The Structure of Export Entry Costs

Andrew H. McCallum

Federal Reserve Board

January 3, 2016

Firm-Level International Linkages

Econometrics Society - ASSA Annual Meetings

Disclaimer

Any opinions and conclusions expressed herein are solely the responsibility of the author and do not necessarily represent the views of the U.S. Census Bureau, the Board of Governors, or any other person associated with the Federal Reserve System. All results using Census Bureau data have been reviewed to ensure that no confidential information is disclosed.

Possible sunk export entry cost structures

- Only country specific (bilateral):

$$\begin{aligned} Canada: &\quad b_c \\ Mexico: &\quad b_m \\ Both: &\quad b_c + b_m \end{aligned}$$

- Country specific plus "language complementarity":

$$\begin{aligned} Mexico: &\quad b_m + b_{Spanish} \\ Spain: &\quad b_e + b_{Spanish} \\ Both: &\quad b_e + b_m + b_{Spanish} \end{aligned}$$

- Only global:

$$\begin{aligned} Canada: &\quad g \\ Mexico: &\quad g \\ Both: &\quad g \end{aligned}$$

Motivation

Sunk costs firms pay to enter foreign markets:

- are the friction that makes exporting a rare activity
- have trade policy implications
- determine how participation margin responds to shocks
- can affect welfare due to love of variety

Past work

- Hanson & Xiang (2011) - U.S. movies, mostly global
- Moxnes (2010) - Norwegian MFG, mostly country specific
- Morales et al. (2014) - Chilean chemicals, "gravity" and "extended gravity"
- Chaney (2014) - French firms, networks make entry into countries which are "close" to current partners cheaper than other partners (similar to Morales)

Question

Which entry cost structure is most consistent for U.S. firms?

1. Statistics and reduced form
   - Firms only enter one country when they start exporting
   - General exporting experience does little to help access new markets
   - Past experience does little to help access similar markets today
2. Structural model
   - The global entry cost is $20 thousand
   - Country specific costs are $3.6 to $4.25 million per market

Up front costs faced by U.S. firms are mostly country specific.

- Marketing and market research are likely local

Data: universe of U.S. manufacturing firms

- Customs transactions matched to production data built by Bernard, Jensen, and Schott (2009)
- Arms-length manufacturing exports only
- Values converted to 2000 USD using NBER 4-digit SIC PPI
- Top 50 destinations, 95% of U.S. MFG exports
- 1992-2007: 16 years and about $40k$ firms ($50 \times 16 \times 40k = 32m$)

