Export Market Penetration Dynamics

Joseph B. Steinberg

University of Toronto

March 2, 2019

Introduction

Two strands of trade literature emphasize different facts, models:

1. Cross-sectional facts, static models
2. Life-cycle facts, dynamic models

This paper: synthesize two strands using theory, microdata, and quantitative analysis

- Theory of exporter distribution and dynamics that generalizes both sets of models
- Document new facts about systematic variation in exporter dynamics across destinations
- Calibrated model accounts for both sets of facts, yields new insights about exporting costs and trade adjustment dynamics

Cross-sectional facts, static models

Key facts:

- Exporting dominated by large, multi-destination firms
- Easier destinations: more exporters, but more concentrated exports
- Least traded products respond most to trade policy changes

Arkolakis (2010): theory of endogenous market penetration costs

- Reaching foreign customers increasingly costly $\Rightarrow$ exports concentrated among high-productivity firms
- Easier to reach customers in larger markets $\Rightarrow$ more small, unproductive exporters in larger markets

This paper:

- "Dynamicizes" Arkolakis (2010) framework
- Mechanism accounts for life-cycle facts as well

Life-cycle facts, dynamic models

Key facts:

- New exporters sell less than incumbents, more likely to exit
- Aggregate trade flows adjust slowly to price/policy changes

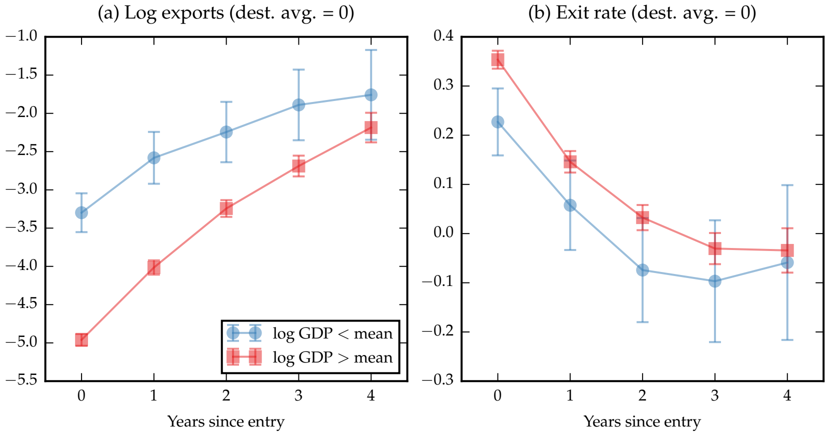
Sunk-cost models of exporter dynamics (Das et al., 2007; Alessandria and Choi, 2007, 2014; Ruhl and Willis, 2017)

- Cost of exporting depends on current status as exporter
- Exogenous shocks to demand/exporting costs needed to generate new exporter dynamics

This paper:

- New exporters smaller, more likely to exit in easier destinations; exporters more likely to exit from less important destinations
- Theory of endogenous exporting costs that vary across firms and over life cycle

Life-cycle dynamics of Mexican exporters across destinations



Note: Blue circles (red squares) show coefficients and 95% confidence intervals estimated using data for destinations with log GDP below (above) the mean. Regression specification includes industry and year fixed effects.

$$y_{j,d,t} = \sum_{a=0}^{4} \beta_a \mathbb{1}_{\{\text{tenure}_{j,d,t}=a\}} + \epsilon_{i,d,t} + f_t + f_i$$

Dynamics of multi-destination Mexican exporters

	Destination rank									
Num. dest.	1	2	3	4	5	6	7	8	9	10+
1	0.50	-	-	-	-	-	-	-	-	-
2	0.35	0.60	-	-	-	-	-	-	-	-
3	0.26	0.47	0.61	-	-	-	-	-	-	-
4	0.20	0.37	0.50	0.59	-	-	-	-	-	-
5	0.15	0.32	0.40	0.49	0.59	-	-	-	-	-
6	0.13	0.26	0.35	0.40	0.51	0.57	-	-	-	-
7	0.10	0.21	0.27	0.36	0.41	0.52	0.59	-	-	-
8	0.10	0.18	0.22	0.32	0.38	0.41	0.49	0.61	-	-
9	0.09	0.16	0.21	0.24	0.30	0.33	0.45	0.47	0.60	-
10+	0.05	0.08	0.11	0.13	0.17	0.18	0.21	0.24	0.28	0.32

