Demand Learning, Customer Capital, and Exporter Dynamics

Nicholas Kozeniauskas* and Spencer Lyon

* Bank of Portugal & Católica Lisbon

Contact: nicjkoz.com, nicjkoz@gmail.com

Motivation and overview

- With increasing availability of micro data, we know a lot more about the dynamics of exporters than we used to. E.g. Information about initial size, growth rates, survival rates and price paths.
- Do these micro dynamics matter for the aggregate effects of trade?
- Methodology for answering this question
  1. Develop GE trade model with endogenous exporter dynamics
  2. Show that model quantitatively fits micro data on exporter dynamics well
  3. Assess impact of dynamics on aggregate effects of changes in trade costs
- Focus on demand side frictions as the source of dynamics due to evidence of their importance (Berman et al '14; Fitzgerald et al '17; Ruhl & Willis '17)

Model

- Foundation: 2 country dynamic Melitz model
  - CES demand and inelastic labor supply
  - Firm production: $y = z\ell$, z is AR(1)
  - Trade costs: fixed cost (γ_x) and iceberg cost (τ)
  - Entry and exit: entry cost to create a firm, and exogenous death shocks
- Extensions
  1. Advertising: a consumer doesn't know a firm until it advertises to her
  2. Demand learning: each firm has a demand distribution in each market—learning happens through sales
- Demand function
  - Consumers' problems $\Rightarrow$ demand for firm ω in market j at time t:

$$q_{jt}(\omega) = \frac{Y_{jt}}{P_{jt}}\left(\frac{P_{jt}}{p_{jt}(\omega)}\right)^{\frac{1}{1-\rho}} \sum_{i\in\mathcal{I}_{jt}(\omega)} \xi_{ijt}(\omega)$$

  - Standard CES demand function in black, new part in pink
  - $\mathcal{I}_{jt}(\omega)$: ω's set of customers. Captures fact that a firm can only sell to customers acquired through advertising.
  - $\xi_{ijt}(\omega)$: consumer i's demand shock
- Advertising: building the customer base $\mathcal{I}_{jt}(\omega)$.
  - $N_{jt}(\omega)$: # of customers in market j that know about ω at start of t
  - Cost of attracting I_{jt} new customers in period t in market j:

$$\Phi(I_{jt}) = a(I_{jt}-1)^{\eta}, \quad a>0, \eta>1.$$

    Convex cost because some customers are easier to attract than others.
  - Each period each customer is lost w.p. δ_N
- Demand Learning:
  - Demand for firm ω in market j: $\xi_{ijt}(\omega) \sim Exp(\lambda_j(\omega))$ with i.i.d. draws across customers and over time
  - Demand parameters drawn at birth: $\lambda_j(\omega) \sim \Gamma(\alpha_\lambda, \beta_\lambda)$, draws are i.i.d. across markets and firms
  - Firm ω learns about $\lambda_j(\omega)$ each period as follows:
    - Set price, $p_{jt}(\omega)$
    - Observe quanity, $q_{jt}(\omega)$, and back out demand, $\sum_{i\in\mathcal{I}_{jt}(\omega)} \xi_{ijt}(\omega)$
    - Update beliefs about demand: $(\alpha_{jt}, \beta_{jt}) \rightarrow (\alpha_{j,t+1}, \beta_{j,t+1})$
  - Learning has standard properties
    - Unexpectedly high (low) demand shocks $\rightarrow$ higher (lower) beliefs
    - Beliefs converge to the truth with enough observations

