Intermediate Inputs, Firm Size, and Import Content of Production

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Introduction

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- Trade in intermediate goods is big: 2/3 of all merchandise flows.
- 60% - 70% of production costs is on intermediate goods.
- We aim to quantify the role of costs attached to importing and exporting while explaining the relationship between firm size, intermediate input imports, and export behavior.

Main Preliminary Findings

- Costs attached to importing and exporting are sizeable and decisive in domestic value-added creation.

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  - Iceberg costs
  - Adaptation costs

About the Data

Combine two distinct datasets:

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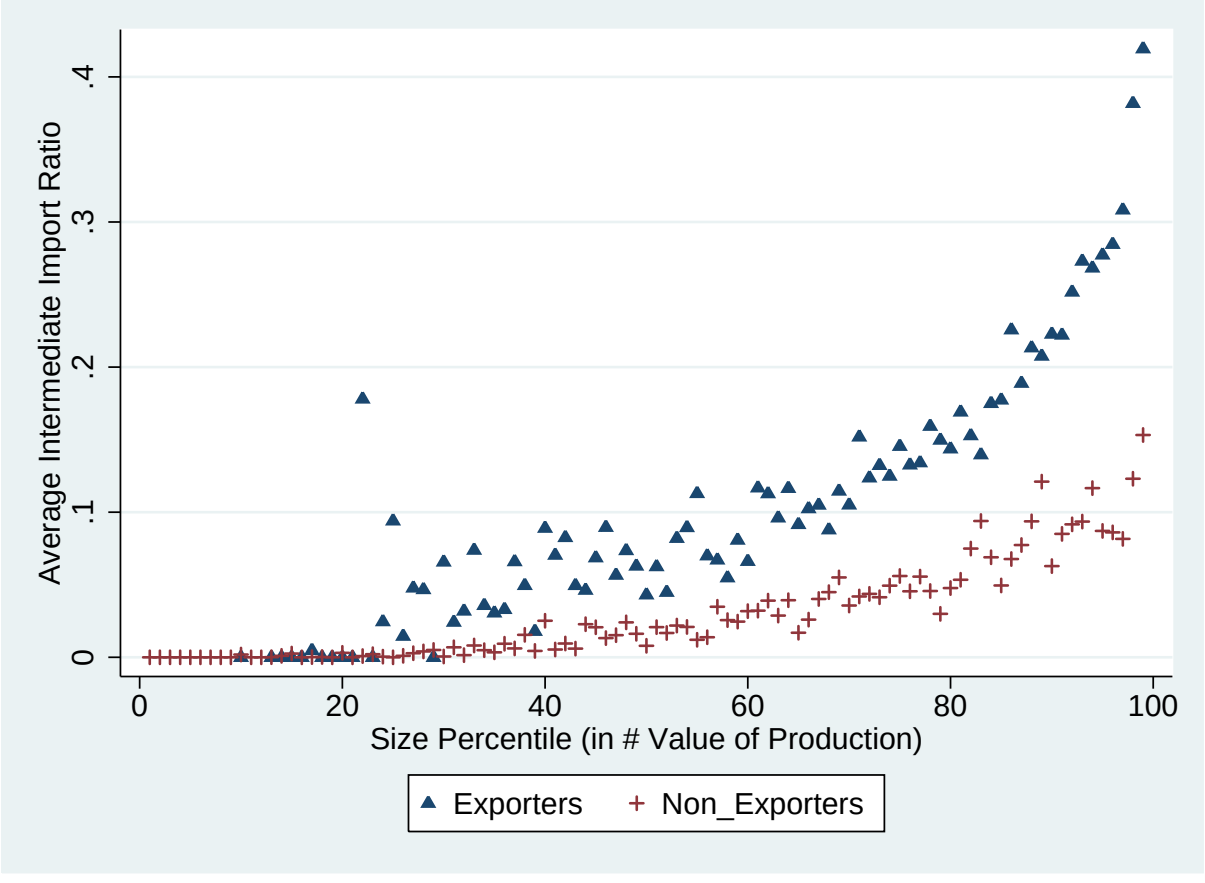
- Trade transactions of Turkish manufacturing firms (NACE 15-37) in 2008
- Industry Census of Turkish manufacturing firms in 2008

Some Regularities

Figure : Intermediate Import Ratio By Exporter Status



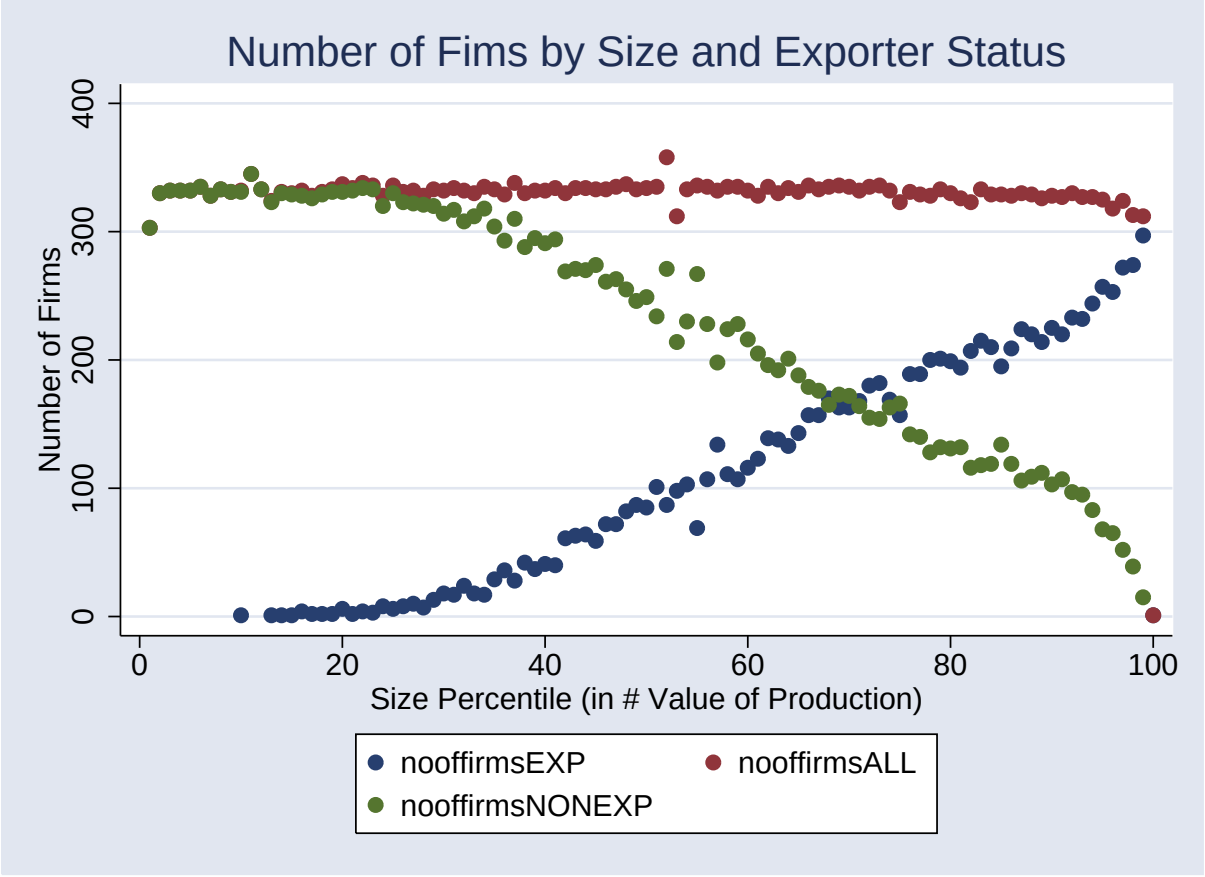


Figure : Number of Firms By Size and Exporter Status

Figure : Intermediate Import Ratio by Size (Within)