Group exporters by number of destinations served, and rank each each exporters destinations by sales

Exporters more likely to exit from less important destinations

Exporters that serve 10+ destinations less likely to exit from least important destination than one-destination exporters

Preview of mechanism

Export participation in trade models driven by exporting cost, κ

Static models:

- Melitz (2003): fixed cost $\kappa > 0$
- Arkolakis (2010): pay $\kappa(n)$ to reach $n \leq 1$ customers, $\kappa'' > 0$

Dynamic models: pay $\kappa(s)$, current exporter status $s \in \{0, 1\}$

- Entry cost, $\kappa(0) >$ continuation cost, $\kappa(1)$
- Idiosyncratic shocks to κ

This paper: pay $\kappa(n', n)$ to reach n' customers tomorrow given n customers today

- $\kappa_{1,2} < 0$: harder to reach new customers with few (or none) today
- Exit rate ↓ in n: survival rate increases as firm builds n over time

Model

Model: overview

Importing countries indexed by $j = 1, \ldots, J$ with three traits:

- Population, L_j
- GDP per capita, Y_j
- Trade barrier, τ_j

Exporting country populated by unit measure of firms

- Produce differentiated varieties a là Melitz
- Heterogeneous in productivity and foreign customer bases
- Advertise to attract new customers and improve chance of survival

Partial equilibrium (Arkolakis, 2010; Ruhl and Willis, 2017)

- Small open economy: exogenous importing-country aggregates
- Small export sector: exogenous exporting-country wage

Model: export demand

Market j's demand for a firm's product depends on

- Price, p
- Customer base, $n \in [0,1]$

Conditional on purchasing firm's product, invididual consumer's demand takes standard form: $c_j(p) = L_j Y_j p^{-\theta}$

- θ: elasticity of substitution between varieties
- Aggregate importing-country prices normalized to one

Total demand in market j: $y_j(p) = nc_j(p) = nL_j Y_j p^{-\theta}$

Demand framework straight from Arkolakis (2010)

Model: production and pricing

Firms use labor to produce according to CRS technology

- Productivity z drawn from $F(z)$, constant over firm's life
- CRS implies profit-maximization problem separable across markets

Given productivity and customer base in market j, firm's static problem is to choose price for that market to maximize profits:

$$\pi_j(z,n) = \max_p \left\{ p y_j(n,p) - W \frac{\tau_j y_j(n,p)}{z} \right\}$$

Optimal price given by standard constant-markup solution:

$$p_j(z) = \frac{\theta}{\theta - 1} \frac{\tau_j W}{z}$$

Profits from selling to market j given by

$$\pi_j(z,n) = \left(\frac{1}{\theta} \frac{\theta}{\theta - 1} \right) n L_j Y_j (W \tau_j)^{1-\theta} z^{\theta - 1} = \tilde{\pi}_j n z^{\theta - 1}$$

Model: market penetration dynamics

Dynamics of a firm's customer base in market j depend on

- Level of advertising, a
- Current customer base, n

Assumptions:

- Customers and non-customers see ads with same probability $q_j(a)$
- Customers who see ads retained with probability one
- Non-customers who see ads become customers with probability ω
- Customers who don't see ads lost with probability δ

Law of motion for market penetration:

$$n' = \underbrace{\omega q_j(a)(1-n)}_{\text{new customers}} \quad + \quad \underbrace{q_j(a)n + (1-q_j(a))(1-\delta)n}_{\text{retained customers}}$$

Model: market penetration dynamics, continued

Arkolakis (2010): probability consumers see firm's ads given by

$$q_j(a) = 1 - \left[1 - (1-\beta) L_j^{-\alpha} \psi a\right]^{\frac{1}{1-\beta}}$$

- $\alpha < 0$: returns to scale in advertising w.r.t. market size
- $\beta > 0$: diminishing returns to advertising
- ψ: labor requirement of one unit of advertising

