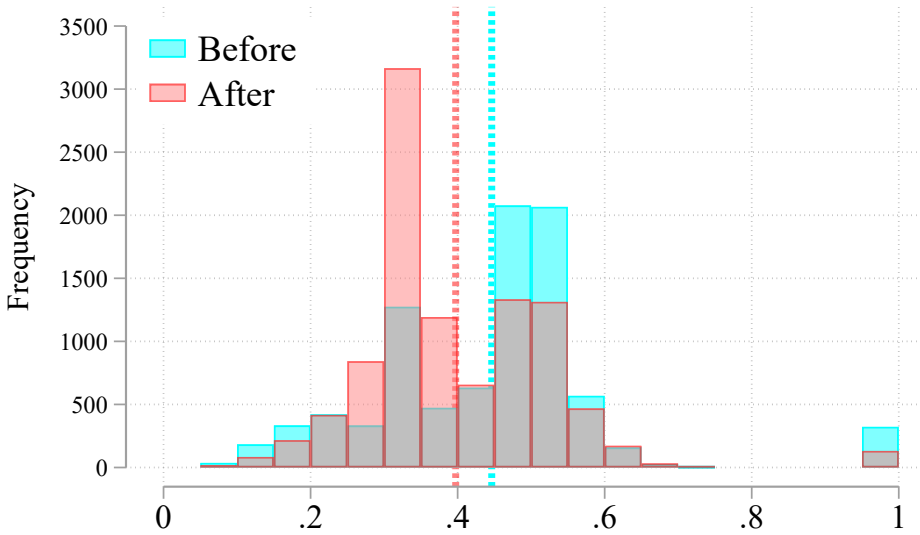
- Origin 1's mkt share $\Uparrow$
  (positive cross-origin realloc. effect for origin 1 firms)
- Within-origin mkt share of origin 1 firms $\Downarrow$
  (negative within-origin realloc. effect)
- Markups of origin 1 firms $\Downarrow$
  (within-origin realloc. effect dominates)
- Mean markup of firms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

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

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)



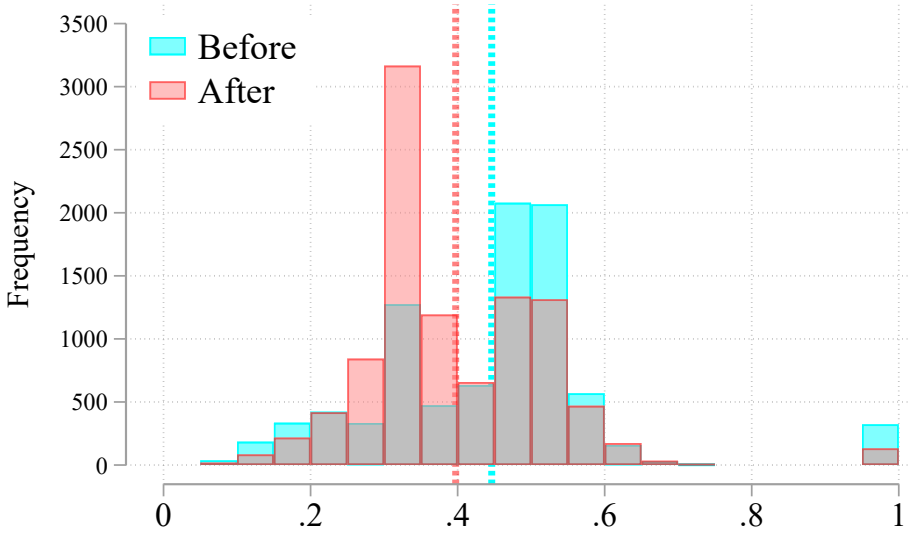
- Within-origin market share of origin 1 firms $\Downarrow$ (left)

