Trade Wars and the Reallocation of Market Power in Global Export Markets

Chuan-Han Cheng
Cambridge University

Giancarlo Corsetti
EUI and CEPR

Meredith Crowley
Cambridge University and CEPR

Lu Han
Bank of Canada and CEPR

Networks and Firm Heterogeneity in Macro and Trade Workshop
BSE Summer Forum, 5 June 2025

Disclaimer: the views expressed in this presentation are those of the authors and not the Bank of Canada

Motivation

How do trade wars reshape the micro market structure and affect firms' competitiveness? What are their implications for resource allocation and welfare?

Motivation

How do trade wars reshape the micro market structure and affect firms' competitiveness? What are their implications for resource allocation and welfare?

Leading papers focus on perfect or monopolistic competition (constant markups)

- Caliendo & Parro 15; Fajgelbaum, et al. 24

Recent works account for oligopolistic competition and/or markup adjustments

- Edmond, Midrigan & Xu 15; Arkolakis et al 19; Antràs, Morales & Ramos-Menchelli 25

Often overlooked aspects in oligopolistic competition models:

$\Rightarrow$ Extensive margin: With large shocks, firm entry/exit can play a substantial role

$\Rightarrow$ Input-output linkages and firms' strategic responses to tariffs

This paper

Provide new empirical facts using firm-level exports data from 11 developing countries

- Origin-destination-product markets are highly concentrated

$\Rightarrow$ Small number of exporters in each market; entry/exit of one firm can have big impact

- Exporters respond differently to common vs bilateral tariff changes

$\Rightarrow$ Evidence for oligopolistic competition and strategic pricing

This paper

Provide new empirical facts using firm-level exports data from 11 developing countries

- Origin-destination-product markets are highly concentrated
- Exporters respond differently to common vs bilateral tariff changes

Evaluate global impact of trade war by building a multi-country GE model that

- Captures micro market structure and matches exporters' responses to tariff changes
- Accounts for realistic input-output linkages across countries and industries

This paper

Provide new empirical facts using firm-level exports data from 11 developing countries

- Origin-destination-product markets are highly concentrated
- Exporters respond differently to common vs bilateral tariff changes

Evaluate global impact of trade war by building a multi-country GE model that

- Captures micro market structure and matches exporters' responses to tariff changes
- Accounts for realistic input-output linkages across countries and industries

Decompose welfare impacts and quantify importance of firm entry/exit and markup adj.

- Extend Baqaee and Farhi 24 to allow for extensive margin adjustments
- Find significant welfare impacts of variety and markup adjustments

Roadmap

1. New empirical facts using customs data from 11 countries
2. Multi-country GE model with oligopolistic competition, firm entry/exit, and input-output linkages
3. Trade war and welfare decomposition

Firms' product-level exports from 11 origin countries

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

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

Combined with origin-destination-product-year-level data from UNcomtrade and WTO

Concentrated origin-destination-product markets

	25th Percentile	Median	75th Percentile
(a) Number of firms	7.00	3.00	1.00
(b) Herfindahl-Hirschman Index	0.34	0.64	1.00
(c) Cumulative market share cond. on ≥ 1 incumbent and ≥ 1 entrant			
– Incumbents	30.3%	61.9%	85.7%
– Entrants	69.7%	38.1%	14.3%

Note: 1.3M product-origin-destination-year granular markets based on 3600 products, 11 origins, 165 destinations, and 12 years. Product is defined as a 6-digit HS product.

$\Rightarrow$ Small number of firms at origin-destination-product level

- Suggests firms from an origin compete oligopolistically in each destination
- Firms' entry and exit can have big impact on market structure

▸ US market

Exporters' responses to tariff changes

	Quantity_{fiodt}
Destination-average tariff_{idt}	-0.78***
	(0.06)
Bilateral tariff_{iodt}	-2.40***
	(0.13)
Observations	13.3M
R^2	0.715

Note: Firm-product-origin-year and product-destination fixed effects added to all regressions

- Decompose tariff into common (eg MFN) and origin-specific components

$\Rightarrow$ If competition is monopolistic $\Rightarrow$ same quantity response to both types of tariffs

$\Rightarrow$ If competition is oligopolistic $\Rightarrow$ diff. responses due to changes in rel. competitiveness