Law of motion becomes

$$n' = \left\{1 - \left[1 - (1-\beta) L_j^{-\alpha} \psi a\right]^{\frac{1}{1-\beta}}\right\} [\omega + n(\delta - \omega) + (1-\delta) n]$$

Invert to yield labor cost of increasing customer base from n to n':

$$\kappa(n', n; L_j) = \frac{L_j^{\alpha}}{(1-\beta)\psi} \left\{1 - \left[\frac{\omega + n(1-\omega) - n'}{\omega + n(\delta - \omega)}\right]\right\}^{1-\beta}$$

Model: entry and exit

Entrants defined as firms with $n = 0$ that choose $n' > 0$

Incumbents (firms with $n > 0$) survive with probability

$$\xi(n) = 1 - e^{-\lambda n}$$

- λ governs sensitivity of survival probability to market penetration
- Exiting firms start from scratch as potential entrants with $n = 0$

Exit shocks independent across markets

- Firm can exit from one market and continue in another
- Joint distribution of productivity and market penetration evolves independently in each market
- Bilateral exit rates higher than multilateral exit rate

Model: dynamic program and stationary distribution

Timing:

1. Given productivity z and customer base n, earn profits $\pi_j(z,n)$
2. Exit with probability $\xi(n)$
3. Choose n' and pay $\kappa(n',n;L_j)$

Policy function, $n'_j(z,n)$ solves end-of-period Bellman equation:

$$V_j(z,n) = \max_{n'} \Big\{ Q\pi(z,n') - W\kappa(n',n;L_j) + Q\left[\xi(n')V_j(z,n') + (1-\xi(n'))V_j(z,0)\right] \Big\}$$

Stationary market penetration distribution, $H(z,n)$, satisfies

$$H_j(z,\mathcal{N}) = \int_{[0,1]} \left[\xi(n)\mathbb{1}_{\{n'_j(z,n)\in\mathcal{N}\}} + (1-\xi(n))\mathbb{1}_{\{0\in\mathcal{N}\}} \right] \mathrm{d}H_j(z,n)$$

Model: characterization

First-order condition holds with equality if firm advertises:

$$\overbrace{W\kappa_1(n', n; L_j)}^{\text{marginal cost}} \geq \overbrace{Q\tilde{\pi}_j z^{\theta-1}}^{\text{marginal profit}} - \underbrace{Q\xi(n')\kappa_2(n'', n'; L_j)}_{\text{gain from} \downarrow \text{future cost}} + \underbrace{Q\xi'(n')\left[V_j(z, n'') - V_j(z, 0)\right]}_{\text{gain from} \uparrow \text{survival prob.}}$$

Marginal entrant: firm with productivity $\underline{z}$ such that marginal benefit from first customer equals marginal cost:

$$\frac{W\kappa_1(0,0;L_j)}{L_j} = \frac{WL_j^{\alpha-1}}{\psi} = \frac{Q\tilde{\pi}_j \underline{z}^{\theta-1}}{L_j}$$

- Exactly the same expression as in static Arkolakis (2010) model!
- Extensive margin determined by α, ψ, θ, productivity dispersion, and destination characteristics

Model: key properties

Model's ability to capture cross-sectional and life-cycle facts hinges on five key properties that hold when $\beta > 1$ and $\delta < 1$:

1. $\kappa_1(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
2. $\kappa_{11}(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
3. $\lim_{n' \to [\omega + n(1-\omega)]} \kappa_1(n', n) = \infty$ for all $n \in [0, 1]$
4. $\kappa_{12}(n', n; L_j) < 0$ for all $n', n \in [0, 1]$
5. $\xi'(n) > 0$ for all $n \in [0, 1]$

Model: key properties

Model's ability to capture cross-sectional and life-cycle facts hinges on five key properties that hold when $\beta > 1$ and $\delta < 1$:

1. $\kappa_1(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
2. $\kappa_{11}(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
3. $\lim_{n' \to [\omega + n(1-\omega)]} \kappa_1(n', n) = \infty$ for all $n \in [0, 1]$
4. $\kappa_{12}(n', n; L_j) < 0$ for all $n', n \in [0, 1]$
5. $\xi'(n) > 0$ for all $n \in [0, 1]$