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

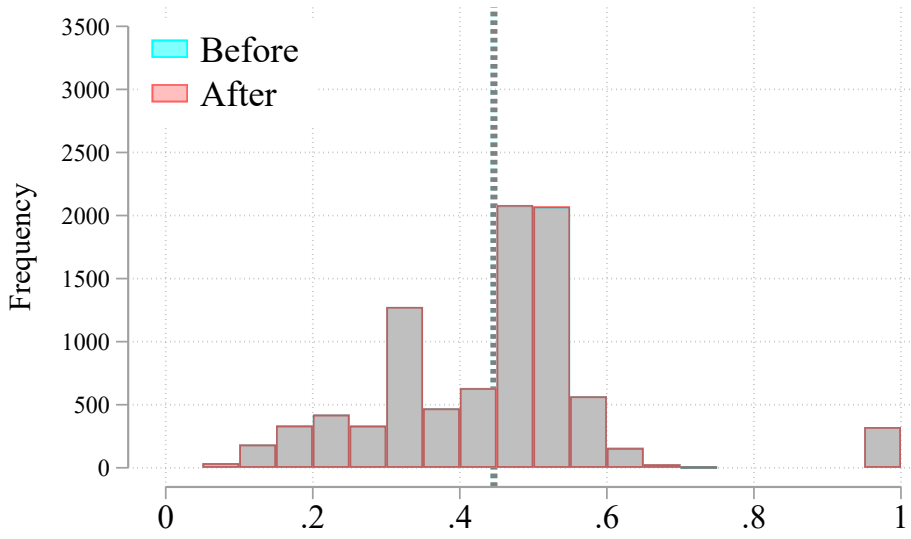
Distribution of firms' within-origin market shares over 4000 products

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)



Counterfactual within-origin market share
without entry/exit
(for origin 1 firms selling to country 2)



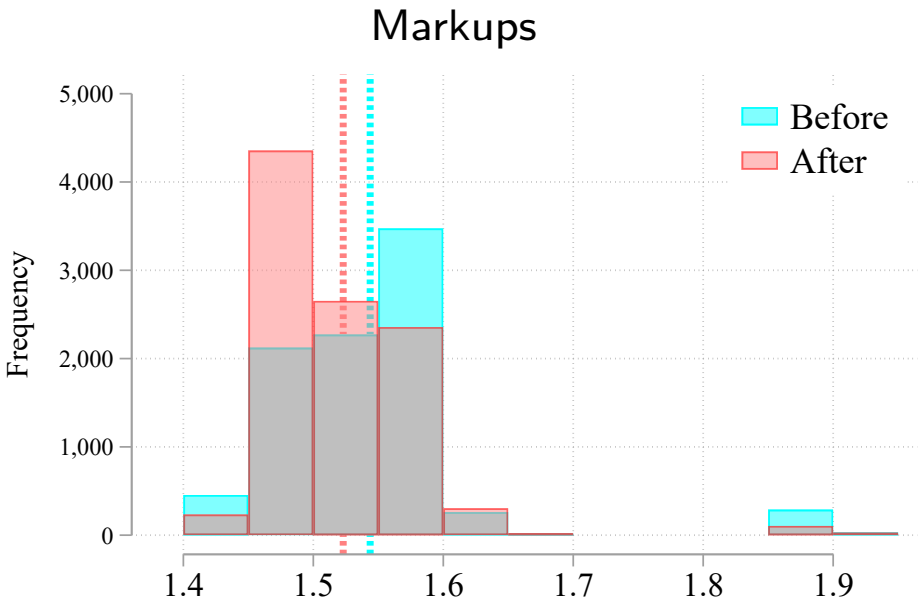
- Within-origin market share of origin 1 firms ⇓ (left)