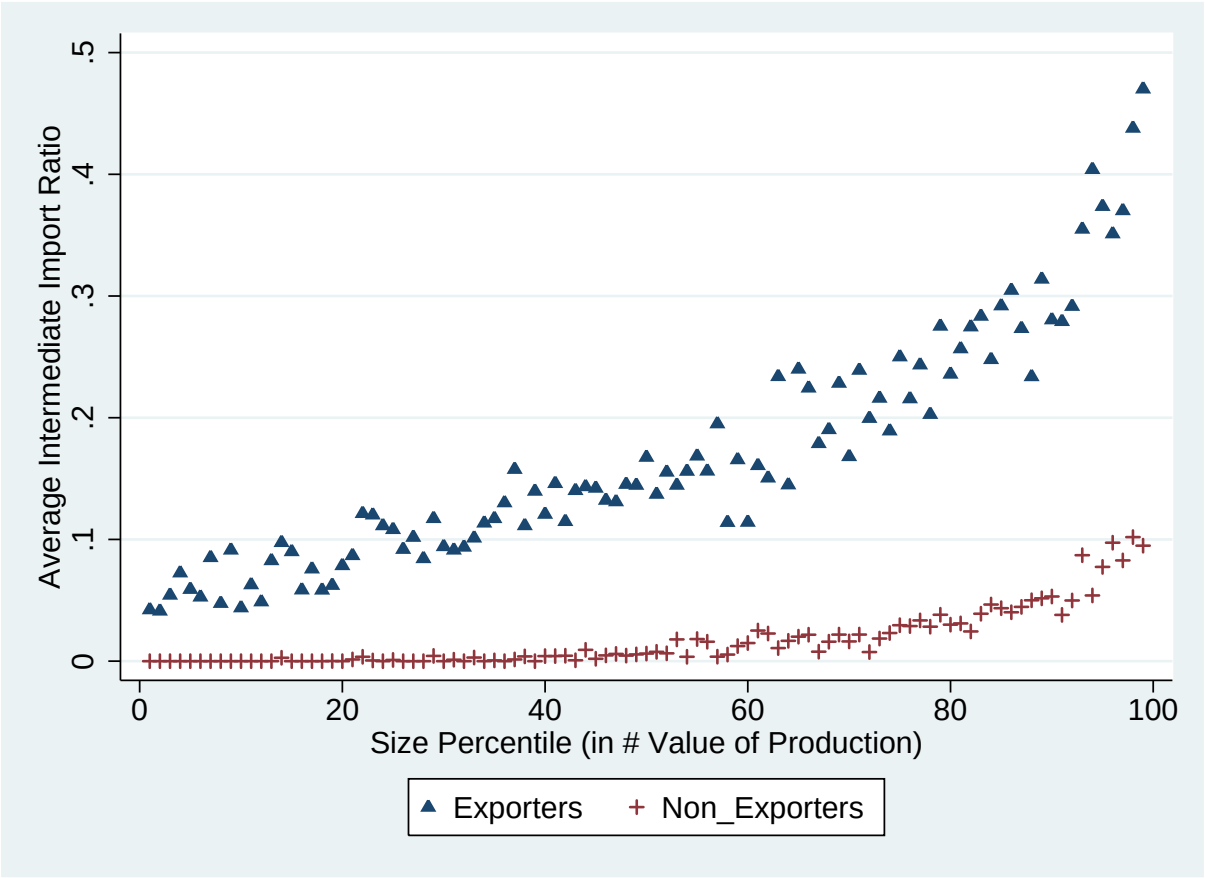


Figure : Number of Imported Varieties vs. Fraction of Firms

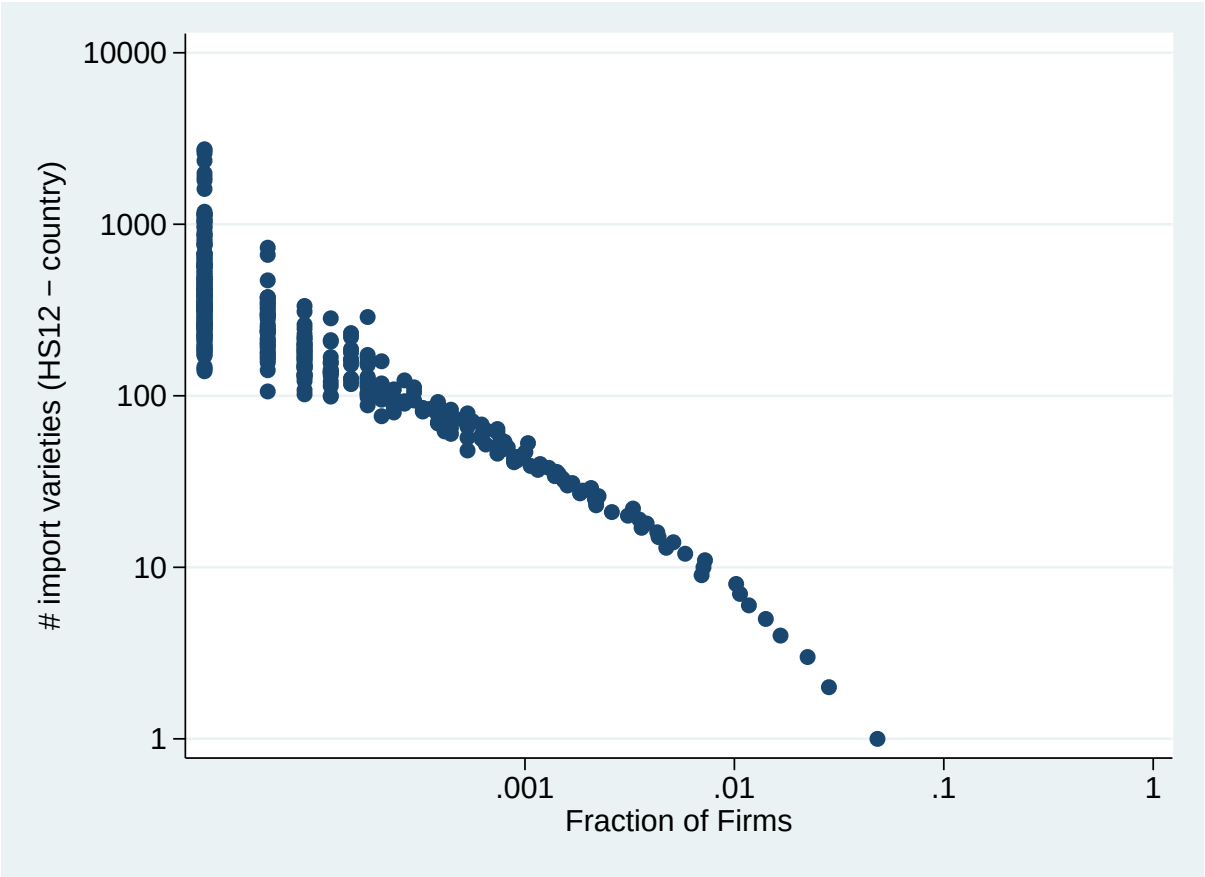


Figure : Number of Import Varieties by Size (Within)

