Advanced International Trade: Lesson 2

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M2 Paris I

Lesson 2

Micro-level Trade Elasticities

- Microfoundation of the gravity model
- Estimating trade elasticities with micro-data
- **Suggested readings:**
- Chaney (2008), "Distorted Gravity: The Intensive and Extensive Margins of International Trade?", American Economic Review 2008, 98:4, 1707-1721
- Bas, M, T. Mayer and M. Thoenig, (2016), "From micro to macro: Demand and supply-side determinants of trade elasticity?", Working Paper.

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Micro-level Trade Elasticities

- Microfoundation of the gravity model
- Chaney (2008), "Distorted Gravity: The Intensive and Extensive Margins of International Trade?", American Economic Review 2008, 98:4, 1707-1721
- Additional assumptions to Melitz

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Micro-level Trade Elasticities

- Chaney (2008), "Distorted Gravity: The Intensive and Extensive Margins of International Trade?", American Economic Review 2008, 98:4, 1707-1721
- Aim: Proposes a more simple (but more specific) version of Melitz (2003)
- Two additional assumptions
- (1) No entry: the mass of firms is fixed and proportional to countrys size Lj.
- (2) Pareto distribution of productivity draws
- Contribution

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Micro-level Trade Elasticities

- Contribution: Details the consequence of trade barriers on the two trade margins:
- (1) The intensive trade margin = firm-level exports
- (2) The extensive trade margin = number (or the selection) of exporters
- Shows how firms heterogeneity changes the predictions of gravity equations

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Micro-level Trade Elasticities

- With heterogeneous firms, a change in trade costs affects both the intensive and the extensive margin

- Using the Pareto distribution assumption, the aggregate trade elasticity is:

$$\varepsilon_{ni} = \underbrace{1-\sigma}_{\text{intensive margin}} + \underbrace{\gamma - (\sigma - 1)}_{\text{extensive margin}}, \tag{1}$$

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Micro-level Trade Elasticities

- The effect of the elasticity of substitution (demand side parameter) on each margin cancels out
- The aggregate elasticity of trade with respect to variable trade costs depends only on a supply side parameter:
- measuring firm heterogeneity
- Implications

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Micro-level Trade Elasticities

- Main implications:
- (1) The aggregate trade elasticity is constant
- (2) Does not depend on destination markets
- (3) Difference with respect to Krugman's model

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Micro-level Trade Elasticities

- Main implications:
- (3) Difference with respect to Krugman's model
- Krugman's model monopolistic competition, intra-industry trade (firms are homogeneous) $-->$
- Aggregate trade elasticity depends only on the demand side parameter
- the elasticity of substitution (σ)

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Estimating trade elasticities with micro-data

- Bas, M, T. Mayer and M. Thoenig, (2016), "From micro to macro: Demand and supply-side determinants of trade elasticity?", Working Paper.
- Aim: Integrate in a single framework demand and supply determinants of trade elasticity
- Contribution:
- Firm heterogeneity matters for the aggregate trade elasticity
- Micro-data is necessary to estimate the aggregate trade elasticity
- Important for evaluation of the impact of trade policies

The importance of the trade elasticity

- Aggregate trade elasticity (ε) is a central element in any evaluation of Gains From Trade.
- Most common usage = estimate ε in a macro-level structural gravity equation (method is the same across many models):

$$\ln X_{ni} = \text{FE}_i + \text{FE}_n + \varepsilon \ln(1 + t_{ni})$$

- Estimate of ε is relevant for a particular experiment of trade liberalization iif structural gravity holds, with in particular, a unique elasticity to be estimated across dyads.

The heterogeneity of the trade elasticity

- Melitz-type models of heterogeneous firms with selection into export market participation in general exhibit a dyad-specific elasticity, i.e. an ε_{ni}, which applies to each country pair.

$$\varepsilon_{ni} = \underbrace{1-\sigma}_{\text{intensive margin}} + \underbrace{\frac{1}{\bar{x}_{ni}/x_{ni}^{\mathtt{MIN}}}}_{\text{min-to-mean}} \times \underbrace{\frac{d\ln N_{ni}}{d\ln \tau_{ni}}}_{\text{extensive margin}}, \qquad (2)$$

The heterogeneity of the trade elasticity

- With (untruncated) Pareto(θ), the last part of the elasticity reduces to $\sigma - 1 - \theta$, and therefore $\varepsilon_{ni}^{P} = \varepsilon^{P} = -\theta$, a supply side parameter (Chaney, 2008).

- With homogeneous firms, $\varepsilon = 1 - \sigma$, a demand side parameter

What we do

- We study the demand and supply side determinants of the aggregate (bilateral) trade elasticity.
- We argue that quantifying ε_{ni} makes it necessary to use micro-level information... when moving away from Pareto.
- We provide a method using firm-level exports for estimating all the components of the aggregate trade elasticity:
    1. the CES demand parameter that governs the intensive margin
    2. the supply side parameter that drives the extensive margin, measuring firm-level dispersion in performance.