  ⇒ 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%

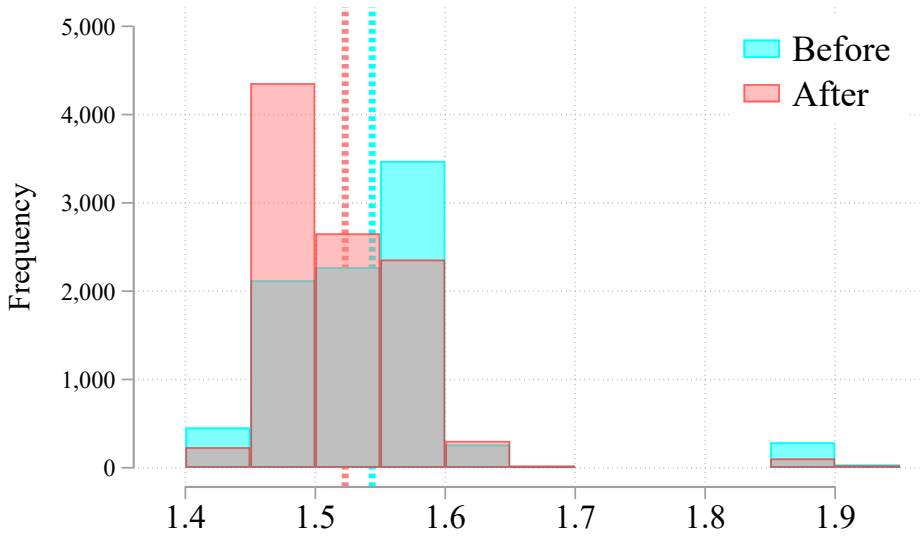
Recall: $\widehat{\mu}_{fiodt} = \underbrace{A(.) \cdot \widehat{ms}_{fiodt} \Downarrow}_{\text{Within-origin reallocation effect}} + \underbrace{B(.) \cdot \widehat{ms}_{iodt} \Uparrow}_{\text{Cross-origin reallocation effect}}$

- Within-origin reallocation effect dominates and markup drops

Markups of country 1 firms selling in country 2

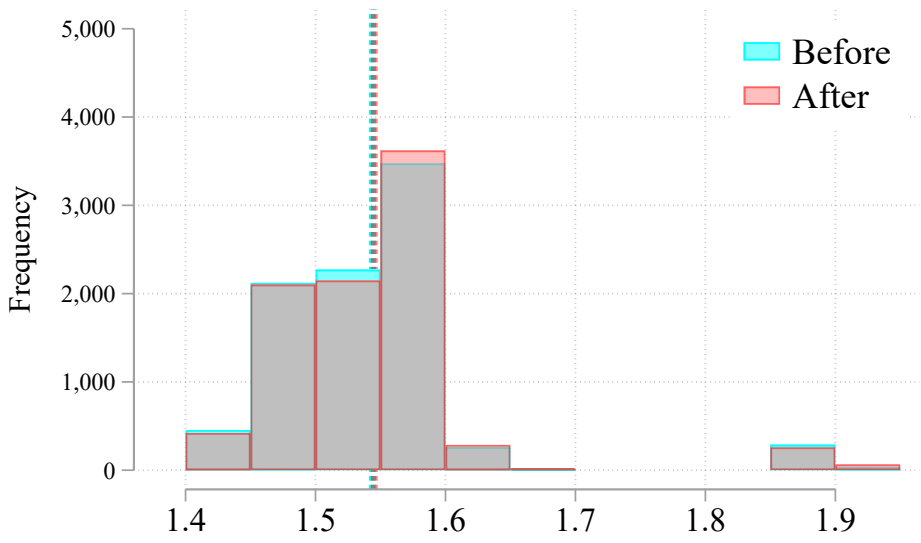
Before and after a 10% bilateral tariff cut between 1 & 2