Property 1: strictly positive marginal cost of reaching new customers, including cost of very first customer, $\kappa_1(0, 0; L_j)$

Implies firms with low productivities will not enter at all

Model: key properties

Model's ability to capture cross-sectional and life-cycle facts hinges on five key properties that hold when $\beta > 1$ and $\delta < 1$:

1. $\kappa_1(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
2. $\kappa_{11}(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
3. $\lim_{n' \to [\omega + n(1-\omega)]} \kappa_1(n', n) = \infty$ for all $n \in [0, 1]$
4. $\kappa_{12}(n', n; L_j) < 0$ for all $n', n \in [0, 1]$
5. $\xi'(n) > 0$ for all $n \in [0, 1]$

Property 2: increasing marginal cost of reaching new customers

Implies that, conditional on current customer base,
high-productivity firms will reach more customers in future

Model: key properties

Model's ability to capture cross-sectional and life-cycle facts hinges on five key properties that hold when $\beta > 1$ and $\delta < 1$:

1. $\kappa_1(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
2. $\kappa_{11}(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
3. $\lim_{n' \to [\omega + n(1-\omega)]} \kappa_1(n', n) = \infty$ for all $n \in [0, 1]$
4. $\kappa_{12}(n', n; L_j) < 0$ for all $n', n \in [0, 1]$
5. $\xi'(n) > 0$ for all $n \in [0, 1]$

Property 3: marginal cost of reaching new customers diverges

Implies that firms cannot fully saturate market even in long run

Model: key properties

Model's ability to capture cross-sectional and life-cycle facts hinges on five key properties that hold when $\beta > 1$ and $\delta < 1$:

1. $\kappa_1(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
2. $\kappa_{11}(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
3. $\lim_{n' \to [\omega + n(1-\omega)]} \kappa_1(n', n) = \infty$ for all $n \in [0, 1]$
4. $\kappa_{12}(n', n; L_j) < 0$ for all $n', n \in [0, 1]$
5. $\xi'(n) > 0$ for all $n \in [0, 1]$

Property 4: marginal cost of reaching new customers decreasing in current customer base

Implies that firms gradually accumulate customers over time

Model: key properties

Model's ability to capture cross-sectional and life-cycle facts hinges on five key properties that hold when $\beta > 1$ and $\delta < 1$:

1. $\kappa_1(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
2. $\kappa_{11}(n', n; L_j) > 0$ for all $n', n \in [0, 1]$
3. $\lim_{n' \to [\omega + n(1-\omega)]} \kappa_1(n', n) = \infty$ for all $n \in [0, 1]$
4. $\kappa_{12}(n', n; L_j) < 0$ for all $n', n \in [0, 1]$
5. $\xi'(n) > 0$ for all $n \in [0, 1]$

Property 5: survival probability increasing in customer base

Implies that firms with low productivities and short tenures (esp. entrants) more likely to exit

Model: special cases

Theory nests other export participation models as special cases

Two parameterizations equivalent to static Arkolakis (2010) model

- $\delta = \omega = 1$: customer base fully depreciates, reaching new customers equally costly as retaining old ones
- $\beta = \omega = 1$: marginal cost of reaching new customers independent of current customer base, i.e., $\kappa_{12}(n', n; L_j) = 0$

Maps to broad class of fixed-cost models when $\beta = 0$, i.e., marginal cost of reaching new customers is zero

- $\delta = \omega = 1$: per-period fixed exporting cost (Melitz, 2003)
- $\delta = 0, \omega = 1$: one-time sunk cost to start exporting (Das et al, 2007)
- $\omega < 1$: "gradual demand" version of Ruhl and Willis (2017)

Model: other comments

Limitations:

- Productivity constant over firm's life $\Rightarrow$ no exporter hysteresis
- No interaction between destinations, or between exports and domestic production

No analytical solution, but numerically tractable in dynamic GE

- Can be solved using endogenous grid method if $\omega = 1$
- Example: Brexit uncertainty (Steinberg, 2019)

Quantitative analysis

Quantitative analysis: overview

Calibrate model to match cross-sectional and life-cycle facts about Mexican firms that export to United States

Validate model by comparing predictions for facts about Mexican firms that export to other destinations