Literature

- **Estimating aggregate elasticities:** Hummels (1999), Baier and Bergstrand (2001), Head and Ries (2001), Caliendo and Parro (forth.), Romalis (2007), Imbs and Méjean (forth.), Feenstra, Luck, Russ and Obstfeld (2014)
- **Firm-level elasticities:** Berman et al. (2012), Fitzgerald and Haller (2012), Berthou and Fontagné (2015)
- **Heterogeneity's impact on elasticities and welfare:** Head et al. (2014), Yang (2014), Melitz and Redding (2014), Feenstra (2013), Barba-Navaretti et al. (2015)
- **Non-constant elasticities:** Helpman et al. (2008), Novy (2013)

Theoretical framework

- Setup: heterogeneous firms facing constant price elasticity exporting to several destinations

- Firm-level exports to country n depend upon the firm-specific unit input requirement (α), wages (w), and discounted expenditure in n: $A_n \equiv X_n P_n^{\sigma-1}$.

- Trade costs: observable iceberg part (τ_n), and a shock $b_n(\alpha)$

$$x_n(\alpha) = \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \left[\alpha w \tau_n b_n(\alpha)\right]^{1-\sigma} A_n \qquad (3)$$

- The *firm-level trade elasticity*, i.e. the individual reaction to a change in observable trade costs is $1-\sigma$.

Inferring aggregate elasticity from firm-level data

- Aggregate exports:

$$X_{ni} = V_{ni} \times \left(\frac{\sigma}{\sigma - 1}\right)^{1-\sigma} (w_i \tau_{ni})^{1-\sigma} A_n M_i^e, \qquad (4)$$

with

$$V_{ni} \equiv \int_0^{a_{ni}^*} a^{1-\sigma} g(a) da, \quad \text{with} \quad a \equiv \alpha \times b(\alpha) \qquad (5)$$

Inferring aggregate elasticity from firm-level data

- The solution for this cutoff firm is the cost satisfying the zero profit condition, i.e., $x_{ni}(a^*_{ni}) = \sigma w_i f_n$:

$$a^*_{ni} = \frac{1}{\tau_{ni} f_n^{1/(\sigma-1)}} \left(\frac{1}{w_i}\right)^{\sigma/(\sigma-1)} \left(\frac{A_n}{\sigma}\right)^{1/(\sigma-1)} . \qquad (6)$$

Inferring aggregate elasticity from firm-level data

- Holding w_i, M_i^e and A_n constant (Partial equilibrium)

$$\frac{d\ln X_{ni}}{d\ln \tau_{ni}} = \varepsilon_{ni} = 1-\sigma-\gamma_{ni}, \quad \text{with} \quad \gamma_{ni} \equiv \frac{d\ln V_{ni}}{d\ln a^*_{ni}} = \frac{a^{*2-\sigma}_{ni} g(a^*_{ni})}{V_{ni}}$$

- Aggregate trade elasticity is not constant across country pairs, through γ_{ni}
- $\rightarrow$ Firm heterogeneity matters for the aggregate trade elasticity

γ, a^* and $\mathcal{H}$

- In order to evaluate bilateral trade elasticities, we need to determine $\gamma_{ni} \to a^*$.

- Define the following function

$$\mathcal{H}(a^*) \equiv \frac{1}{a^{*1-\sigma}} \int_0^{a^*} a^{1-\sigma} \frac{g(a)}{G(a^*)} da = \frac{V(a^*)}{a^{*1-\sigma} G(a^*)}, \qquad (7)$$

$\to$ average/minimum performance (measured as $a^{*1-\sigma}$)

γ, a^* and $\mathcal{H}$

- Empirical counterpart of the theoretical function $\mathcal{H}(a^*)$
- This ratio also corresponds to the observed mean-to-min ratio of export sales:

$$\frac{\bar{x}_{ni}}{x_{ni}(a^*_{ni})} = \mathcal{H}(a^*_{ni}). \tag{8}$$

- Calibrate $\mathcal{H}$ as a function of the mean-to-min ratio, observed for our two origin countries (France and China), to reveal the cutoff.

Inferring aggregate elasticity from firm-level data

- From the theory to the empirical estimations:
- Aggregate trade elasticities are obtained from firm level data by combining two steps:
- Step 1: estimate $\hat{\sigma}$ the intensive margin (the demand-side parameter) from a firm-level export equation.
- Step 2: Determine γ_{ni} using the firm level data to compute the mean-to-min ratio to $\rightarrow$ reveal a^*. (the supply-side parameter)

Step 1: A firm-level export equation

Estimation issues

- (1)**The need for multiple origins**: The first challenge is to separate the effect of trade costs from destination fixed effects. Taking logs of the firm level exports:

$$\ln x_{ni}^{p}(\alpha) = (1-\sigma)\ln\left(\frac{\sigma}{\sigma-1}\right) + (1-\sigma)\ln(\alpha w_i) + (1-\sigma)\ln(1+t_{ni}^{p}) + (1-\sigma)\delta\ln D_{ni} + \ln A_n^p + \ln \epsilon_{ni}^{p}(\alpha). \quad (9)$$

- A_n^p and τ_n^p would then vary across the same dimension
- One need to use at least two sets of exporters, based in countries that face different levels of tariffs applied by n: combine firm-level customs data for France and China

Step 1: A firm-level export equation

- (2) **The fixed effects curse**: in addition to the market dimension (A_n^p), a set of fixed effects at the firm level to capture marginal costs(αw_i)

- Two solutions to deal with the very large number of fixed effects:

- 2WFE: estimate firm level exports directly using the high-dimensional procedure:

$$\ln x_{ni}^p(\alpha) = \mathrm{FE}_i^\alpha + \mathrm{FE}_n^p + (1-\sigma)\ln(1+t_{ni}^p) + (1-\sigma)\delta \ln D_{ni} + \ln \epsilon_{ni}^p(\alpha) \tag{10}$$

Step 1: A firm-level export equation

- A ratio-type estimation
- removes observable and unobservable determinants for both firm-level and destination factors $\rightarrow$
- using four individual export flows to calculate ratios of ratios
- Requieres two firm level datasets from different origin countries.