$\Rightarrow$ Oligopoly is the empirically-validated structure

Exporters' responses to tariff changes

	Quantity$_{fiodt}$	Origin's market share in dest$_{iodt}$	Within-origin market share$_{fiodt}$
Destination-average tariff$_{idt}$	-0.78***	-1.19**	1.18***
	(0.06)	(0.11)	(0.09)
Bilateral tariff$_{iodt}$	-2.40***	-3.89***	3.54***
	(0.13)	(0.22)	(0.16)
Observations	13.3M	13.3M	13.3M
R^2	0.715	0.887	0.776

Note: Firm-product-origin-year and product-destination fixed effects added to all regressions

- Two reallocation effects (Crowley, Han, Prayer; JIE 2024)

$\Rightarrow$ Origin's market share decreases (as firms from the origin become less competitive)

$\Rightarrow$ Within-origin market share of surviving firms increases (due to exits of small firms from same origin)

Exporters' responses to tariff changes

	Quantity$_{fiodt}$	Origin's market share in dest$_{iodt}$	Within-origin market share$_{fiodt}$	Markup$_{fiodt}$
Destination-average tariff$_{idt}$	-0.78***	-1.19**	1.18***	0.05**
	(0.06)	(0.11)	(0.09)	(0.02)
Bilateral tariff$_{iodt}$	-2.40***	-3.89***	3.54***	0.23***
	(0.13)	(0.22)	(0.16)	(0.03)
Observations	13.3M	13.3M	13.3M	13.3M
R^2	0.715	0.887	0.776	0.888

Note: Firm-product-origin-year and product-destination fixed effects added to all regressions

- Markup increases slightly as tariff rises
  (Consistent to the small increase in tariff exclusive prices during 2018 US-China trade war)
  ▸ Fajgelbaum et al 20

Model

Key elements:

- Multi-country oligopolistic competition GE model with hetero. products and firms
- Firms pay a fixed cost to sell to a foreign market and their exporting decisions are endogenous to trade policy
- Limited number of firms at product-origin-destination level

Market structure and production

Two sets of oligopolistic markets: intermediate inputs and final consumer goods

A firm produces either intermediates or final goods; both require intermediate inputs

Cobb-Douglas production: total output of firm f selling product i from origin o is given by

$$q_{fiot} = A_{fiot} \left(\frac{L_{fiot}}{\nu} \right)^{\nu} \left(\frac{M_{fiot}}{1-\nu} \right)^{1-\nu} = \sum_{d} q_{fiodt}$$

- q_{fiot} total quantity produced; A_{fiot} productivity; L_{fiot} labour employed
- M_{fiot} units of the composite intermediate bundle M_{ot} used
- q_{fiodt} quantity demanded in each destination market d

Oligopolistic competition in final goods markets

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

Across products

$$Y_{dt} = \left(\int_{i \in \mathcal{FD}} (\alpha_{id})^{\frac{1}{\eta}} y_{idt}^{\frac{\eta-1}{\eta}} di \right)^{\frac{\eta}{\eta-1}},$$

Within product, across origins

$$y_{idt} = \left(\sum_{o \in \mathcal{C}} (\alpha_{od})^{\frac{1}{\rho}} y_{iodt}^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho}{\rho-1}},$$

Across firms within an origin

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

Back to Atkeson and Burstein 08 when $\sigma = \rho$.

Notation: f (firm), i (product), o (origin), d (destination), t (time). $\mathcal{FD}$ is the set of products used for final demand; α_{id} and α_{od} are demand shifters; $\mathcal{F}_{iodt}$ is set of active firms at product-origin-destination level

Oligopolistic competition in intermediate input markets

Same structure with different demand shifters:

Across products
$$M_{dt} = \left(\int_{i \in \mathcal{IM}} \left(\alpha^M_{id}\right)^{\frac{1}{\eta}} m_{idt}^{\frac{\eta-1}{\eta}} \, di \right)^{\frac{\eta}{\eta-1}},$$

Within product, across origins
$$m_{idt} = \left(\sum_{o \in \mathcal{C}} \left(\alpha^M_{od}\right)^{\frac{1}{\rho}} m_{iodt}^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho}{\rho-1}},$$