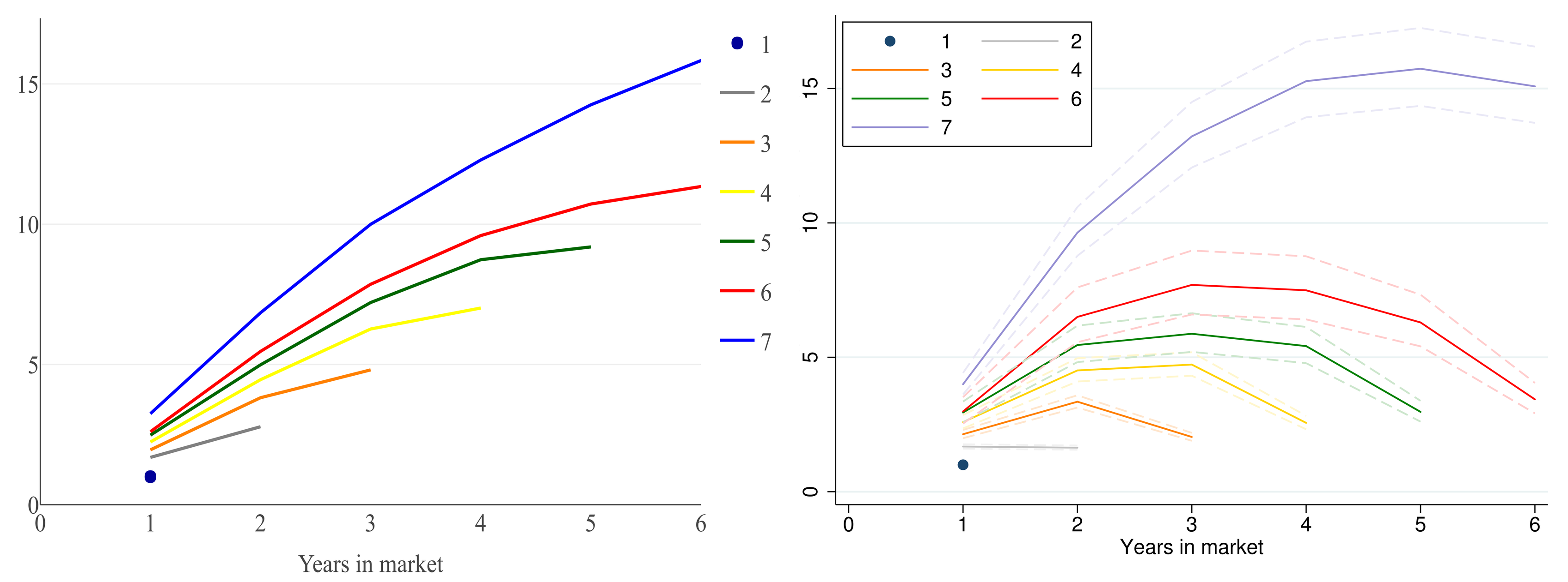
Calibration

- Model calibrated to data on US manufacturing establishments
- 14 parameters, 6 calibrated internally
- Internal calibration: uses only 2 dynamic moments—other dynamic moments are left untargeted as tests of the model

Parameter	Value	Moment	Model	Data
σ_z	0.1	Coefficient of variation of firm size	4.42	4.5
a	0.5	Marketing costs/GDP	7.7%	6.6%
η	1.05	Share of employment at firms in 1st year	1.8%	2.6%
β_λ	1.8	1st year exit rate of exporters	38.6%	37%
γ_x	0.07	Share of firms that export	20.5%	22.3%
τ	0.37	Foreign/total sales of exporters	14.0%	13%

Export quantity by export spell length

- Firms grow slowly because:
  1. Convexity of customer acquisition cost $\Rightarrow$ cheaper to smooth over time
  2. Exporters increase customer base as they learn about demand
- Exporter growth paths are similar to the data (see figure below).
- Quantity in year 1 is correlated with spell length because firms with high demand sell more initially, are more profitable, and export for longer

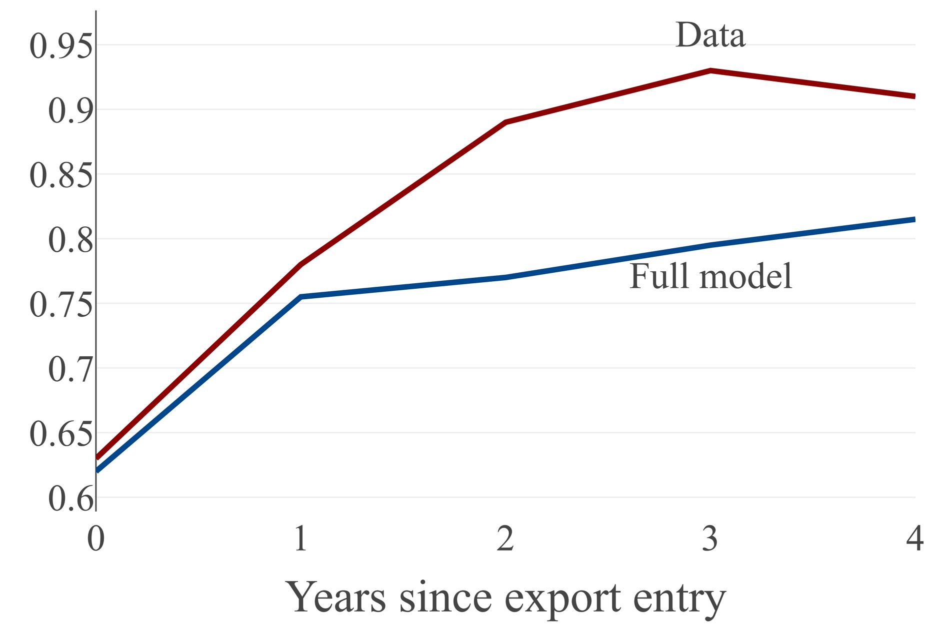


(a) Model (b) Data (Fitzgerald et al '17)