Step 1: A firm-level export equation

- (3) **Firm-level zeroes (selection bias)**: endogenous selection into different export markets across firms.
- A firm with a low cost (αw_i) can afford having a low draw on $\epsilon^p_{ni}(\alpha)$ and still export profitably to n.
- $\rightarrow$ Higher tariff observations will be associated with firms having drawn higher $\epsilon^p_{ni}(\alpha)$, thus biasing downwards our estimate of the trade elasticity.

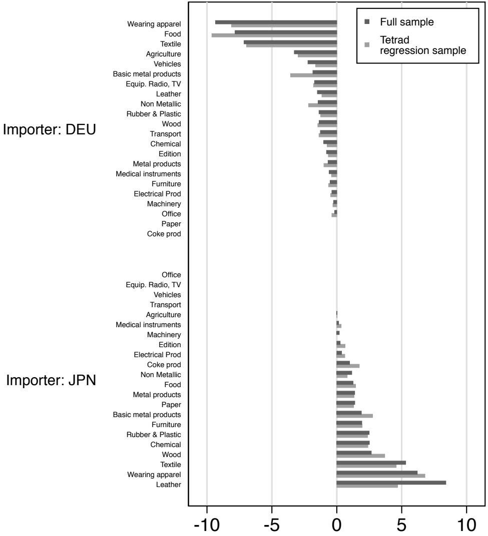
Step 1: A firm-level export equation

- No "perfect" estimator
- We propose these three alternative methods to estimate the demand side parameter σ (firm level trade elasticity)
- that we confront to Monte Carlo evidence of a simulated version of the model.

Step 1: Data

- **Trade:** Our dataset consists of Chinese and French exporters in the year 2000. Data is aggregated at HS6 level for each firm/destination.
- **Tariffs:** Tariffs come from the WITS (World Bank) database for the year 2000 (also HS6).
- **Gravity controls:** Bilateral distances, common (official) language, colony and common border (contiguity) come from the CEPII distance database.

Step 1: Average difference in tariffs (FRA -CHN)



Step 1: A firm-level export equation

- (1) 2WFE on top exporters
- Restrict the sample to top exporters that are far away from the truncation point and
- the idiosyncratic destination shock is of second order
- Mulligan and Rubinstein (2008), Paravisini et al. (2015) and Fitzgerald and Haller (2015)

Step 1: A firm-level export equation

- (2) Tetrads method
- with a similar strategy of restricting attention to large exporting firms that are the least likely to be affected by the selection bias.
- $\rightarrow$ the issue is that (1) and (2) estimate the intensive margin elasticity on a reduced sub-sample

A firm-level tetrad

1. Rank firms for each hs6 and destinations used as ref. k.
2. By product, take ratio of exports for French firm ranked j exporting to country n, over the flow to k $\rightarrow$ removes firm-level characteristics:

$$\frac{x_n(\alpha_{j,\mathrm{FR}})}{x_k(\alpha_{j,\mathrm{FR}})} = \left(\frac{\tau_{n\mathrm{FR}}}{\tau_{k\mathrm{FR}}}\right)^{1-\sigma} \frac{A_n}{A_k} \frac{\epsilon_n(\alpha_{j,\mathrm{FR}})}{\epsilon_k(\alpha_{j,\mathrm{FR}})} \tag{11}$$

A firm-level tetrad

1. Take the ratio of equation over the same ratio for a firm with rank j located in China $\rightarrow$ eliminates destination factors:

$$\frac{x_n(\alpha_{j,\mathrm{FR}})/x_k(\alpha_{j,\mathrm{FR}})}{x_n(\alpha_{j,\mathrm{CN}})/x_k(\alpha_{j,\mathrm{CN}})} = \left(\frac{\tau_{n\mathrm{FR}}/\tau_{k\mathrm{FR}}}{\tau_{n\mathrm{CN}}/\tau_{k\mathrm{CN}}}\right)^{1-\sigma} \frac{\epsilon_n(\alpha_{j,\mathrm{FR}})/\epsilon_k(\alpha_{j,\mathrm{FR}})}{\epsilon_n(\alpha_{j,\mathrm{CN}})/\epsilon_k(\alpha_{j,\mathrm{CN}})}. \quad (12)$$

Denoting tetradic terms with a $\widetilde{\ }$ symbol,

$$\widetilde{x}_{\{j,n,k\}} = \widetilde{\tau}^{1-\sigma}_{\{n,k\}} \times \widetilde{\epsilon}_{\{j,n,k\}}, \quad (13)$$

Step 1: Estimating equation

- Restoring product subscript (p), bilateral trade costs are

$$\tau_{ni}^{p} = (1 + t_{ni}^{p}) D_{ni}^{\delta}, \tag{14}$$

with ad valorem applied tariffs t_{ni}^{p} and D_{ni} a collection of other barriers.