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

Notation: f (firm), i (product), o (origin), d (destination), t (time). $\mathcal{IM}$ is set of products used for intermediate input; α^M_{id} and α^M_{od} are demand shifters; $\mathcal{F}^M_{iodt}$ is set of active firms at product-origin-destination level

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}:

$$\begin{aligned}\varepsilon_{fiodt} &= \sigma - ms_{fiodt}[\sigma - \rho + (\rho - \eta)ms_{iodt}] \\ \mu_{fiodt} &= \frac{\varepsilon_{fiodt}}{\varepsilon_{fiodt} - 1}\end{aligned}$$

where

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

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

$\Rightarrow$ Demand facing a firm could become more or less elastic, depending on which force dominates

$\Rightarrow$ Markups may rise or fall (Crowley, Han, Prayer; JIE 2024)

▸ Examples

Bring model to data

1. Calibrating key elasticities using firm-level exports data

2. Calibrating demand shifters to match market shares in final demand and input-output linkages using World Input-Output Database 2014

1. Calibrating key model parameters

Simulate a model with 450 products; SMM to match empirical estimates

Estimated parameters	Value
Within-origin elasticity of substitution σ	6.05
Cross-origin elasticity of substitution ρ	3.49
Productivity dispersion (inverse)	7.50
Heterogeneous demand preference	0.39

	Data		Model	
Targeted tariff elasticity estimates	Common	Bilateral	Common	Bilateral
Quantity	-0.78	-2.40	-1.58	-2.39
Markup	0.05	0.23	0.11	0.22
Firm's within-origin market share	1.18	3.54	1.16	2.70
Origin's market share in dest.	-1.19	-3.89	-1.41	-3.93

2. Calibrating model to match World Input-Output Database (WIOD)

We calibrate the demand shifters $(\alpha_{id}, \alpha_{od}, \alpha_{id}^{M}, \alpha_{od}^{M})$ to match the market shares in final demand and intermediate input markets

Details

- Inner loop: for given demand shifters, solve the model to get trade shares
- Outer loop: compare model vs data shares and update demand shifters

2. Calibrating model to match World Input-Output Database (WIOD)

We calibrate the demand shifters $(\alpha_{id}, \alpha_{od}, \alpha_{id}^{M}, \alpha_{od}^{M})$ to match the market shares in final demand and intermediate input markets ▸ Details

- Inner loop: for given demand shifters, solve the model to get trade shares
- Outer loop: compare model vs data shares and update demand shifters

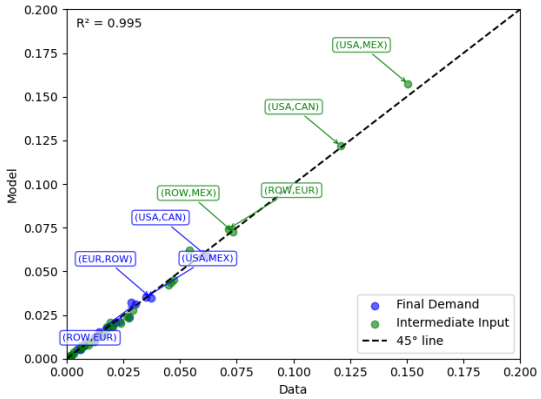
Adjustments made to facilitate computation:

- Aggregate 45 countries into 6 groups: US, China, Canada, Mexico, EU, and ROW
- Aggregate 56 industries into 9 categories (with 50 similar products per category)

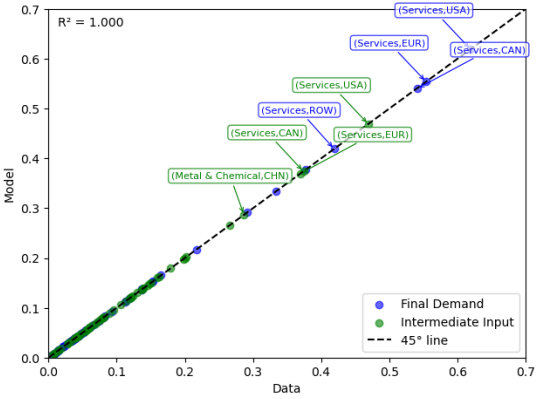
List of industry categories: 1. Agriculture & Natural Resources, 2. Food, Textiles & Basic Manufacturing, 3. Metals & Chemical Manufacturing, 4. Electronics & Machinery, 5. Transport Equipment Manufacturing, 6. Other Manufacturing & Repair, 7. Utilities & Construction, 8. Wholesale, Retail & Transportation Services, 9. Knowledge, Public & Personal Services