Descriptive evidence for large country specific component

Table: Number of countries entered

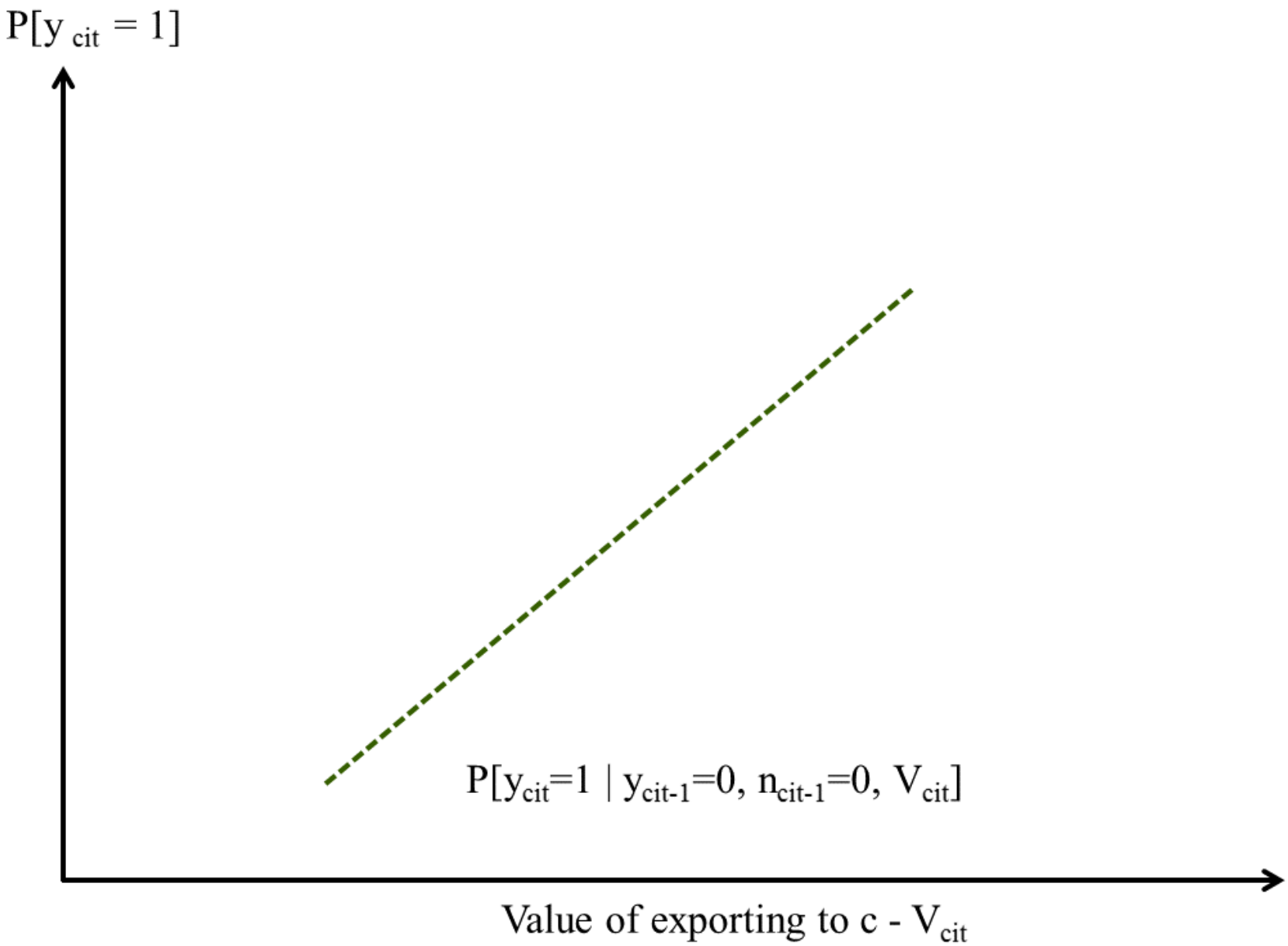
Number entered	Percent	Cumulative
1	89.42	89.42
2	8.26	97.67
3	1.46	99.13
4	0.48	99.62
5+	0.38	100.00