- Our estimable equation is

$$\ln \widetilde{x}_{\{j,n,k\}}^{p} = (1-\sigma) \ln \left(\widetilde{1 + t_{\{n,k\}}^{p}}\right) + (1-\sigma)\delta \ln \widetilde{D_{\{n,k\}}} + \ln \widetilde{\epsilon}_{\{j,n,k\}}^{p} \tag{15}$$

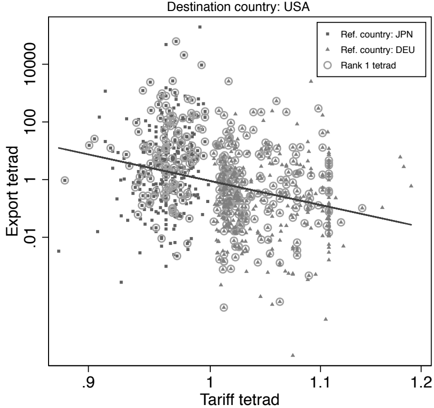
The dependent variable is constructed by the ratio of ratios of exports for $j = 1$ to 10, that is firms ranking from the top to the 10th exporter for a given product.

Reference importers

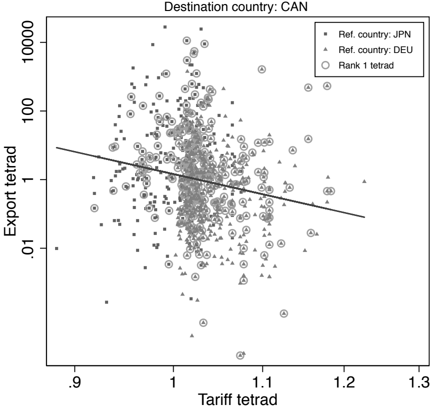
The reference importer countries are picked according to two criteria:

1. Major trade partners of France and China in the year 2000
2. Within the main trading partners, countries for which the average difference between the effectively applied ad valorem tariffs to France and China is greater: Australia, Canada, Germany, Italy, Japan, New Zealand, Poland and the UK.

Graphical illustration 1

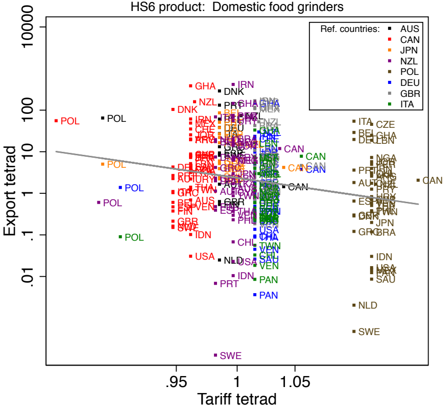


Note: The coefficient on tariff tetrad is -20.11 with a standard error of 2.21

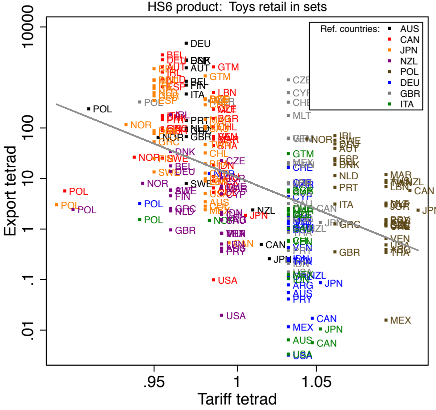


Note: The coefficient on tariff tetrad is -14.19 with a standard error of 2.79

Graphical illustration 2

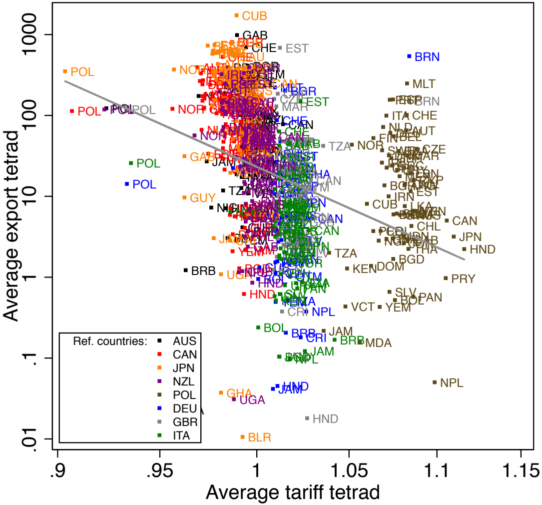


Note: The coefficient on tariff tetrad is -9.54 with a standard error of 3.12.



Note: The coefficient on tariff tetrad is -29.86 with a standard error of 3.82.

Graphical illustration 3



Note: Tetrads are averaged over the 184 products with at least 30 destinations in common.
The coefficient is -24.04 with a standard error of 2.89.