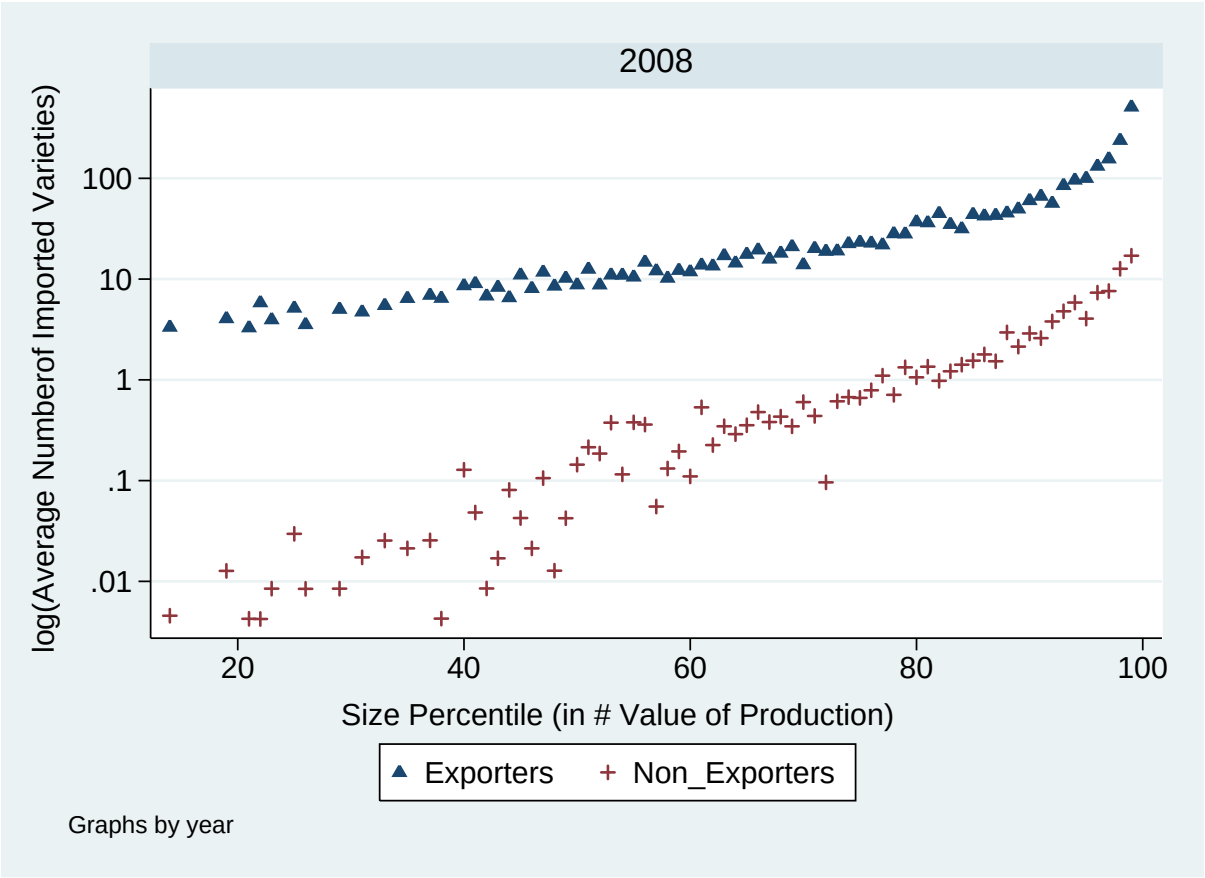
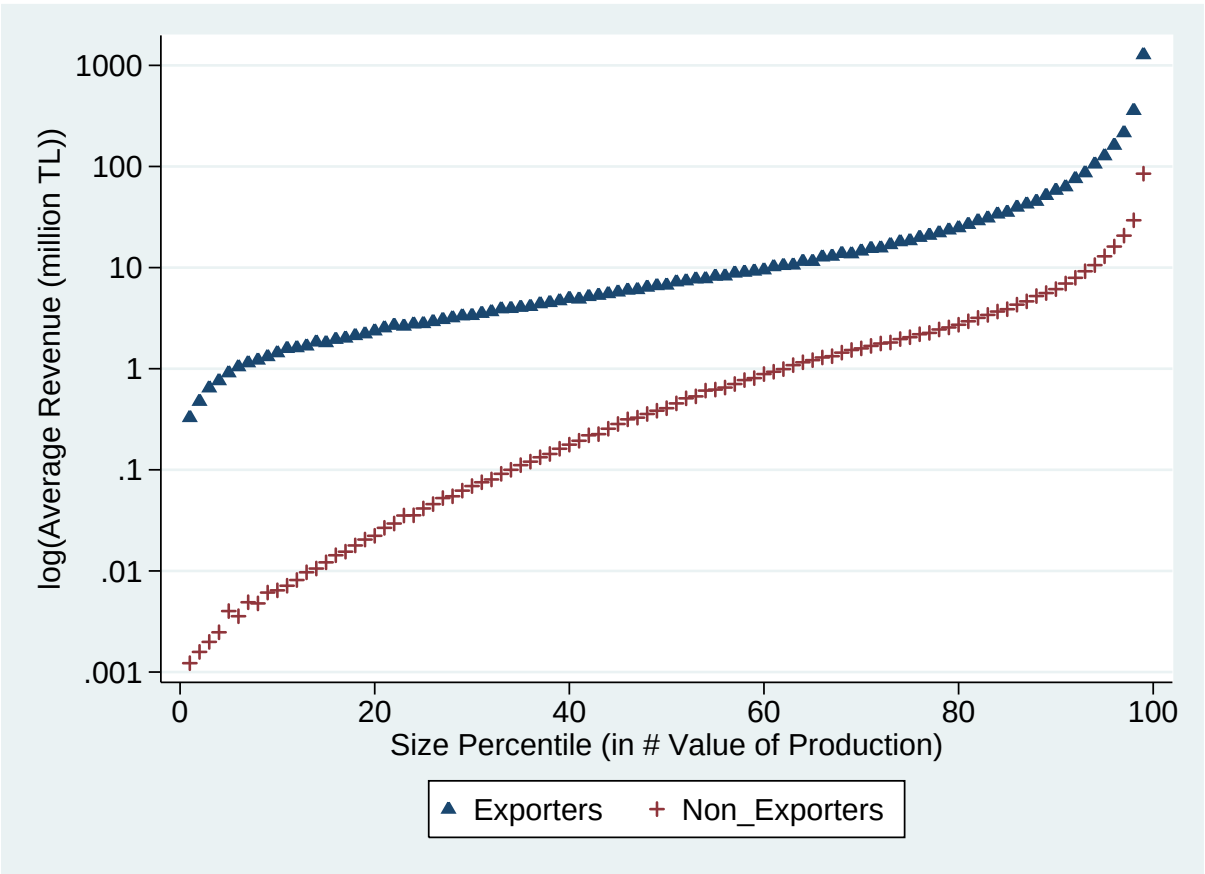


Figure : Revenue by Size (Within)



Previous Studies

- Imported intermediate goods and productivity
  Halpern, Koren, and Szeidl (2011), Kasahara and Rodrigue (2008), Gopinath and Neiman (2014)
- Joint analysis of import and export decisions
  Kasahara and Lapham (2012)
- New intermediate goods and product scope
  Goldberg et al. (2010)
- Motives for importing intermediate inputs
  Saygili et al. (2010)

Preliminaries

- Extend Gopinath and Neiman (2014) by adding exports market and demand shocks

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- Extend Gopinath and Neiman (2014) by adding exports market and demand shocks
- Two countries: home and foreign
- Continuum of monopolistic firms in both markets
- Production requires two types of input: labor L and a bundle of intermediate inputs X

$$Y_i = A_i (L_{p,i})^{1-\mu} X_i^{\mu}$$

Intermediate Goods

- Z_i and M_i are the bundles of domestic and imported intermediate inputs used by firm i, respectively.

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- where

$$Z_i = \left[\int z_{ij}^{\theta} dj\right]^{\frac{1}{\theta}}$$

$$M_i = \left[\int_{\Omega_i} (bm_{ik})^{\theta} dk\right]^{\frac{1}{\theta}}$$

$b \geq 1$ is the quality attached to imported inputs.