Model's fit

(a) Origin's share in destination



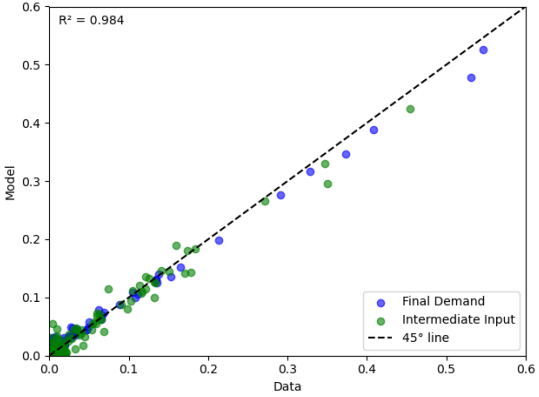
(b) Industry's share in destination



- Perfect match at the origin-destination and industry-destination level

Model's fit

(c) Origin-industry's share in destination



- Good fit at the industry-origin-destination level

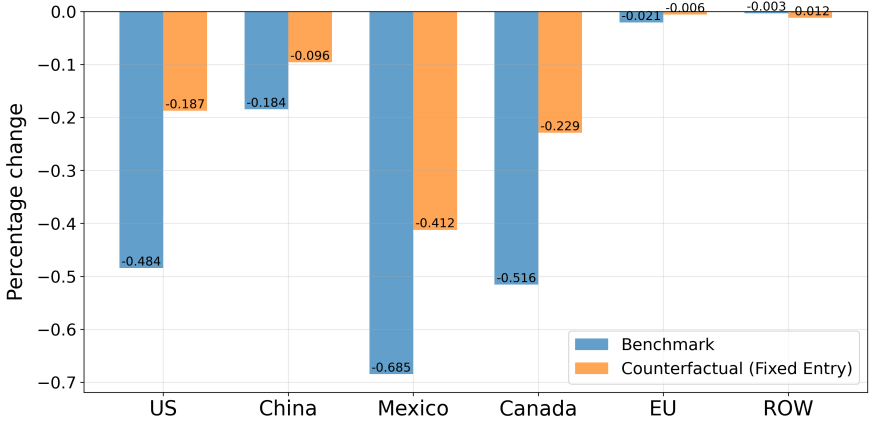
Trade war

With the calibrated model, we conduct the following experiment:

- US vs China: bilateral tariff increases to 30%
- US vs Canada, Mexico, EU and ROW: bilateral tariff increases to 10%

We evaluate the welfare impacts and quantify the importance of markup adjustments and firm entry/exit.

Welfare impacts of trade war



- Significantly larger effect due to firm entry and exit

▸ Trade statistics ▸ Without input-output linkages

Welfare decomposition

Extend Baqaee and Farhi 24 to allow for extensive margin adjustment:

$$\mathrm{d}\log W_d \approx \underbrace{-\sum_a \tilde{\lambda}_{ad}\,\mathrm{d}\log\tau_{ad}}_{\Delta\text{Tariff wedge}} \underbrace{-\sum_a \tilde{\lambda}_{ad}\,\mathrm{d}\log\mu_{ad}}_{\Delta\text{Markup wedge}} \underbrace{-\sum_b \left(\tilde{\lambda}_{bd}-\Lambda_{bd}\right)\mathrm{d}\log\Lambda_b}_{\Delta\text{Factor income wedge}} + \underbrace{E_d}_{\text{Variety effect}}$$

- first three terms capture welfare changes brought by continuing firms
- a is firm-product-origin triplet; b captures labor, tariff revenue, and profit 'factor'
- $\tilde{\lambda}_{ad}$: d's expenditure exposure to a; Λ_{bd} : share of factor b in d's income
- Λ_b : share of factor b in world income