Compare life-cycle dynamics of exporting costs to estimates from sunk-cost models

Simulate transition dynamics following trade policy changes to explore implications for aggregate trade adjustment dynamics

Quantitative analysis: data source

Customs data from Mexico provided by World Bank Exporter Dynamics Database

- Variables: Year, firm, destination, HS6 code, value
- Aggregation: first assign each firm a time-invariant HS2 industry code, then aggregate to firm-destination-year level
- Drop non-manufacturing, firms with less than $1,000 USD exports
- 36 destinations with $>=$ 20 firms/year

Merge on destination characteristics (population, GDP per capita, trade barrier) from CEPII Gravity Database

- Trade barriers computed using standard gravity specification using entire CEPII dataset (not just observations with origin = Mexico)

Quantitative analysis: calibration strategy

Assume z lognormally distributed with standard deviation σ

σ and θ, elasticity of substitution between varieties, cannot be separately identified $\Rightarrow$ set $\theta = 5$

Use differential evolution global optimization algorithm to jointly calibrate parameters to match exporter facts for US

- ψ: export participation rate
- σ: concentration of exports
- λ: overall exit rate
- ω: relative size of entrants
- δ: relative growth rate of entrants
- β: relative exit rate of entrants
- α: average number of other destinations served

Quantitative analysis: calibration issues

Data on exporters only ⇒ no export participation rates

- US is by far most common destination for Mexican exporters
- Assume all exporters serve US ⇒ bilateral and multilateral export participation rates equal
- Set multilateral export participation rate to 25% following literature

α cannot be identified from exporter facts for US, requires cross-destination variation

- Target average number of other destinations served by Mexican firms that export to US
- Does not affect calibration of other 6 parameters

First calibrate other 6 parameters, then choose α to match average number of destinations served by firms that export to the US

Quantitative analysis: calibration results

Parameter	Meaning	Value	Target moment	Model	Data
ψ	Marketing efficiency	0.133	Export part. rate	0.250	0.250
σ	Productivity dispersion	0.786	Top-5 share	0.880	0.880
λ	Survival prob. elast.	3.644	Overall exit rate	0.398	0.390
ω	New customer conv. prob.	0.566	Entrants' rel. size	0.057	0.060
δ	Old customer dep. rate	0.597	Entrants' rel. growth	0.433	0.430
β	Marketing cost convexity	4.092	Entrants' rel. exit rate	0.393	0.400
α	Returns to market size	0.263	Avg. num. dests.	2.209	2.210

$\beta > 1$, $\delta < 1$: strong history-dependence of market penetration

$\omega < 1$: new entrants much smaller than incumbents

$\alpha < 1$: strong returns to market size

Quantitative analysis: validation strategy

Model calibrated to cross-sectional and life-cycle facts about Mexican exporters for US

Can model account for variation in facts across other destinations?

Simulate panel of firms that can export to same 36 destinations in processed microdata

- Destinations differ only in (L_j, Y_j, τ_j)
- Same processing and analysis of simulated data as customs data

Compare summary statistics, regression coefficients, etc.