Sales and Fixed Costs of Importing and Exporting

- g_i is the domestic sales while g_i^* is the exports.

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- Three kinds of fixed costs: f_e, f_I, and f_v.

$$F(|\Omega_i|, g_i^*) = [f_I \mathbf{1}_{|\Omega_i| \neq 0} + f_v |\Omega_i|^{\lambda} + f_e \mathbf{1}_{|g_i^*| > 0}]$$

where $\lambda > 1$.

Input Prices

- $$P_{X_i} = \begin{cases} \left(P_Z^{\frac{\rho}{\rho-1}} + P_{M_i}^{\frac{\rho}{\rho-1}} \right)^{\frac{\rho-1}{\rho}} & \text{if firm } i \text{ imports} \\ P_Z & \text{if firm } i \text{ does not import} \end{cases}$$

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- $$\begin{aligned} P_{M_i} &= \left[\int_{k \in \Omega_i} \left(\frac{p_m}{b} \right)^{\frac{\theta}{\theta-1}} dk \right]^{\frac{\theta-1}{\theta}} \\ &= \frac{p_m}{b} |\Omega_i|^{\frac{\theta-1}{\theta}} \end{aligned}$$

where $0 < \theta < 1$.

Firm's Problem

- Unit cost of production for firm i is

$$C_i = \frac{1}{\mu^{\mu}(1-\mu)^{1-\mu}} \frac{w^{1-\mu} P_{X_i}^{\mu}}{A_i}.$$

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$$m_i = \begin{cases} \left(\frac{p_m}{P_{M_i}}\right)^{\frac{1}{\theta-1}} \left(\frac{P_{M_i}}{P_{X_i}}\right)^{\frac{1}{\rho-1}} X_i & \text{if firm } i \text{ imports} \\ 0 & \text{if firm } i \text{ does not import} \end{cases}$$

Firm's Problem Cont...

Firm i receives demand shock s_i in the foreign market.

- $$g_i^*(s_i, p_i) = \begin{cases} s_i p_i^{\frac{1}{\epsilon-1}} & \text{if firm } i \text{ exports} \\ 0 & \text{if firm } i \text{ does not export} \end{cases}$$

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- Firm has to decide about being an exporter and an importer, as well as, the number of varieties to import.

$$\Psi = \max_{\Omega_i, g_i, g_i^*} \{\Pi_i - wF(|\Omega_i|, g_i^*)\}$$

F.O.C.

- $$\frac{\partial \Psi}{\partial \Omega} = W(1-\varepsilon)(1+I(g^* > 0)s\tau^{\frac{\varepsilon}{\varepsilon-1}})\frac{\partial p(\Omega)^{\frac{\varepsilon}{\varepsilon-1}}}{\partial \Omega} - \lambda w f_\nu \Omega^{\lambda-1} = 0$$

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- $$\Longrightarrow \kappa \frac{\mu\varepsilon}{\varepsilon-1}\frac{\theta-1}{\theta}\left(\frac{p_m}{b}\right)^{\frac{\rho}{\rho-1}} P_X^{\frac{\mu\varepsilon}{\varepsilon-1}+\frac{\rho}{1-\rho}} = \lambda w f_\nu \Omega^{\lambda-\frac{\theta-1}{\theta}\frac{\rho}{\rho-1}}$$

where

$$\kappa = W(1-\varepsilon)(1+I(g^* > 0)s\tau^{\frac{\varepsilon}{\varepsilon-1}})\varepsilon^{\frac{\varepsilon}{1-\varepsilon}}\left(\frac{w^{1-\mu}}{A\mu^\mu(1-\mu)^{1-\mu}}\right)^{\frac{\varepsilon}{\varepsilon-1}}.$$

Some Discussions

- Relative expenditures on imported and domestic intermediate inputs

$$\frac{E_m}{E_Z} = \frac{(p_m)^{\frac{\rho}{\rho-1}}(b)^{\frac{1}{\theta-1}-\frac{1}{\rho-1}}}{(P_Z)^{\frac{\rho}{\rho-1}}}\Omega^{\frac{\theta-1}{\theta}\frac{\rho}{\rho-1}}$$

- Responses

$$\frac{\partial(E_m/E_Z)}{\partial\Omega} > 0, \frac{\partial(E_m/E_Z)}{\partial p_m} < 0, \frac{\partial(E_m/E_Z)}{\partial P_Z} > 0$$

Calibration

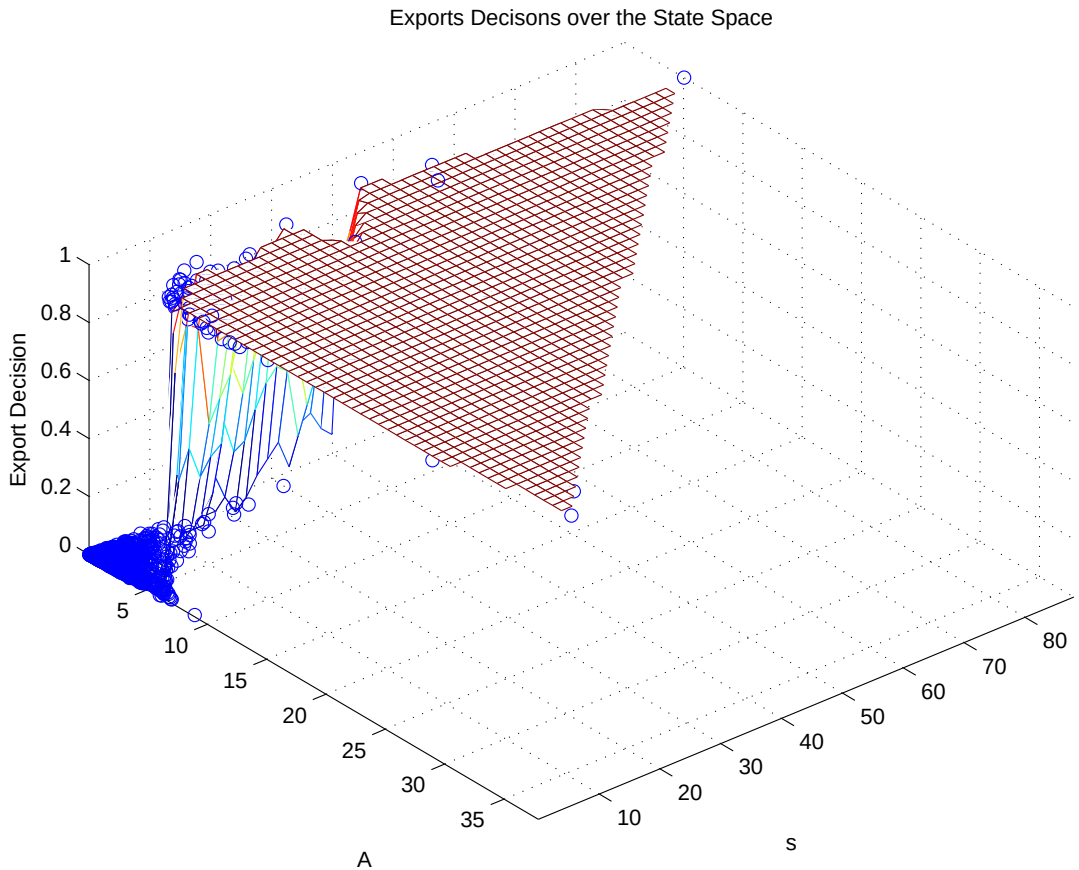
- Each firm is a tuple of shocks (A_i, s_i)
- Targeting moments from the data calibrate the vector of parameters Θ.