Approximation of variety effect

$$E_d \approx \underbrace{-\frac{1}{\theta_d}\left[\sum_{e\in\mathcal{E}_d}\tilde{\lambda}_{ed} - \sum_{x\in\mathcal{X}_d}\tilde{\lambda}_{xd}\right]}_{\text{Effect on aggregate price (a la Feenstra 94)}} + \underbrace{\sum_{e\in\mathcal{E}_d}\Lambda_{ed} - \sum_{x\in\mathcal{X}_d}\Lambda_{xd}}_{\text{Effect on factor income}}$$

- $\mathcal{E}_d$, $\mathcal{X}_d$: the sets of entrants and exiters in d
- $\tilde{\lambda}_{ed}$: d's expenditure exposure to e (based on the extended HAIO; element of $(I-\widetilde{\Omega})^{-1}$)
- Λ_{ed} : share of profit e in d's income
- θ_d is trade elasticity

Welfare approximation with and without variety effects

$$\mathrm{d}\log W_d \approx \underbrace{-\sum_a \tilde{\lambda}_{ad}\,\mathrm{d}\log\tau_{ad}}_{\Delta\text{Tariff wedge}} \underbrace{-\sum_a \tilde{\lambda}_{ad}\,\mathrm{d}\log\mu_{ad}}_{\Delta\text{Markup wedge}} \underbrace{-\sum_b (\tilde{\lambda}_{bd}-\Lambda_{bd})\,\mathrm{d}\log\Lambda_b}_{\Delta\text{Factor income wedge}} + \underbrace{E_d}_{\text{Variety effect}}$$

Country	Change in Welfare (in %)		
	Model	Approxi-mation	Approximation Ignoring Variety Effects
US	-0.485	-0.458	0.014
China	-0.184	-0.122	0.032
Mexico	-0.712	-0.612	-0.210
Canada	-0.548	-0.345	0.090
EU	-0.016	-0.003	0.036
ROW	-0.005	0.003	0.014

Decomposing welfare changes

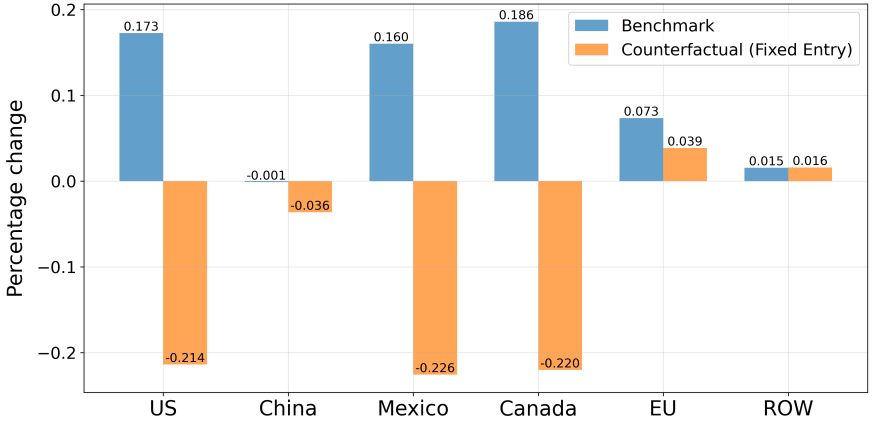
$$\mathrm{d}\log W_d \approx \underbrace{-\sum_a \tilde{\lambda}_{ad}\,\mathrm{d}\log\tau_{ad}}_{\Delta\text{Tariff wedge}} \underbrace{-\sum_a \tilde{\lambda}_{ad}\,\mathrm{d}\log\mu_{ad}}_{\Delta\text{Markup wedge}} \underbrace{-\sum_b (\tilde{\lambda}_{bd}-\Lambda_{bd})\,\mathrm{d}\log\Lambda_b}_{\Delta\text{Factor income wedge}} + \underbrace{E_d}_{\text{Variety effect}}$$

Country	Welfare	Allocation			Variety
		Markup	Tariff	Factor	
US	-0.485	-0.239	-0.696	0.955	-0.471
China	-0.184	-0.064	-0.038	0.128	-0.154
Mexico	-0.712	-0.151	-0.681	0.614	-0.402
Canada	-0.548	-0.123	-0.694	0.960	-0.435
EU	-0.016	-0.027	-0.131	0.194	-0.040
ROW	-0.005	-0.031	-0.157	0.202	-0.011