Table: Number of countries entered by firm size

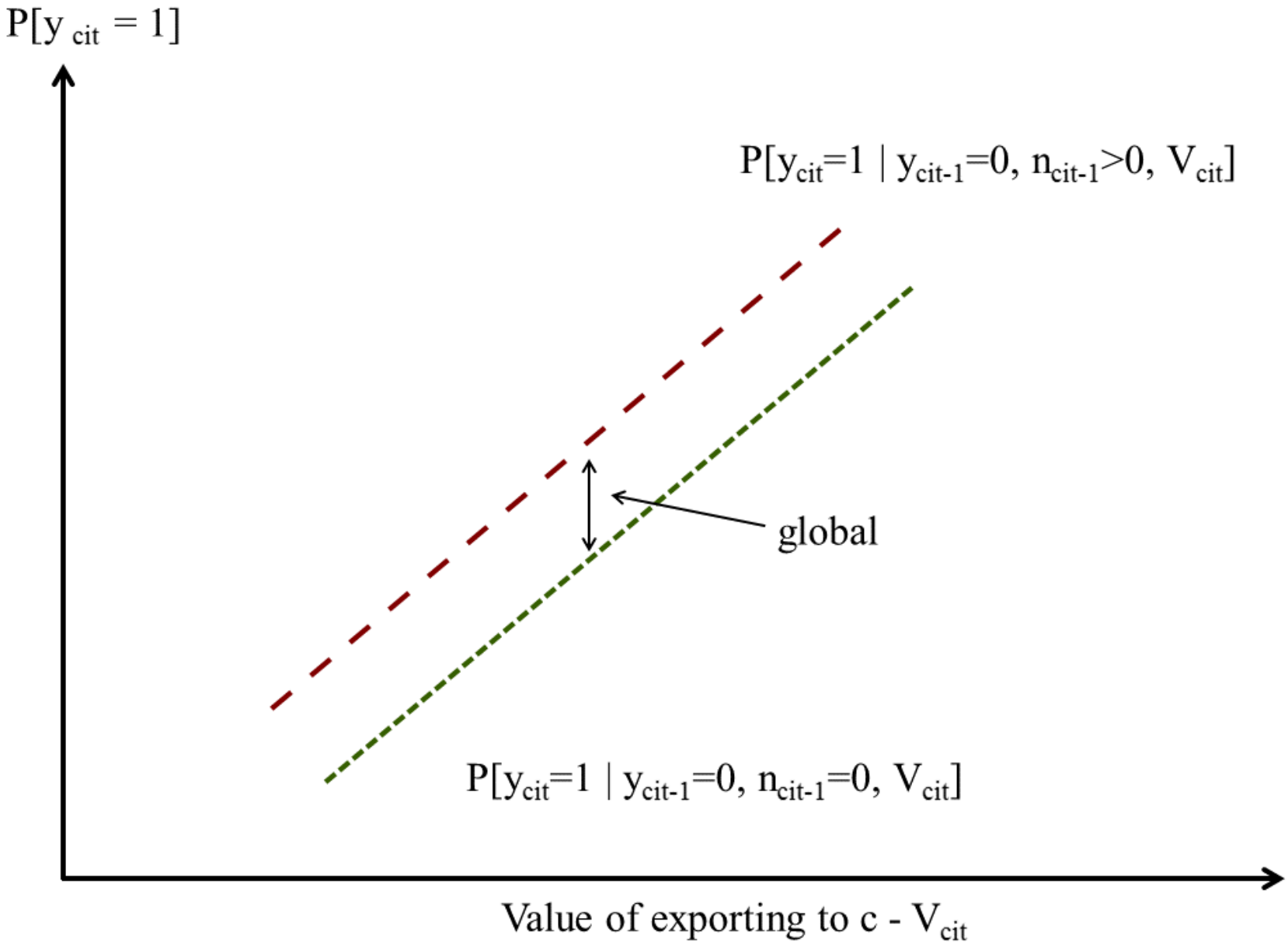
Employees	Mean entered	St. Dev. entered
$[20, 50)$	1.11	0.43
$[50, 150)$	1.18	0.69
$[150, 500)$	1.24	0.93
$[500, 1000)$	1.34	0.98
≥ 1000	1.30	0.83

- Same when Canada is not treated as a foreign market.
- No dramatic increase in the number of countries after initial entry.
- Start by exporting to Canada, Mexico, the United Kingdom, Germany and Japan.