$$\Theta = \{\theta, \rho, b, \mu, \lambda, f_e, f_v, f_I, \tau, w, p_m, \sigma_s, corr, W, P_Z, \epsilon\}$$

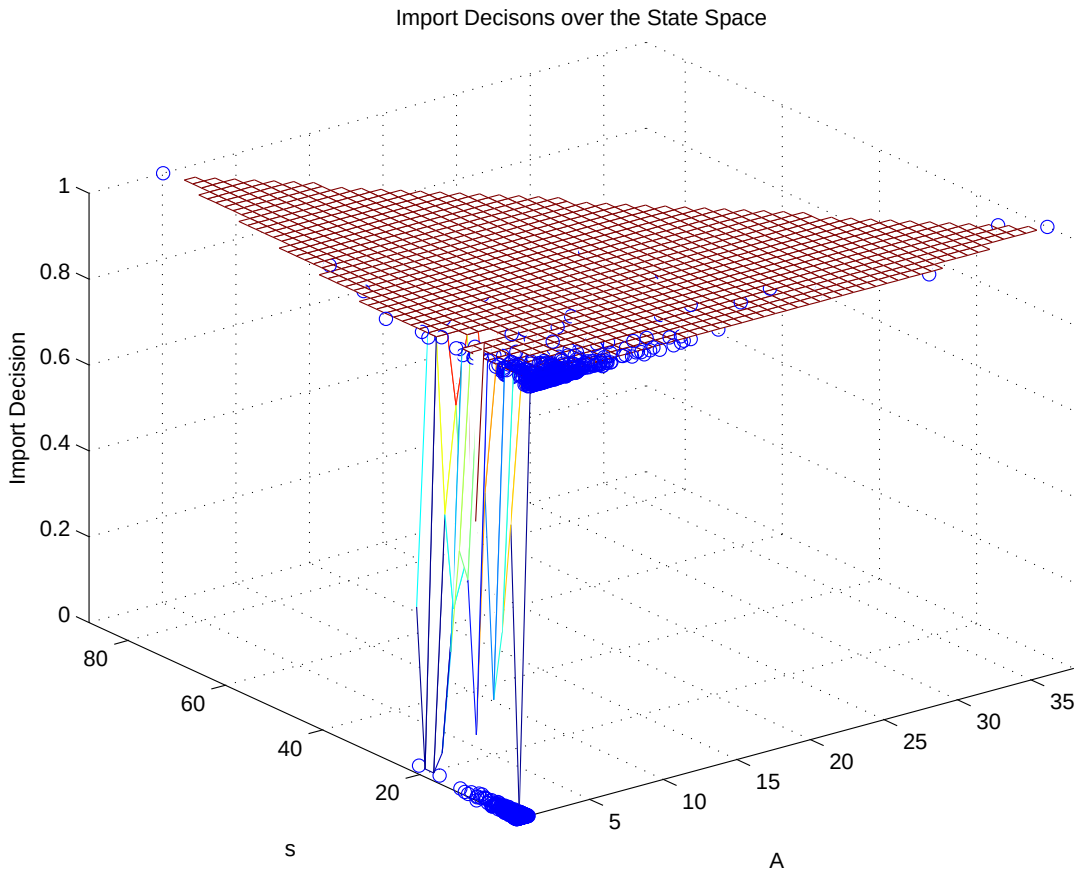
Simulation Parameters

Param.	Val.	Desc.
θ	0.67	elasticity of substitution within intermediate input groups
ρ	0.52	elasticity of substitution between intermediate input groups
b	2	quality attached to imported intermediate varieties
μ	2/3	cost share of intermediate inputs
λ	2.33	curvature of the convex adjustment cost
f_e	0.3	entry cost for the export market
f_v	0.0003	scale parameter for the adjustment cost
f_I	0.0001	entry cost for the import market
τ	1.2	iceberg cost
w	60	wage
p_m	20	unit price of imported intermediate varieties
σ	0.5	std. dev. for the demand shocks
$corr$	0.8	correlation between the demand and productivity shocks
W	1000	demand shifter
P_Z	2	price of the domestically produced intermediate inputs
ϵ	0.75	elasticity of substitution between intermediate input groups