Intensive margin elasticities in 2000

Dependent variable:	Top 1 firm-level exports			Top 1 to 10 firm-level exports		
	(1)	(2)	(3)	(4)	(5)	(6)
Applied Tariff	-5.74[a]	-4.83[a]	-3.83[a]	-4.54[a]	-4.65[a]	-2.66[a]
	(0.76)	(0.81)	(0.71)	(0.60)	(0.61)	(0.54)
Distance	-0.47[a]	-0.46[a]	-0.15[a]	-0.50[a]	-0.45[a]	-0.19[a]
	(0.03)	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)
Contiguity	0.58[a]	0.75[a]	0.52[a]	0.60[a]	0.75[a]	0.54[a]
	(0.08)	(0.08)	(0.07)	(0.08)	(0.07)	(0.07)
Colony	0.27	0.63[c]	-0.24	-0.07	0.24	-0.61[a]
	(0.29)	(0.32)	(0.29)	(0.15)	(0.18)	(0.15)
Common language	0.10	-0.09	0.39[a]	0.08	-0.10	0.39[a]
	(0.09)	(0.09)	(0.09)	(0.08)	(0.07)	(0.07)
RTA			1.06[a]			1.07[a]
			(0.12)			(0.09)
Observations	37396	15477	37396	99645	41376	99645
R^2	0.137	0.189	0.143	0.146	0.181	0.153

Notes: Standard errors are clustered by destination×reference country. . Columns (2) and (5) present estimations on the sample of positive tetraded tariffs.

Intensive margin elasticities in 2000, Within-product estimations.

Dependent variable:	Top 1 firm-level exports			Top 1 to 10 firm-level exports		
	(1)	(2)	(3)	(4)	(5)	(6)
Applied Tariff	-5.99[a]	-5.47[a]	-3.20[a]	-4.07[a]	-3.09[a]	-1.65[b]
	(0.79)	(1.07)	(0.79)	(0.72)	(0.75)	(0.68)
Distance	-0.54[a]	-0.49[a]	-0.21[a]	-0.59[a]	-0.55[a]	-0.29[a]
	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)
Contiguity	0.93[a]	0.97[a]	0.84[a]	1.00[a]	0.94[a]	0.93[a]
	(0.08)	(0.09)	(0.07)	(0.07)	(0.09)	(0.07)
Colony	0.56[a]	0.48[c]	0.01	0.13	0.18	-0.34[a]
	(0.21)	(0.29)	(0.21)	(0.10)	(0.15)	(0.11)
Common language	-0.03	-0.00	0.25[a]	-0.07	-0.07	0.18[a]
	(0.07)	(0.08)	(0.06)	(0.06)	(0.07)	(0.06)
RTA			1.08[a]			0.94[a]
			(0.11)			(0.07)
Observations	37396	15477	37396	99645	41376	99645
R^2	0.145	0.128	0.153	0.140	0.115	0.146

Notes: Standard errors are clustered by destination×reference country. All estimations include (hs6-product×reference country) fixed effects. Columns (2) and (5) present estimations on the sample of positive tetraded tariffs.

Intensive margin in 2000: non-MFN sample

Dependent variable:	Top 1 to 10 firm-level exports			
	(1)	(2)	(3)	(4)
Applied Tariff	-3.87[a]	-5.36[a]	-3.24[a]	-5.47[a]
	(1.09)	(1.14)	(1.09)	(1.03)
Distance	-0.50[a]	-0.41[a]	-0.45[a]	-0.36[a]
	(0.03)	(0.03)	(0.05)	(0.05)
Observations	12992	9421	12992	9421
R^2	0.102	0.094	0.058	0.062

Notes: Standard errors are clustered by destination×reference country. Columns (3) and (4) include fixed effects at the (hs6 product×reference country) level. Columns (2) and (4) present estimations on the sample of positive tetraded tariffs.

Step 1: Intensive margin elasticities. Robustness tests

1. Results are robust to cross-section analysis in 2001 and 2006
2. Similar results hold for panel estimations 2000-2006 period: identifying the variation of tariffs within product-destination over time and across reference countries.
3. Average intensive margin elasticity across all estimates is

$$\hat{\sigma} \simeq 5$$

Step 1: A firm-level export equation

- (3) EK-tobit uses the full sample of exporters.
- The theoretical equation for minimum sales, $x_{ni}^{p,\mathtt{MIN}}(\alpha) = \sigma w_i f_n^p$,
- provides a natural estimate for the truncation point for each market.

Step 1: Empirical estimates of the intensive margin

Dependent variable:	firm-level exports					
Estimator:	2WFE on top		Tetrad on top		EK-Tobit	
	(1)	(2)	(3)	(4)	(5)	(6)
ln (1 + Applied Tariff)	-5.15[b]	-2.96	-5.74[a]	-3.83[a]	-5.45[a]	-5.44[a]
	(2.03)	(2.06)	(0.76)	(0.71)	(0.26)	(0.26)
ln Distance	-0.51[a]	-0.17[a]	-0.47[a]	-0.15[a]	-1.73[a]	-1.66[a]
	(0.04)	(0.06)	(0.03)	(0.04)	(0.04)	(0.06)
Common language	-0.36[a]	-0.10	0.10	0.39[a]	1.86[a]	1.93[a]
	(0.11)	(0.12)	(0.09)	(0.09)	(0.12)	(0.12)
Contiguity	1.00[a]	0.90[a]	0.58[a]	0.52[a]	1.43[a]	1.41[a]
	(0.09)	(0.09)	(0.08)	(0.07)	(0.11)	(0.11)
Colony	0.46	-0.14	0.27	-0.24	3.50[a]	3.41[a]
	(0.54)	(0.54)	(0.29)	(0.29)	(0.21)	(0.21)
RTA		1.15[a]		1.06[a]		0.23[c]
		(0.18)		(0.12)		(0.13)
ln # of dest. by firm					1.69[a]	1.69[a]
					(0.02)	(0.02)
Chinese exporter					0.59[a]	0.63[a]
					(0.06)	(0.05)
sigma						
Constant					8.68[a]	8.69[a]
					(0.02)	(0.02)
Observations	14044		37396		49067922	
R^2	0.777	0.779	0.137	0.143	0.829/0.08	0.829/0.08