Markups



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

Counterfactual markups without entry/exit



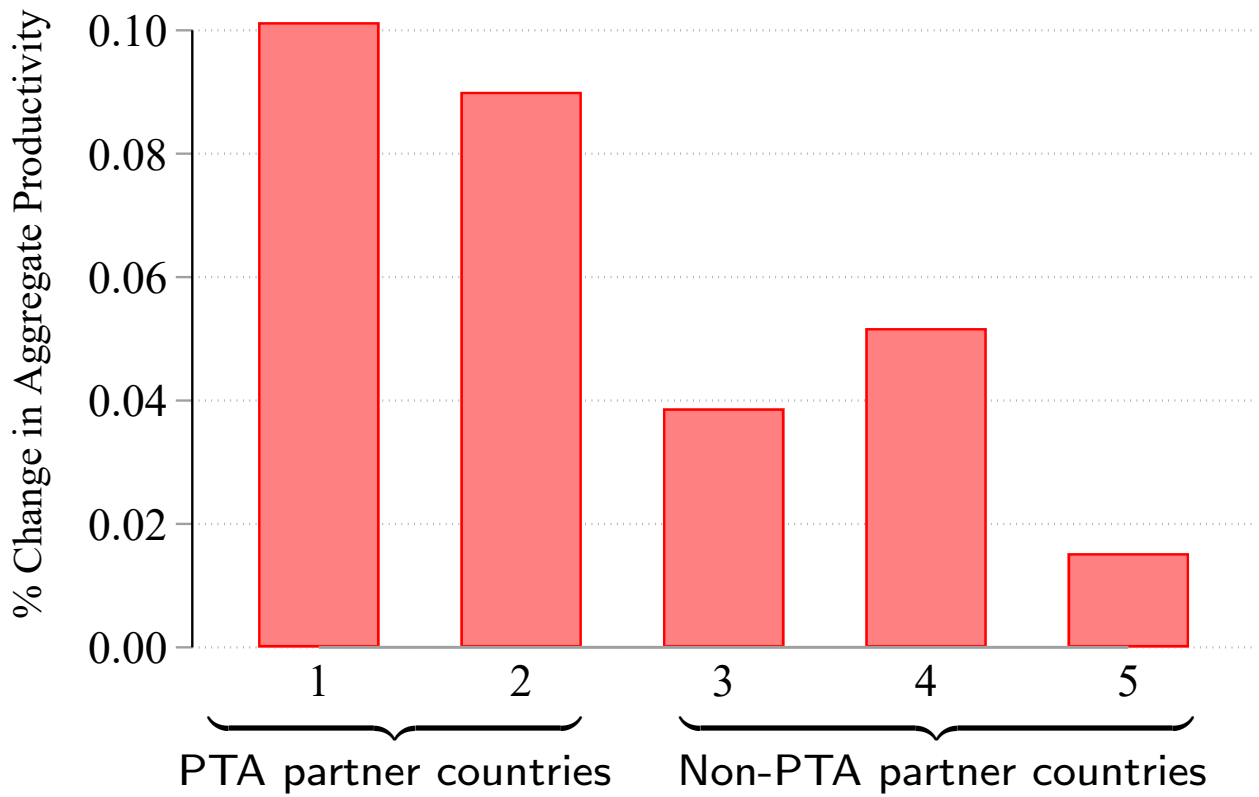
Mean markup: Before = 54.4%; After = 54.5%

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.