Export Decisions



Import Decisions



Model Fit

Figure : Intermediate Import Ratios, Exporters

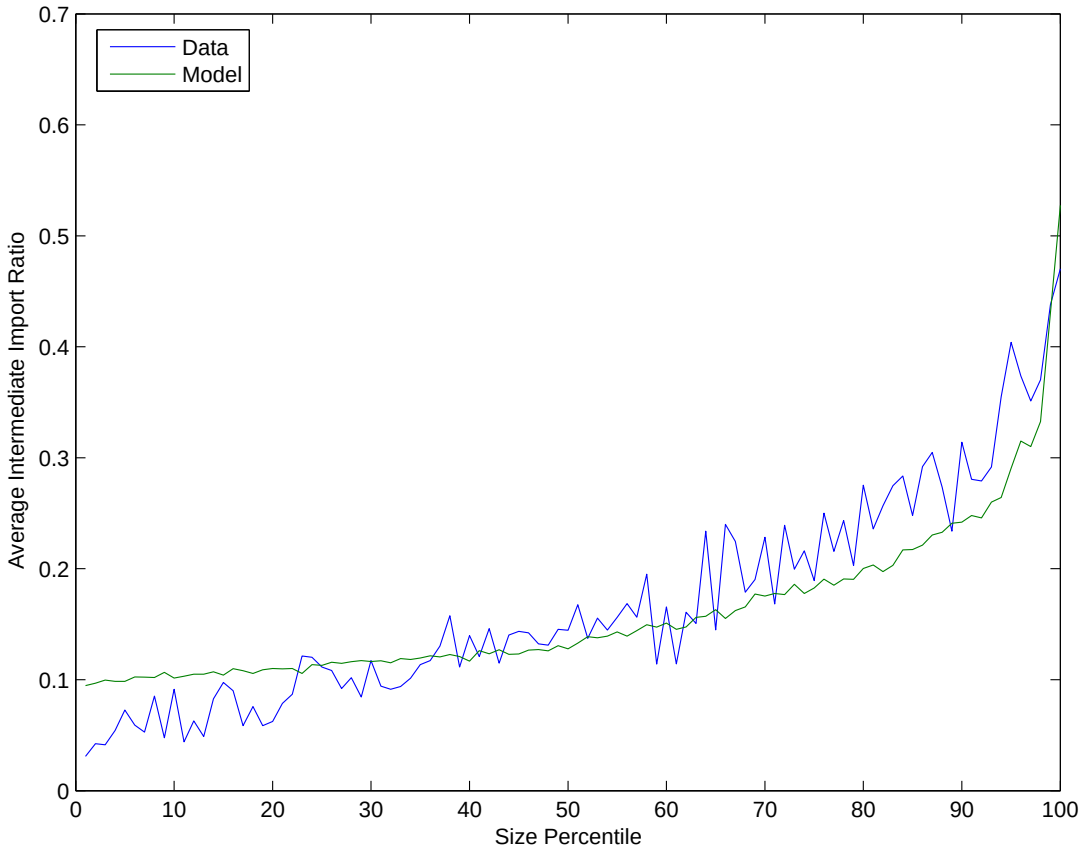


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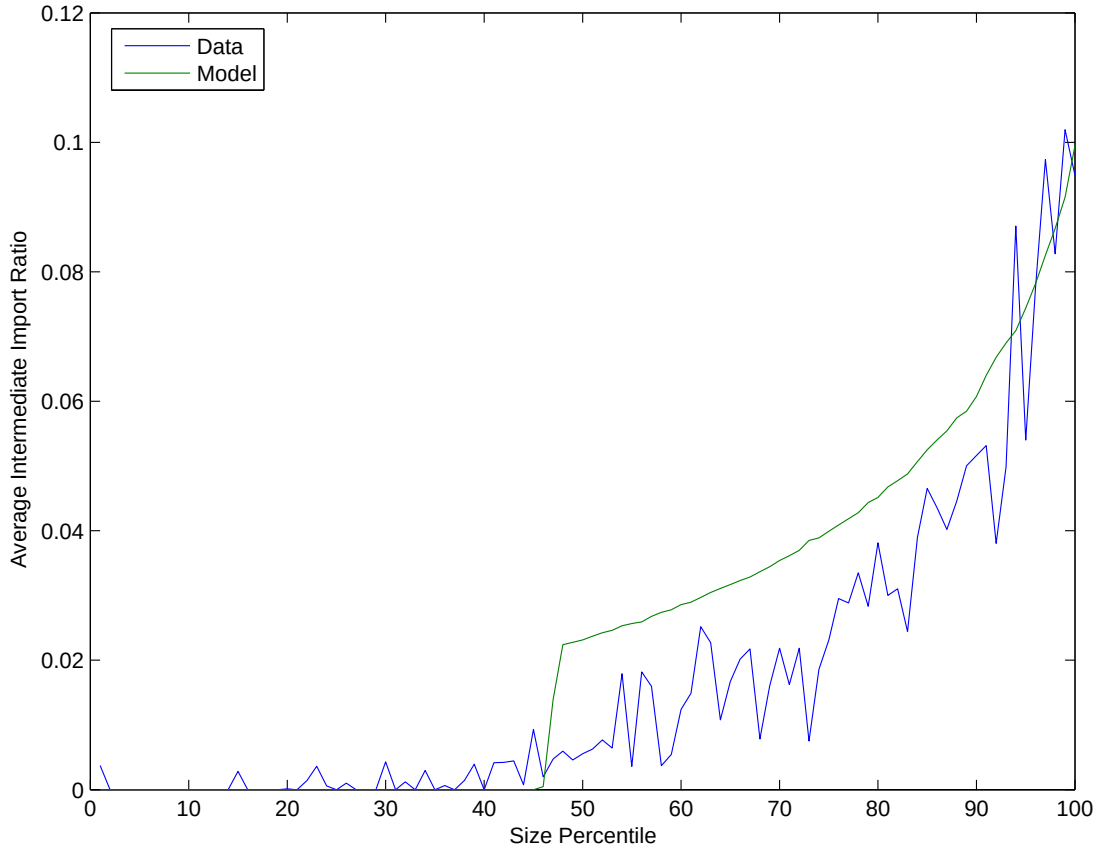
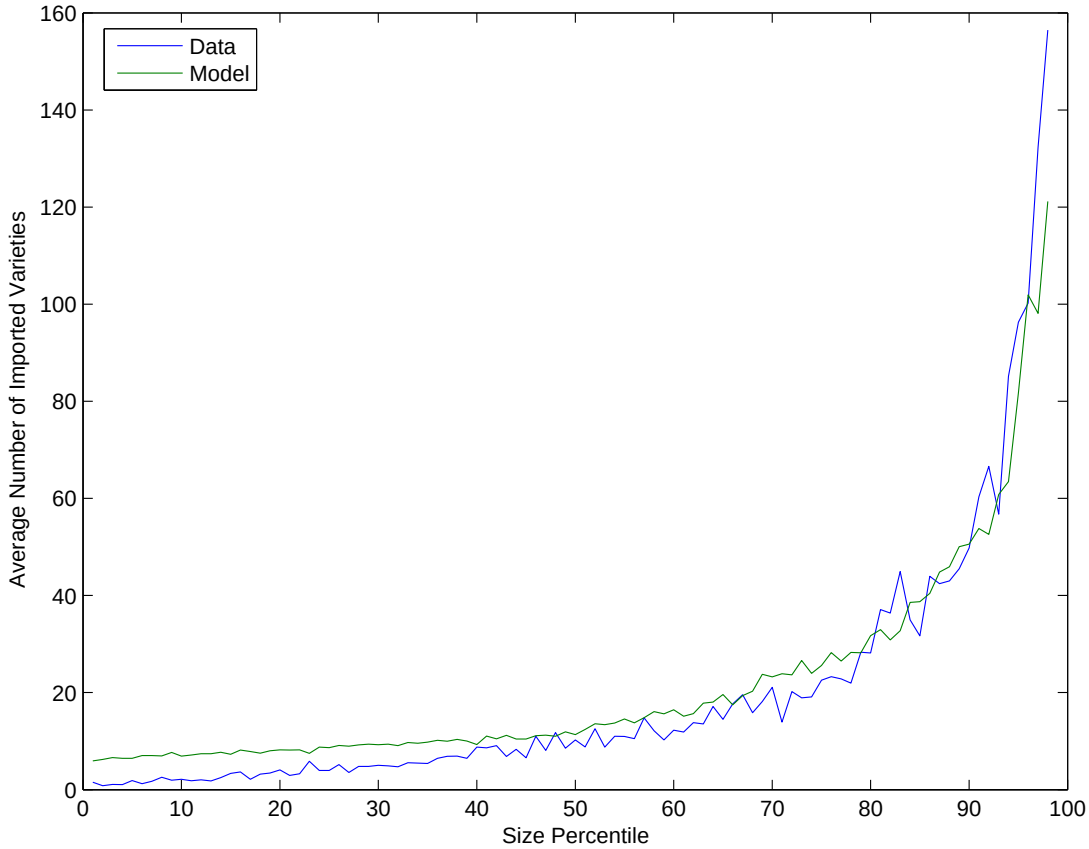
Figure : Intermediate Import Ratios, Non-Exporters



Model Fit

Figure : Average Number of Imported Varieties by Firm Size, Exporters



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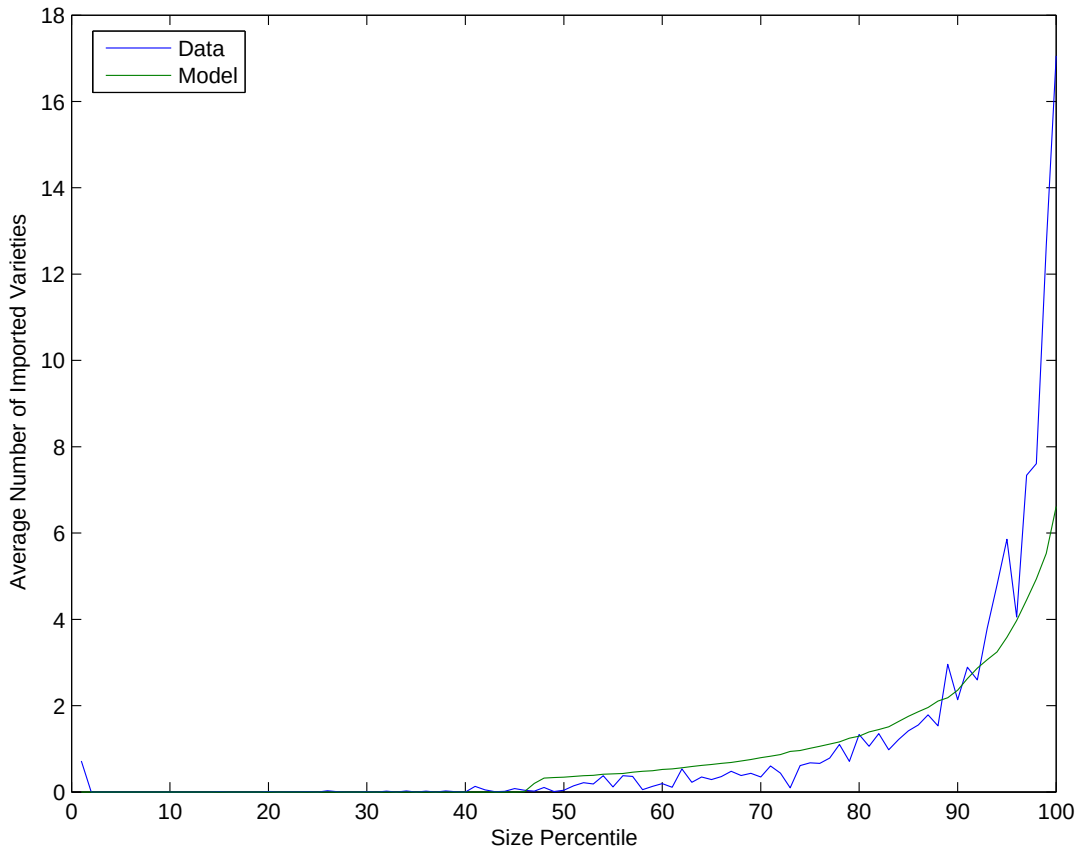