- Significant welfare changes due to markup and variety adjustments

▸ Net effects ▸ Home vs foreign markup contributions

Markup adjustments of foreign firms in tradable sectors



- Average markup of foreign firms can increase due to exits of firms from same origin

▸ All firms

Conclusion

We examine the reallocation of market power in a global trade war:

- Highlight the highly concentrated nature of granular export markets
- Find significant welfare impacts from variety and markup adjustments

Appendix

Data Sources

Firm-Product-Level Exports

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

Country-Product-Level Imports

- UN Comtrade

Tariffs

- WTO
- Feenstra & Romalis 2014
- World Bank Deep Trade Agreements Database

Statistics for US market

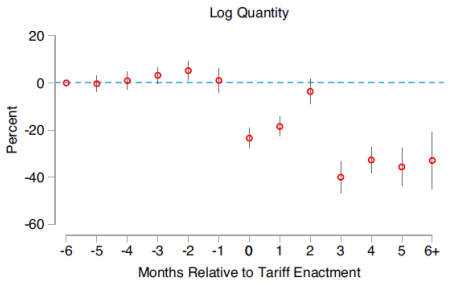
Concentrated granular origin-destination-product markets

	25th Percentile	Median	75th Percentile
(a) Number of firms	24.00	7.00	2.00
(b) Herfindahl index	0.25	0.50	0.92
(c) Cumulative market share cond. on ≥ 1 incumbent and ≥ 1 entrant			
– Incumbents	49.4%	81.9%	95.2%
– Entrants	51.6%	18.1%	4.8%

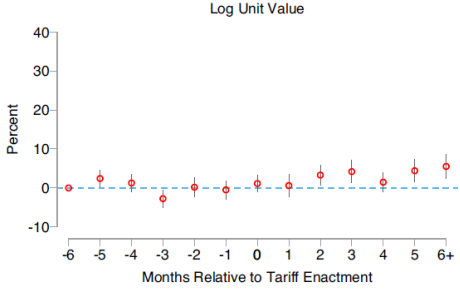
Back

Estimated impacts of the 2018 US-China Trade War

Decline in US imports from China



Prices (ex.tariff) of Chinese exporters to US



Source: Figure II from Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020)

Similar price effects found in Amiti, Redding and Weinstein (2019) and Carvallo, Gopinath, Neiman, and Tang (2021)

Back

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)

Back

Model calibration: Existing approaches and how we differ

There are different ways to include production network and calibrate the trade share

- Baqee and Farhi (2024 Econometrica):
  - Ex-ante trade shares are directly imported from the data
  - Ex-post change in trade shares relies on changes in markup, which are exogenously given
- Mukhin (2022 AER):
  - Ex-ante trade shares are pinned down by demand shifters in Cobb-Douglas form
  - No ex-post change in trade shares possible
- Ferrante, Graves and Iacoviello (2023 JME):
  - Ex-post change in trade shares are possible as consumption and input are CES aggregates
  - Ex-ante trade shares are not guaranteed to match the data because demand shifters are the same as the trade shares

We propose an alternative method to match ex-ante trade shares and predict ex-post change in trade shares

Numerical algorithm

Inner-loop (solving firm's problem and check GE conditions):

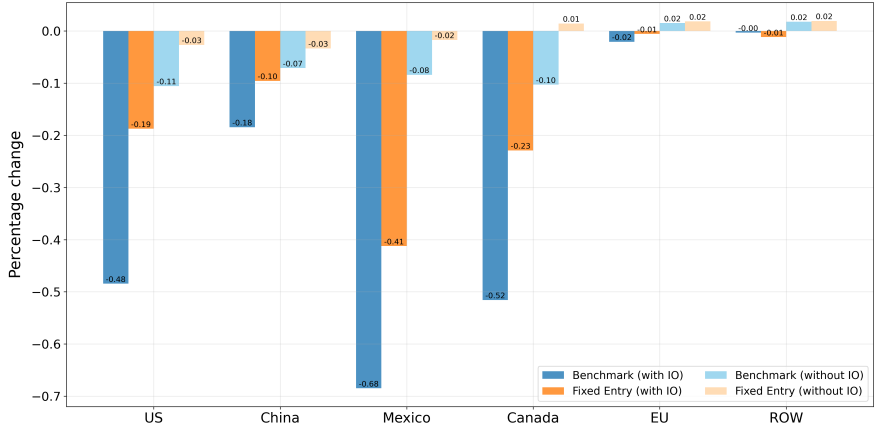
1. Guess initial outputs, nominal wages, and market shares
2. Derive prices, entry decisions, and updated market shares
3. Derive updated outputs, labor demand, and values of imports and exports
4. If the maximum error is sufficiently small, stop. If not, update guesses and proceed
5. If labor supply exceeds labor demand, increase output guesses. If exports exceed imports, increase wage guesses. Return to step 1