Quantitative analysis: summary statistics

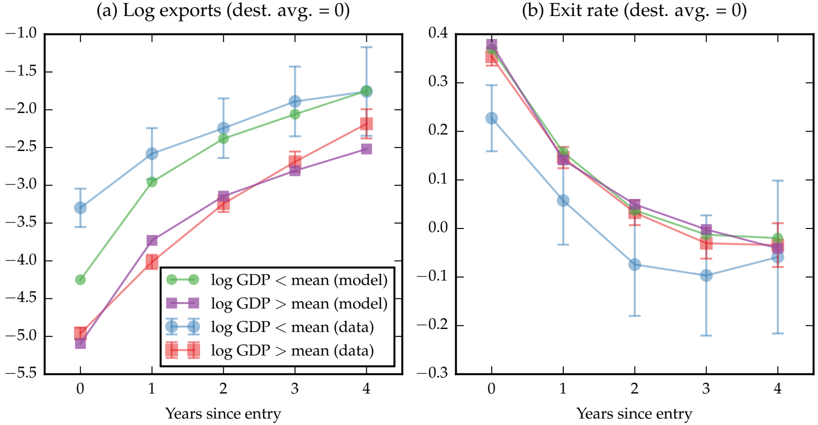
Variable	Average	Minimum	Maximum	Std. dev.	USA
(a) Cross-sectional facts (data)					
Number of exporters	955	22	16,887	2,780	16,887
Top 5% share of exports	0.68	0.39	0.90	0.12	0.88
Avg. num. dest. per exporter	13.82	2.21	24.83	5.70	2.21
(b) Cross-sectional facts (model)					
Number of exporters	1,091	40	16,994	2,852	16,994
Top 5% share of exports	0.72	0.55	0.86	0.07	0.86
Avg. num. dest. per exporter	19.37	2.21	30.20	7.28	2.21
(c) Life-cycle facts (data)					
Exit rate	0.41	0.26	0.54	0.06	0.39
Entrants' relative size	0.42	0.06	2.84	0.61	0.06
Entrants' relative exit rate	0.33	0.13	0.41	0.06	0.40
(d) Life-cycle facts (model)					
Overall exit rate	0.51	0.36	0.59	0.04	0.36
Entrants' relative size	0.10	0.05	0.27	0.05	0.05
Entrants' relative exit rate	0.37	0.30	0.52	0.04	0.38

Quantitative analysis: effects of destination characteristics

	Dependent variable					
Coefficient	Log(num. exporters)	Top-5 share	Avg. num. dests.	Overall exit rate	Entrant rel. size	Entrant rel. exit rate
(b) Data (industry-level)						
log(GDP)	0.327	0.031	-1.045	-0.000	-0.047	0.008
	(0.011)§	(0.002)§	(0.032)§	(0.001)	(0.007)§	(0.002)§
log(trade barrier)	-2.468	-0.112	9.240	0.070	0.320	-0.032
	(0.057)§	(0.013)§	(0.253)§	(0.008)§	(0.064)§	(0.013)†
Num. observations	1,171	1,171	1,171	1,171	1,171	1,171
R^2	0.76	0.35	0.79	0.44	0.09	0.12
(b) Model						
log(GDP)	0.604	0.024	-3.132	-0.016	-0.006	-0.002
	(0.022)§	(0.002)§	(0.198)§	(0.002)§	(0.003)*	(0.003)
log(trade barrier)	-3.424	-0.131	18.599	0.089	0.033	0.009
	(0.080)§	(0.010)§	(0.715)§	(0.008)§	(0.017)†	(0.015)
Num. observations	180	180	180	180	180	180
R^2	0.98	0.49	0.95	0.45	0.04	0.02

§, ‡, †, ∗ denote 0.1%, 1%, 5%, and 10% signficance levels.

Quantitative analysis: effects of tenure on exports and survival



Note: Blue circles (red squares) show coefficients and 95% confidence intervals estimated using data for destinations with log GDP below (above) than the mean. Regression specification includes industry and year fixed effects. Green and purple lines show coefficient estimates for model simulation using same groups of destinations.

Quantitative analysis: multi-dest. exporters' exit rates

	Destination rank									
Num. dest.	1	2	3	4	5	6	7	8	9	10+
(a) Data										
1	0.50	-	-	-	-	-	-	-	-	-
2	0.35	0.60	-	-	-	-	-	-	-	-
3	0.26	0.47	0.61	-	-	-	-	-	-	-
4	0.20	0.37	0.50	0.59	-	-	-	-	-	-
5	0.15	0.32	0.40	0.49	0.59	-	-	-	-	-
6	0.13	0.26	0.35	0.40	0.51	0.57	-	-	-	-
7	0.10	0.21	0.27	0.36	0.41	0.52	0.59	-	-	-
8	0.10	0.18	0.22	0.32	0.38	0.41	0.49	0.61	-	-
9	0.09	0.16	0.21	0.24	0.30	0.33	0.45	0.47	0.60	-
10+	0.05	0.08	0.11	0.13	0.17	0.18	0.21	0.24	0.28	0.32
(b) Model										
1	0.57	-	-	-	-	-	-	-	-	-
2	0.27	0.76	-	-	-	-	-	-	-	-
3	0.23	0.58	0.87	-	-	-	-	-	-	-
4	0.20	0.48	0.74	0.89	-	-	-	-	-	-
5	0.18	0.44	0.65	0.81	0.91	-	-	-	-	-
6	0.17	0.42	0.60	0.74	0.84	0.89	-	-	-	-
7	0.18	0.35	0.56	0.67	0.76	0.86	0.92	-	-	-
8	0.15	0.31	0.49	0.61	0.70	0.77	0.85	0.93	-	-
9	0.14	0.30	0.49	0.60	0.64	0.73	0.78	0.87	0.94	-
10+	0.14	0.24	0.32	0.36	0.42	0.46	0.51	0.54	0.58	0.62