Notes: Each line represents the average export quantity for export spells of a given length. All quantities are relative to the average quantity of firms that only export for one year (the blue dot). Supply side factors are controlled for following Fitzgerald et al '17.

Exporter survival rate

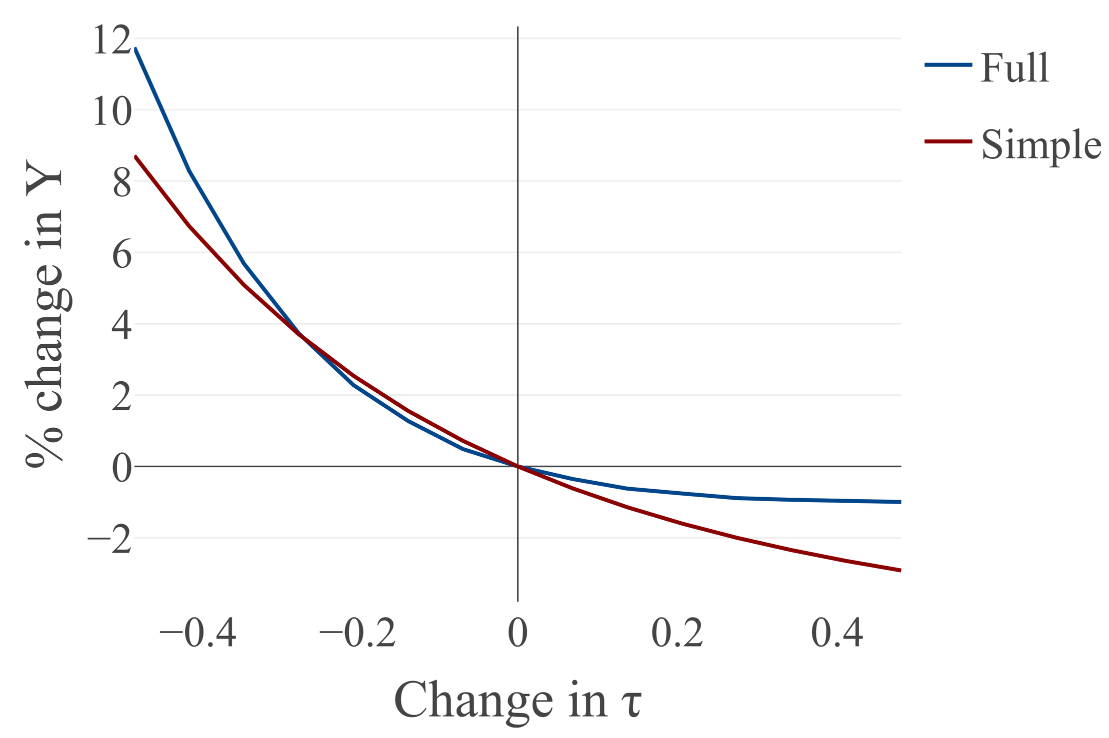
- Exporter survival rate is increasing in export spell length
- Reason: Lower demand exporters slowly exit, more profitable ones remain
- Model generates 2/3 of increase that is in data.



Notes: Vertical scale is the one year survival rate. Data from Ruhl & Willis '17.

Aggregate effects of exporter dynamics

- Experiment: Compare effects of changing iceberg cost (τ) across steady states in full model and a simplified model in which firms know their demand and all customers know all firms
- Result: a more open economy is more sensitive to τ, and a less open economy is less sensitive when exporter dynamics are factored in
- Gains from full liberalization are 30% larger with exporter dynamics; losses from doubling iceberg costs are 60% smaller



References

Berman et al, 2019, Demand learning and firm dynamics: Evidence from exporters, *Review of Economics and Statistics*, 101(1): 91–106.

Fitzgerald et al, 2017, How exporters grow, Working paper.

Ruhl and Willis, 2017, New exporter dynamics, *Internat. Econ. Review*, 58(3): 703–725.