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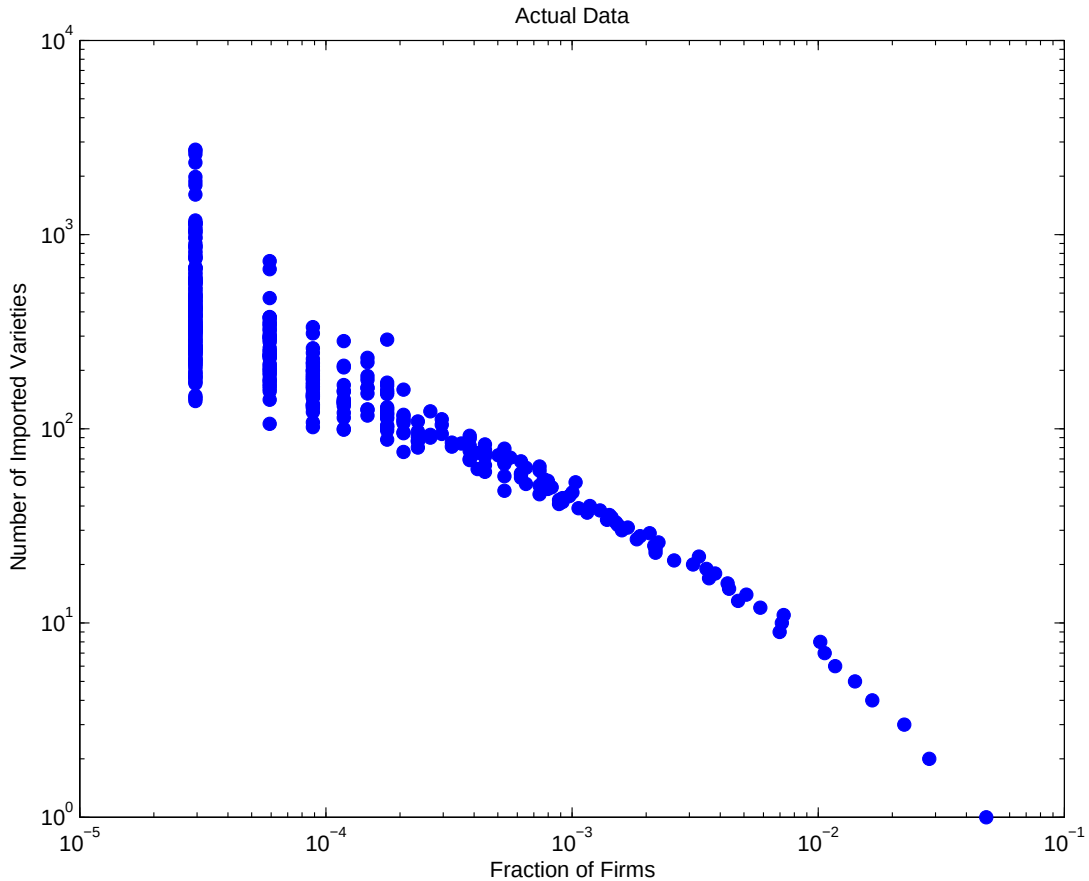
Figure : Number of Imported Varieties by the Fraction of Firms - Data