Notes: [a], [b] and [c] denote statistical significance levels of one, five and ten percent respectively. Standard errors are clustered by destination×reference country for columns (3) and (4) (tetrads), and by HS6-

Step 1: Monte Carlo results

Table : Monte Carlo results: firm-level elasticities wrt to a change in trade costs

	mean	s.d
% of positive flows	0.048	0.008
correlation between global and local rank	0.660	0.015
correlation between $\ln \tau_{ni}$ and $\ln b_{ni}(\alpha)$	-0.137	0.041
σ 2WFE on full sample	5.000	0.004
σ 2WFE on censored sample	2.419	0.105
σ EK-tobit	4.997	0.014
σ EK-tobit (no FEs)	4.996	0.527
σ tetrads	4.336	0.959
σ 2WFE on top exporter	4.528	1.031
# obs full sample (and EK-tobit)	8000000	0
# obs censored sample	384401	60323.965
# obs tetrads	313.195	44.942
# obs 2WFE on top exporter	114.430	20.829

Note: True σ is set to 5. There are 200 replications, parameters on fixed costs of exports and size of the demand term have been calibrated so that the share of non-selected trade flows at the firm-destination level averages between 4 and 5 %. For each elasticity, the first column reports the average value, while the second reports standard deviations of elasticities across the 50 replications.

Step 2: Quantifying the aggregate trade elasticities

- We need to specify the distribution of firm heterogeneity $G(a)$ to inverse the $\mathcal{H}$ function,
- reveal the bilateral cutoffs and the predicted aggregate trade elasticities.
- Pareto vs LN:

$$G^{\mathrm{P}}(a) = \left(\frac{a}{\bar{a}}\right)^{\theta}, \qquad \text{and} \qquad G^{\mathrm{LN}}(a) = \Phi\left(\frac{\ln a + \mu}{\nu}\right),$$

resulting formulas for ε are

$$\varepsilon^{\mathrm{P}}_{ni} = -\theta, \qquad \text{and} \qquad \varepsilon^{\mathrm{LN}}_{ni} = 1 - \sigma - \frac{1}{\nu} h\left(\frac{\ln a^*_{ni} + \mu}{\nu} + (\sigma - 1)\nu\right).$$

- Predictions

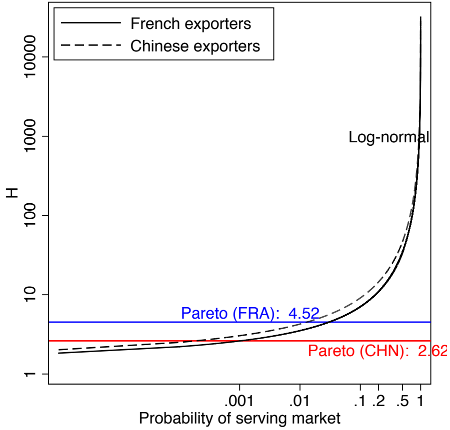
Step 2: Quantifying the aggregate trade elasticities

- Pareto predicts a constant total trade elasticity.
- LN predicts that
  1. elasticities of total trade and of the extensive margin decline with easiness of the market.
  2. elasticity on average exports increases with easiness of the market.
  3. Why?

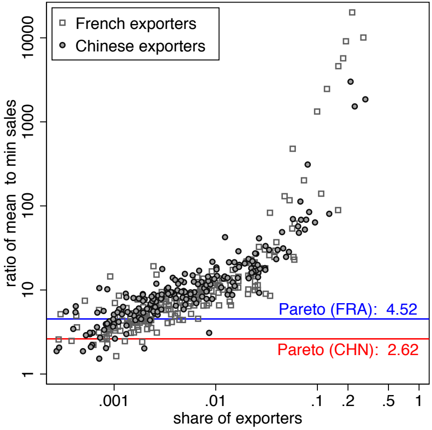
Step 2: Quantifying the aggregate trade elasticities

- elasticities of total trade and of the extensive margin decline with easiness of the market.
- elasticity on average exports increases with easiness of the market..
- $-->$ When a market is very easy the extensive margin goes to zero (all firms can export to that destination)
- and the response of average exports goes to the value of the intensive margin (the firm-level response), $1-\sigma$.