Outer-loop (matching trade shares):

1. Guess initial demand shifters
2. Derive simulated trade shares based on the guess
3. If the maximum error is sufficiently small, stop. If not, update guesses and proceed
4. If observed trade share is smaller than simulated trade share, increase demand shifter. Normalize the demand shifters, and return to step 1

Back

Welfare impacts of trade war - effect of production network



- Significantly larger effect due to production network

Back

Trade Statistics

Table: Share of total sales by destination

Origin / Dest.	US	China	Mexico	Canada	EU	ROW
US	0.938	0.004	0.006	0.009	0.015	0.029
China	0.011	0.924	0.001	0.002	0.012	0.051
Mexico	0.125	0.003	0.827	0.009	0.010	0.025
Canada	0.108	0.005	0.003	0.827	0.013	0.045
EU	0.014	0.008	0.001	0.002	0.902	0.072
ROW	0.016	0.024	0.002	0.002	0.029	0.926

Table: Share of total purchase by origin

Origin / Dest.	US	China	Mexico	Canada	EU	ROW
US	0.923	0.004	0.084	0.090	0.014	0.015
China	0.011	0.941	0.018	0.015	0.011	0.027
Mexico	0.009	0.000	0.830	0.006	0.001	0.001
Canada	0.011	0.001	0.004	0.832	0.001	0.002
EU	0.015	0.009	0.021	0.022	0.923	0.042
ROW	0.031	0.046	0.043	0.035	0.051	0.913

- EU and ROW are much less directly exposed to US relative to Mexico and Canada

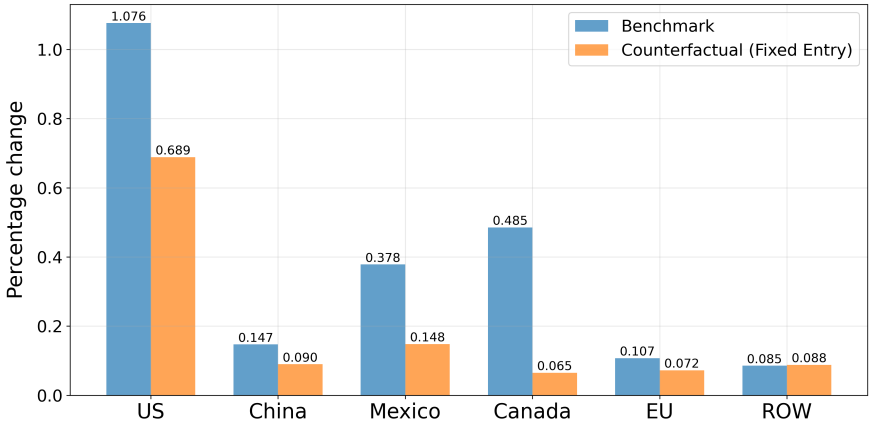
Decomposing changes in markup wedges

Country	Total	Main Components	
		Domestic	Foreign
US	-0.239	-0.236	-0.003
China	-0.064	-0.063	-0.001
Mexico	-0.151	-0.185	0.031
Canada	-0.123	-0.162	0.039
EU	-0.027	-0.026	-0.001
ROW	-0.031	-0.032	0.001

- The main welfare loss from markup adjustments stems from higher domestic markups
- Little impact from foreign firms due to two offsetting reallocation effects