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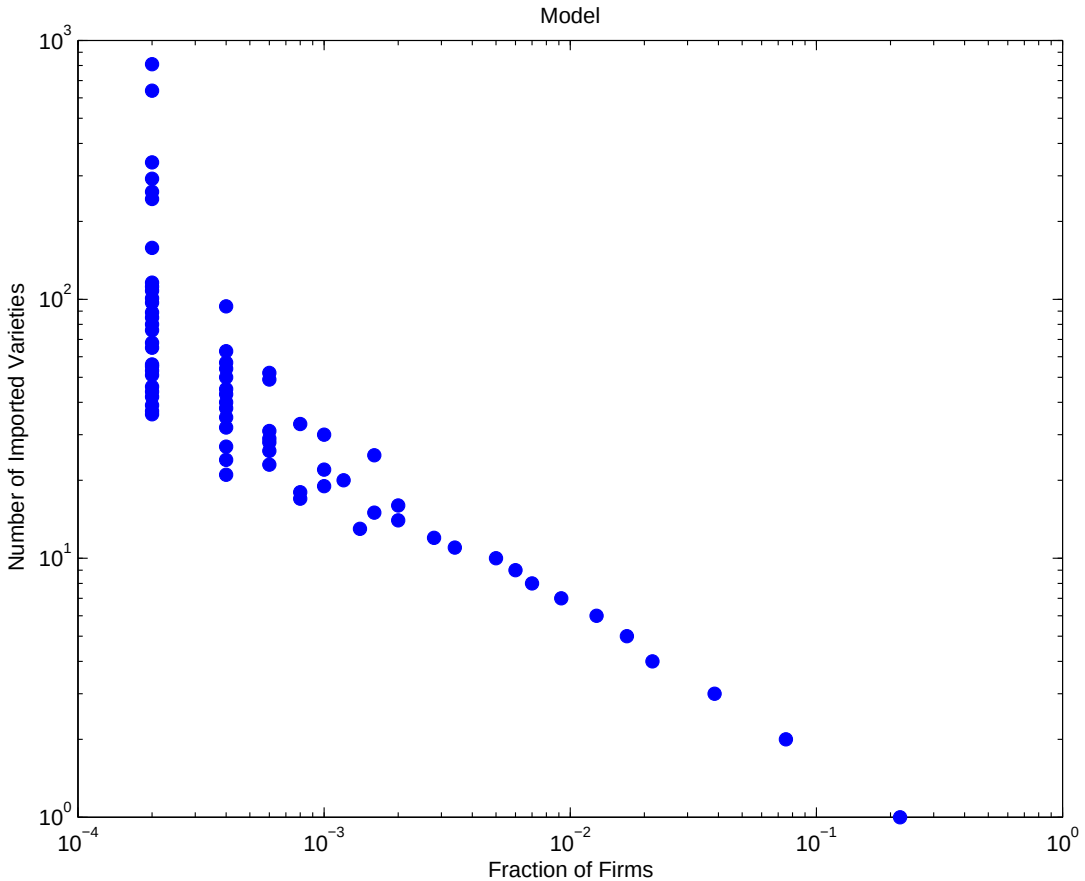
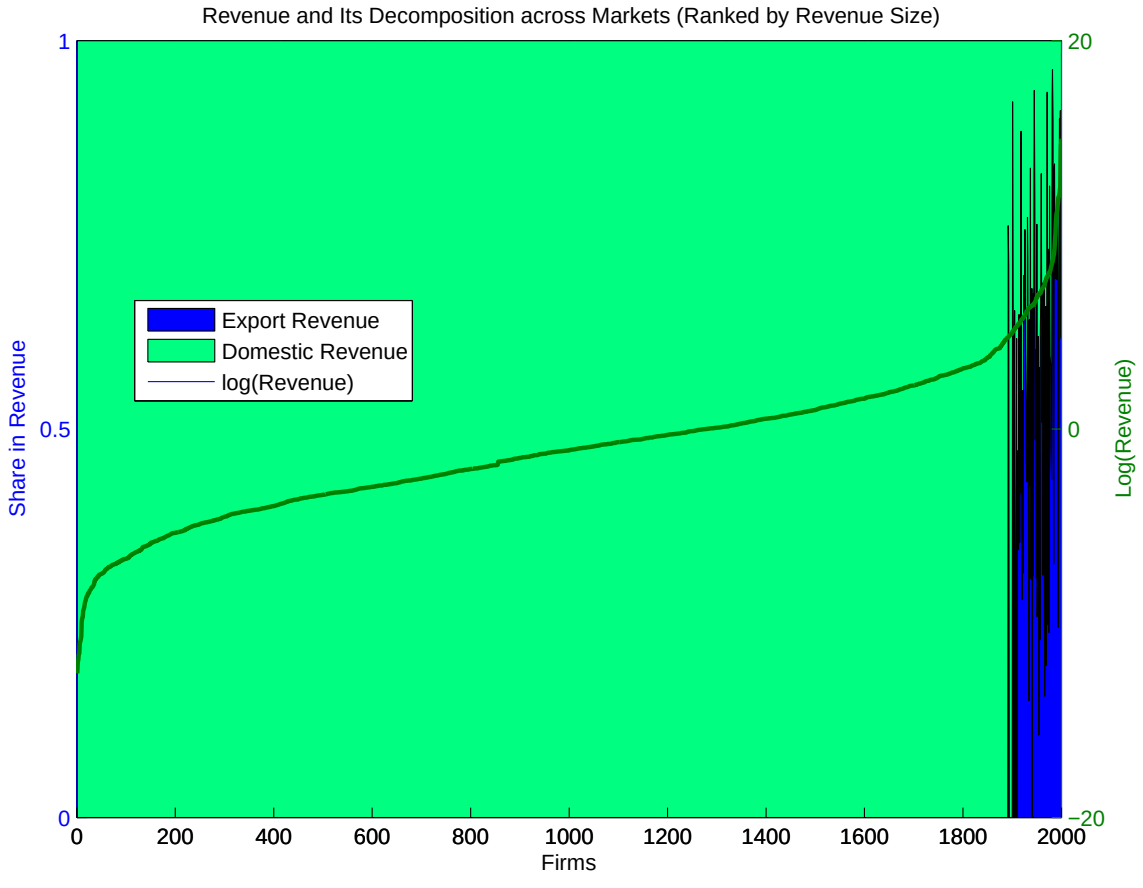
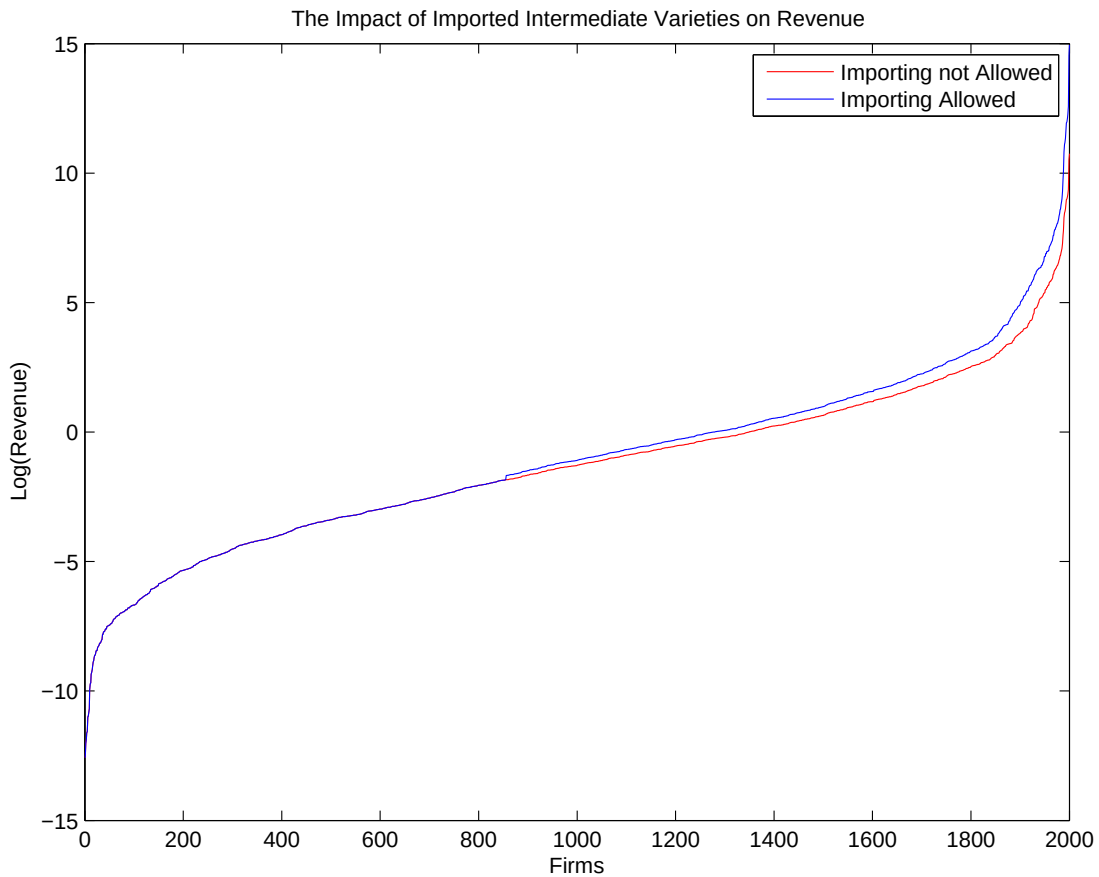


Revenue Decomposition



The Impact of Imported Intermediate Varieties on Revenue



How Sizeable are the Trade Costs?

Table : Sunk and Fixed Costs of Trade

tau	f_e	f_I	f_v	lambda	F_e/R	F_v/R	T/R
1.2	0.3	0.0001	0.0003	2.33	0.000175	0.1928	0.1452
1.08	0.3	0.0001	0.0003	2.33	0.007794	0.07472	0.0454
1.2	0.27	0.0001	0.0003	2.33	0.000164	0.1928	0.1452
1.2	0.3	0.00009	0.0003	2.33	0.000175	0.1928	0.1452
1.2	0.3	0.0001	0.00027	2.33	0.000163	0.19902	0.1452
1.2	0.3	0.0001	0.0003	2.1	0.007825	0.053921	0.14

Notes: This table shows the magnitudes of trade-related costs where $F_e = \sum_i \mathcal{I}(E_i = 1) w f_e$, $F_I = \sum_i \mathcal{I}(I_i = 1) w f_I$, $F_\upsilon = \sum_i \mathcal{I}(I_i = 1) w f_\upsilon |\Omega_i|^\lambda$, $T = \sum_i (\tau - 1) p_i g_i^*$, $R = \sum_i p_i Y_i$

Next Step and Further Research

- Counterfactual experiments regarding cost items f_e, f_I, f_v, τ and input prices
- Behavioral transitions of firms in response some cost alleviations
- Level effects of alleviating some fixed or sunk cost elements

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Further Research

- Getting closer to a general equilibrium analysis
- Studying the nature of the adjustment costs

Conclusion

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- Policy suggestions

Thank You.