Theoretical and Empirical Mean-to-Min ratios

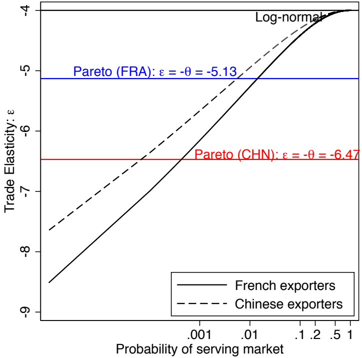


(a) theory

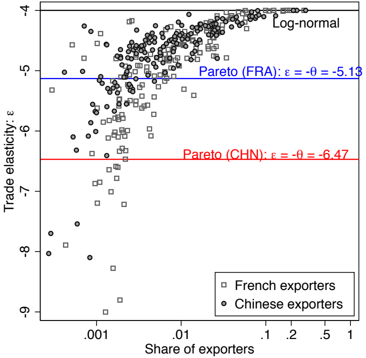


(b) data

Predicted total trade elasticities



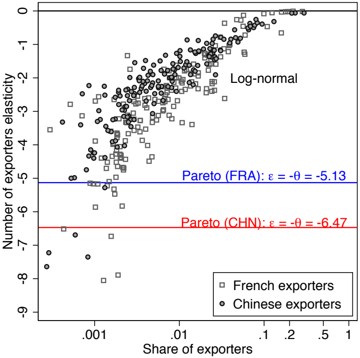
(a) theory



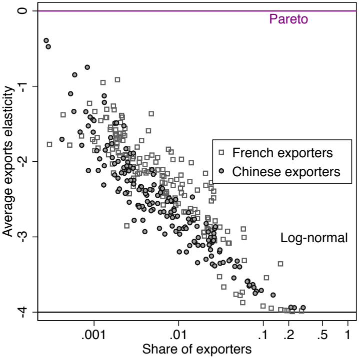
(b) data

- LN: when all firms export, only intensive margin is active → $\varepsilon = 1 - \sigma = -4$.
- Easy markets: trade elasticity in absolute terms is lower.

Predicted elasticities: extensive margin and average exports



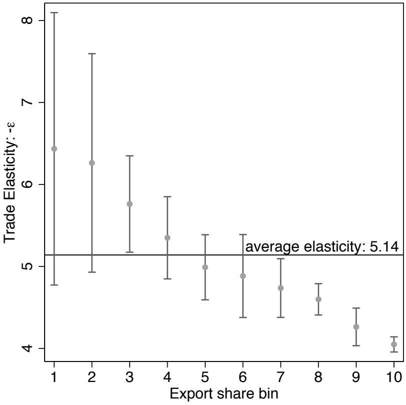
(a) extensive margin



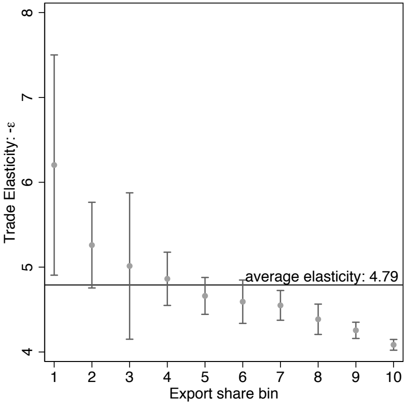
(b) average exports

- LN: when all firms export, extensive margin goes to zero, and the response of average exports equals the intensive margin.
- Pareto: aggregate elasticity = extensive margin ($\varepsilon = -\theta$).

Variance in trade elasticities: ε_{nFR} and ε_{nCN}



(a) French exports



(b) Chinese exports

Aggregate elasticity decreases with bilateral trade intensity. China: 1% $\downarrow \tau$ raises exports by $\simeq$ 6 % for countries like Chad or Azerbaijan, about 4 % for the USA and Japan (top bin). A unique elasticity = 25 % underestimate for low traders and overestimate of around 20 % for the top trade pairs.

Comparison with macro-based estimates: LN preds.

Table : Predicted bilateral trade elasticities (LN distribution)

LHS	France	China	Average
Total flows	-5.14	-4.792	-4.966
	(1.069)	(.788)	(.742)
Number of exporters	-2.866	-2.274	-2.57
	(1.657)	(1.472)	(1.335)
Average flows	-2.274	-2.517	-2.396
	(.687)	(.731)	(.64)

Notes: This table presents the predicted elasticities (mean and s.d.) on total exports, the number of exporting firms, and average export flows. Required parameters are σ, the CES, and ν, the dispersion parameter of the log normal distribution.

- Average value of bilateral trade elasticities calculated using LN.
- Total elasticity is different from the extensive margin and the average exports react to trade cost

Comparison with macro-based estimates

- Using the same sample of product-markets as in our benchmark firm-level estimations in step 1,
- we regress tetraded tariffs on tetrads of aggregate exports, number of exporters and average exports,
- on 3 different samples: baseline, controlling for RTA and on the sample of positive tetraded tariffs.

Comparison with macro-based estimates: data

Table : Macro-based elasticities

LHS	Baseline	RTA	Tariffs > 0
Total flows	-6.84	-4	-4.79
	(.82)	(.73)	(.84)
Number of exporters	-4.29	-1.6	-2.13
	(.66)	(.63)	(.5)
Average flows	-2.55	-2.41	-2.66
	(.54)	(.498)	(.54)
Observations	99645	99645	41376

Notes: This table presents the estimated trade elasticities (mean and s.d.) on total exports, the number of exporting firms, and average export flows.

- Under Pareto, aggregate elasticity reflects extensive margin $\rightarrow$ no impact of tariffs on average flows.