Quantitative analysis: implications for exporting costs

Sunk-cost model analyses estimate large entry costs to match data

- 3–20 $\times$ continuation cost, 1-2 $\times$ average entrant's exporting profits
- Smaller in "gradual demand" models (Ruhl and Willis, 2017; Alessandria et al., 2019)

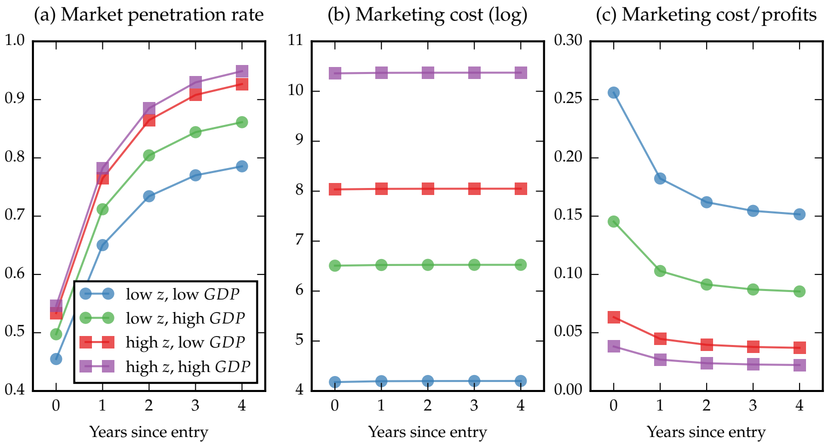
This paper: entry and continuation costs are endogenous

How do equilibrium exporting costs depend on

- Productivity: do low- or high-productivity firms pay larger costs?
- Tenure: do entrants pay larger costs than incuments?
- Destination characteristics: do firms pay more or less to export to large destinations?

How do equilibrium exporting costs compare to fixed entry/continuation costs estimated using sunk-cost models?

Quant. analysis: exporting costs by firm and destination

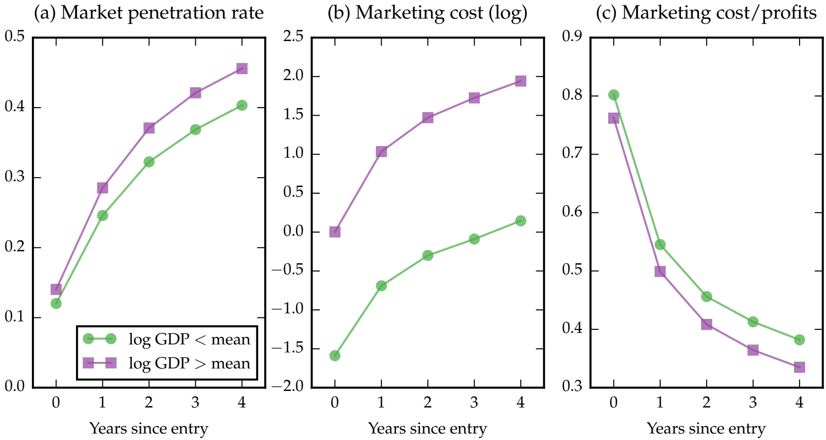


Entry costs ≈ continuation costs, but higher when meaasured relative to profits

High-productivity firms pay higher costs, but lower relative to profits

Firms pay higher costs to export to larger destinations, but lower relative to profits