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 $\sigma > \rho$

- Efficiency gains from a bilateral trade agreement for all countries

Appendix

The effect of entry on incumbent exporters' markups

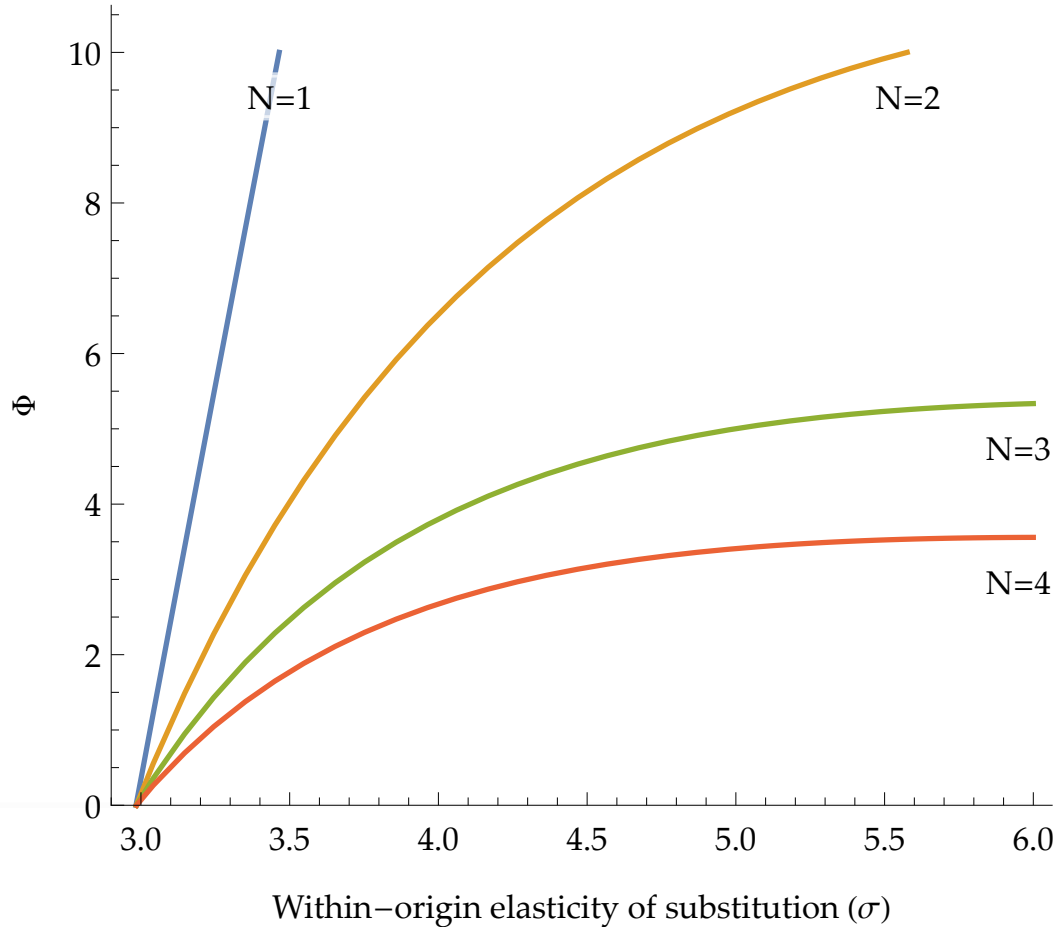
Under a 1% preferential tariff reduction, the markup adjustment (in percentage) of firms from the preferred origin (up to a first order approximation) is given by:

$$\widehat{\mu}_{fiodt} \approx \Upsilon_{fiodt} - \underbrace{\left(1 - \Upsilon_{fiodt}\right) \Phi_{iodt} \widetilde{ms}_{jiodt}}_{\textbf{Entry effect}}$$

where

1. $0 \leq \Upsilon_{fiodt} < 1$ is the markup adjustment in absence of entry;
2. Φ_{iodt} captures the strength of the entry effect;
3. $\widetilde{ms}_{jiodt}$ is the sum of within-origin market shares of new entrants from origin o in product-market id (due to the preferential tariff reduction).

The strength of the entry effect, Φ_{iodt}



Notes: The figure plots the Φ_{iodt} function for different values of σ and the number of incumbent firms N in the market before the tariff cut hits with $ms_{fiodt} = 1/N$, $ms_{iodt} = 0.1$, $\rho = 3$ and $\eta = 1.2$.

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 trade policy impacts:

Country	Observations (firm-product-origin-destination-year)	... with PTA
China	20,043,162	1,168,391
Mexico	3,608,510	2,353,379

Variation in Markup Impact by Type of Good

	Markups all goods	Markups high diff goods	Markups HD cons. goods
PTA_{odt}	-0.02**	-0.02	-0.03*
	(0.008)	(0.014)	(0.015)
$Tariff_{iodt}$	0.41***	**0.88*** **	**1.01*** **
	(0.073)	(0.106)	(0.129)
Observations	15,793,386	5,792,021	4,074,107
Fixed Effects			
Firm-prod-origin-year	✓	✓	✓
Product-destin-year	✓	✓	✓
Origin-destination	✓	✓	✓

For more differentiated goods:

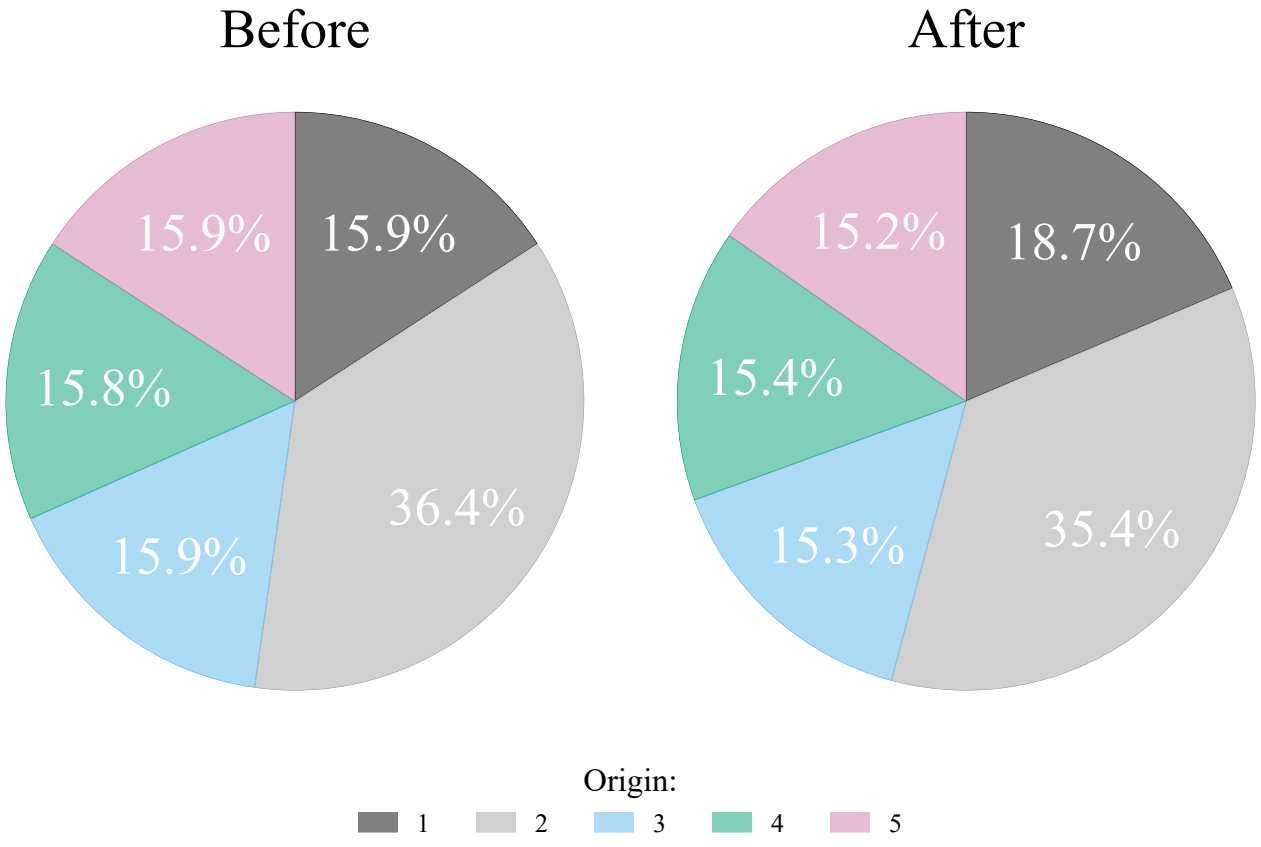
- highly differentiated goods
  10% tariff ↓ ⇒ markup ↓ 8.8%
- highly diff'd consumer goods
  10% tariff ↓ ⇒ markup ↓ 10%

Markup changes are consistent with changes in firms' within-origin market shares:

- For highly differentiated goods, a 10% cut in tariffs ⇒
  average within-origin market share ↓ 44%
- For highly differentiated consumption goods, a 10% cut in tariffs ⇒
  average within-origin market share ↓ 51%

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