Back

Markup adjustments in tradable sectors



- Markup increases as market becomes less competitive

Back

The net welfare contributions of markups and tariffs

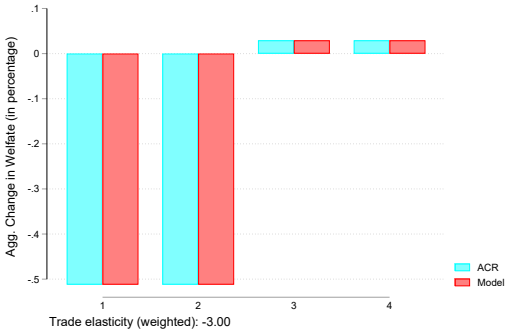
Country	Net Effects	
	Markup	Tariff
US	-0.113	-0.067
China	-0.021	-0.007
Mexico	-0.027	-0.171
Canada	-0.038	-0.146
EU	-0.014	-0.033
ROW	-0.017	-0.026

- The net welfare losses from endogenous markup adjustments can be as large as those from direct tariff changes.

Back

Melitz (2003) case and fixed cost

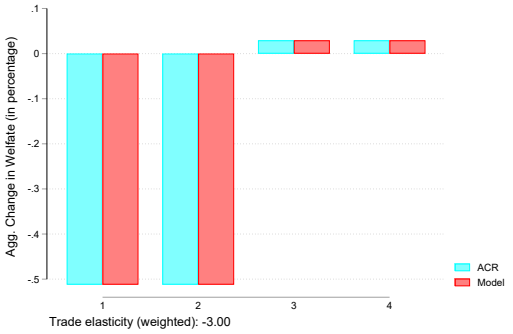
Melitz, fixed cost denominated in consumption



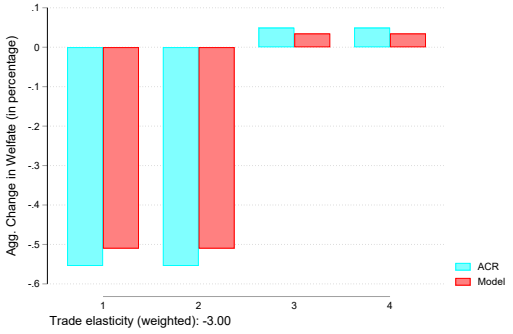
- If fixed cost is denominated in consumption, model's prediction of welfare change coincide's with ACR formula

Melitz (2003) case and fixed cost

Melitz, fixed cost denominated in consumption

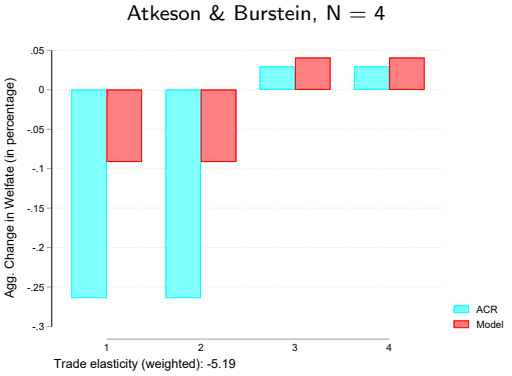


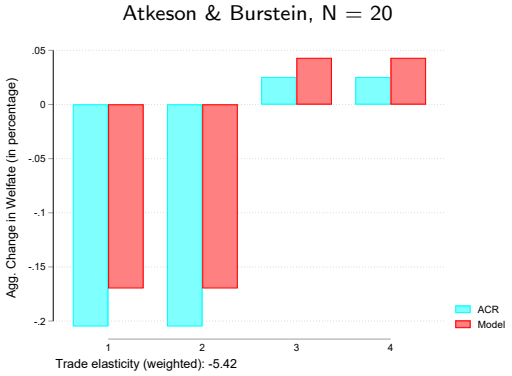
Melitz, fixed cost denominated in labor



- If fixed cost is denominated in consumption, model's prediction of welfare change coincide's with ACR formula
- If fixed cost is denominated in labor, resource is loss in entry and model's prediction of welfare change is smaller than ACR formula

Atkeson & Burstein (2008) case and number of firms





- With variable markup, ACR formula no longer a sufficient statistics of welfare change
- The model converges to monopolistic competition as number of firms increases, and ACR formula performs better