Quant. analysis: estimated effects of tenure on exporting costs



Average entrant pays lower, not higher, cost in simulated data

However, average entrant pays higher cost relative to profits

Similar to estimated costs/profits in sunk-cost models

Quantitative analysis: aggregate trade adjustment dynamics

Trade adjustment dynamics literature:

- Trade elasticities lower in short run than in long run
- Firm-level dynamics play key role in aggregate elasticity dynamics

New goods/least traded products literature:

- Firms/goods that export less have higher (long-run) trade elasticities

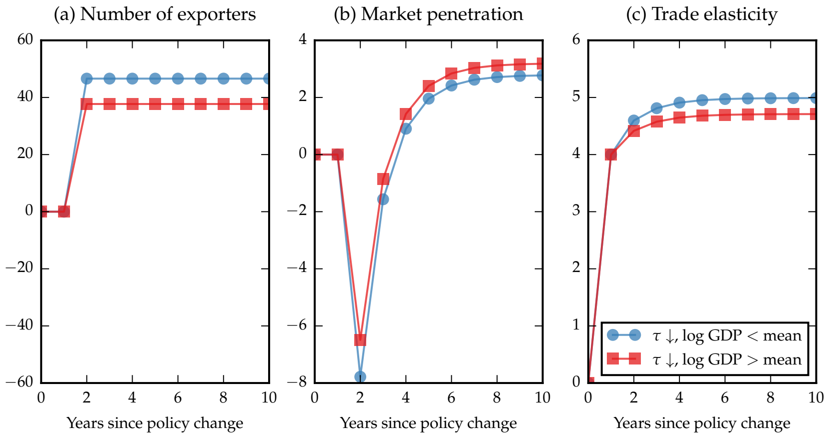
This paper: new insights about

- Effects of destination characteristics on adjustment dynamics
- Different dynamics in response to trade cost increases and decreases

For each destination in customs data, simulate transition dynamics following $\uparrow$ and $\downarrow$ in τ_j

Compare average transitions for low- and high-GDP destinations

Quant. analysis: simulated responses to trade cost changes

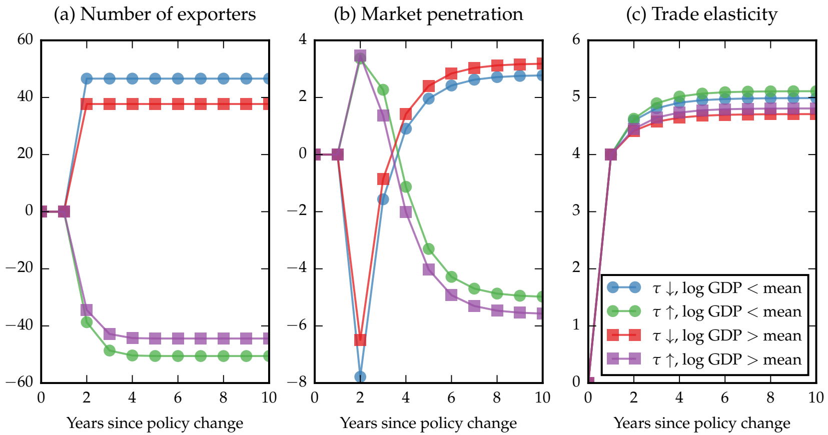


Smaller destinations: higher LR trade elasticity, longer adjustment process

Dynamics in period 2 onward driven by firm-level intensive margin

Avg. mkt. pen. ↓ in SR as new firms enter, ↑ in LR as they build customer bases

Quant. analysis: simulated responses to trade cost changes



Higher LR elasticities to trade cost ↑ than ↓

Larger LR firm-level intensive margin response

Slower adjustment as firms "run down" customer bases

Summary

Used microdata on Mexican exporters to document new facts about how exporters' life cycle dynamics vary across markets

- New exporters are smaller and more likely to exit in larger markets
- Multi-destination exporters exit from less important destinations more often

Developed new model of exporter life-cycle dynamics

- Synthesis of Arkolakis (2010) market penetration costs theory with sunk-cost export participation dynamics framework
- Mechanism accounts for cross-sectional and life-cycle facts, variation in these facts across export destinations

Calibrated model to Mexican exporters' behavior in US, validated it by comparing predictions for other destinations against data

Explored implications for exporting costs and trade dynamics