Micro and Aggregate elasticities at the industry level

Direct evidence that both demand and supply enter the aggregate elasticity

- We estimate a firm-level and an aggregate elasticity to tariffs at the 2-digit industry level.
- Under the Pareto assumption, those two elasticities have no reason to be correlated,

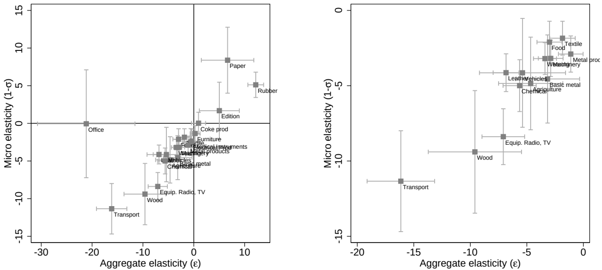
  $\rightarrow$ Micro elasticity is a measure of product differentiation (demand), while the macro one captures homogeneity in firms' productivity (supply).

- Under alternative distributions like the log-normal, the aggregate elasticity includes both determinants;

  $\rightarrow$ Macro elasticities should be correlated with the micro one.

Micro and Aggregate elasticities at the industry level

Figure : Aggregate and intensive margin elasticities by industry 2 digit



(a) Full set (b) Coeff sig. < 0

- Under Pareto the micro and aggregate elasticity no reason to be correlated
- Under LN: aggregate elasticity includes both demand and supply side determinants and should be correlated with the micro elasticity

Non-constant trade elasticity

- Using tetrads on aggregate trade flow, we show direct empirical evidence of non-constant trade elasticities.
- For general distributions, the elasticity of the cost-performance index γ_{ni} is not constant across dyads. It depends on a^*_{ni}.
- Under Pareto, this elasticity is constant $\gamma^{\mathrm{P}}_{ni} = 1 - \sigma + \theta$

Non-constant trade elasticity

Dependent variable:	Tot.	# exp.	Avg.	Tot.	# exp.	Avg.
	(1)	(2)	(3)	(4)	(5)	(6)
Applied Tariff$_{n,FR}$	-4.25^{a}	-2.90^{a}	-1.34^{a}	-4.06^{a}	-2.76^{a}	-1.30^{a}
	(0.27)	(0.25)	(0.18)	(0.26)	(0.23)	(0.17)
Applied Tariff$_{n,CN}$	3.43^{a}	1.87^{a}	1.56^{a}	3.30^{a}	1.76^{a}	1.53^{a}
	(0.27)	(0.25)	(0.17)	(0.26)	(0.23)	(0.17)
Applied Tariff$_{k,FR}$	7.11^{a}	6.60^{a}	0.52^{b}			
	(0.36)	(0.20)	(0.24)			
Applied Tariff$_{k,CN}$	-3.79^{a}	-2.14^{a}	-1.66^{a}			
	(0.40)	(0.26)	(0.23)			
Observations	1077652	1077652	1077652	1085643	1085643	1085643
R^2	0.346	0.587	0.080	0.349	0.593	0.081

Notes: All estimations include product and year FEs and the four components of each gravity control. The 3 last columns add a k FE.

Conclusion

- This paper calls for a "micro approach" to estimating trade elasticities vs. a "macro approach"
- Micro uses firm-level data / Macro uses aggregate gravity.
- Micro provides the full cross-dyadic distribution of elasticities / Macro is based on the Pareto assumption that yields a constant trade elasticity.

Conclusion

- We use averaged elasticities so as to discriminate between the two distributional assumptions.
- The average of bilateral trade elasticities obtained under a LN calibration is very close to the empirical gravity estimate,
- By contrast, Pareto-based calibration leads to elasticities that are further away from empirical estimates.
- Further empirical evidence that trade elasticities are not constant.

QQ regressions (French exports to Belgium in 2000)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample:	all	top 50%	top 25%	top 5%	top 4%	top 3%	top 2%	top 1%
Obs:	34751	17376	8688	1737	1390	1042	695	347
	Log-normal: RHS $= \Phi^{-1}(\hat{F}_i)$, coeff $= \tilde{\nu}$							
$\Phi^{-1}(\hat{F}_i)$	2.392	2.344	2.409	2.468	2.450	2.447	2.457	2.486
R^2	0.999	0.999	1.000	0.999	0.998	0.998	0.996	0.992
ν	0.797	0.781	0.803	0.823	0.817	0.816	0.819	0.829
	Pareto: RHS $= -\ln(1-\hat{F}_i)$, coeff $= 1/\tilde{\theta}$							
$-\ln(1-\hat{F}_i)$	2.146	1.390	1.174	0.915	0.884	0.855	0.822	0.779
R^2	0.804	0.966	0.981	0.990	0.992	0.994	0.994	0.994
θ	1.398	2.158	2.555	3.278	3.392	3.511	3.650	3.849

Notes: the dependent variable is the log exports of French firms to Belgium in 2000. The standard deviation of log exports in this sample is 2.393, which should be equal to $\tilde{\nu}$ if x is log-normally distributed and to $1/\tilde{\theta}$ if distribution if Pareto. ν and θ are calculated using $\sigma = 4$. Standard errors still have to be corrected.

QQ graphs (Head et al., 2014)

(a) French firms $\rightarrow$ Belgium (b) Chinese firms $\rightarrow$ Japan