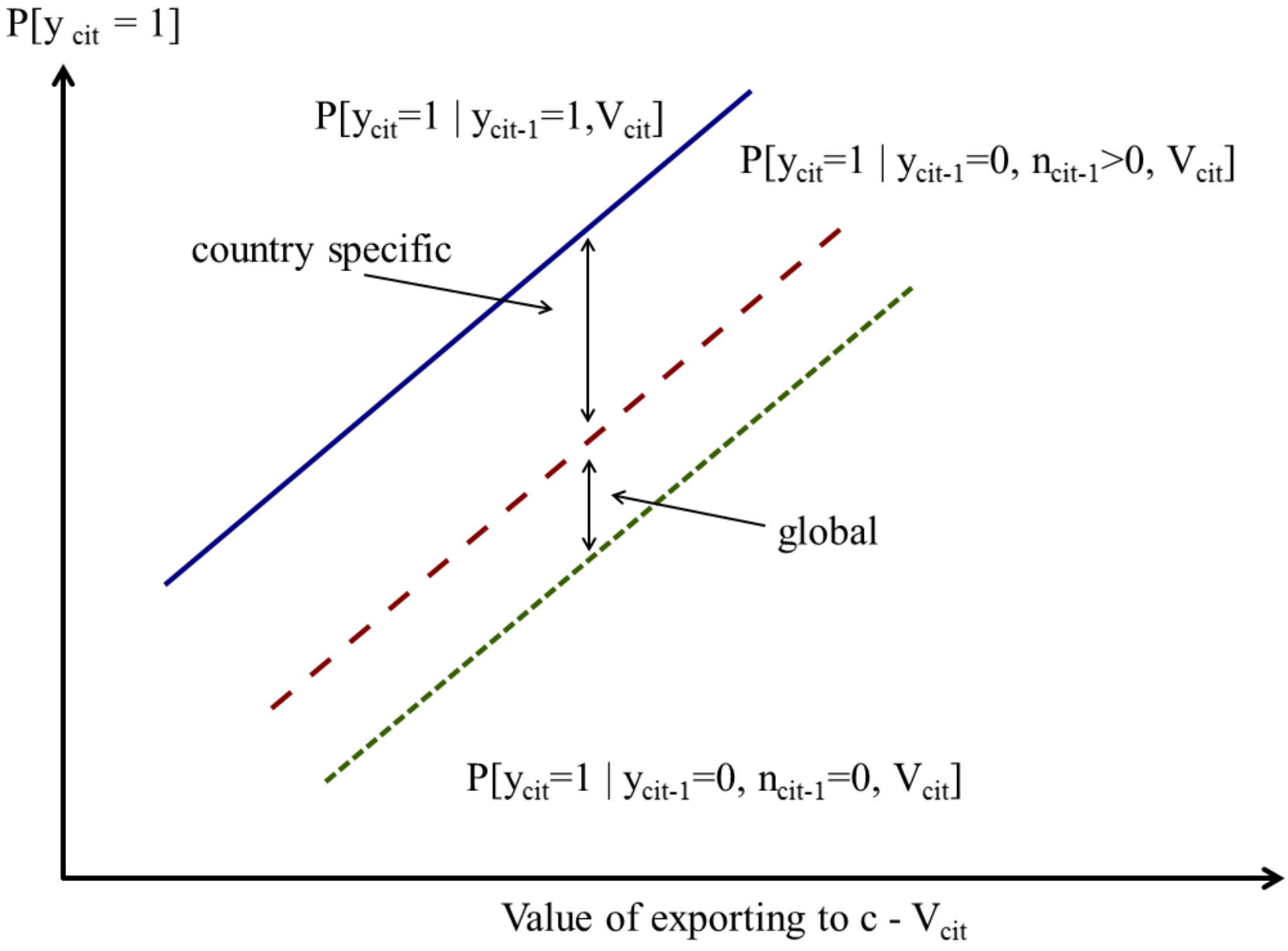
Intuition for identification



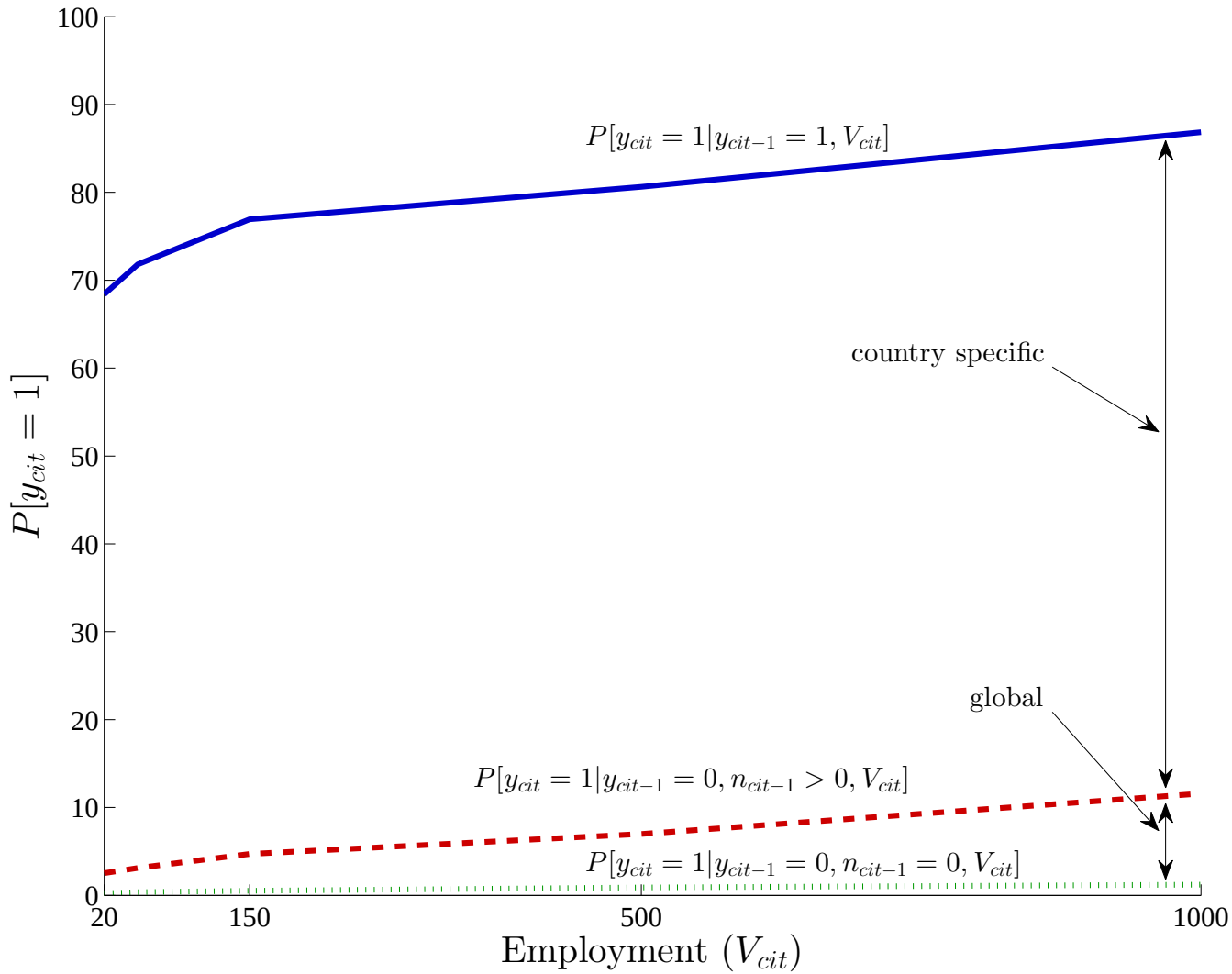
Intuition for identification



Intuition for identification



Empirical counterpart



Interpreting the linear probability model

$$P\left[y_{cit}=1 \mid \cdot\right] \quad = \quad \beta_1 y_{cit-1} + \gamma_1 n_{cit-1} + \lambda_1 X_{cit-1} + \delta_t + \delta_{ci}$$

Regressors

- y_{cit-1} - country specific export status
- $n_{cit-1} \equiv \sum_{k \neq c} y_{kit-1}$ - number of export destinations other than c
- X_{it-1} - firm size, labor productivity
- X_{ct-1} - foreign market size, exchange rate
- δ_t - any common time effect
- δ_{ci} - fixed costs, industry, distance, country's taste, etc.

Persistence bias: $OLS \geq AB \geq WG$

▸ AB details ▸ Summary statistics

Results: number of other destinations

Table: dependent variable y_{cit}

	OLS	AB	WG2	WG3
y_{cit-1}	41.40***	26.19***	19.50***	18.75***
	(0.09)	(0.14)	(0.12)	(0.12)
y_{cit-2}	20.33***	9.10***	4.54***	4.36***
	(0.08)	(0.10)	(0.08)	(0.08)
y_{cit-3}	15.30***	3.16***	-0.78***	-0.98***
	(0.07)	(0.10)	(0.07)	(0.08)
n_{cit-1}	0.68***	0.73***	0.69***	
	(0.01)	(0.02)	(0.01)	
n_{cit-2}	-0.07***	0.08***	0.11***	
	(0.01)	(0.01)	(0.01)	
n_{cit-3}	-0.15***	0.06***	0.09***	
	(0.01)	(0.01)	(0.01)	
controls	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	
controls	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	
controls	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	
FE	δ_t	δ_t, δ_{ci}	δ_t, δ_{ci}	$\delta_{it}, \delta_{ci}, \delta_{ct}$
Observations	19,696,400	19,696,400	19,696,400	19,696,400
Overall R^2	0.611	-	0.525	0.564

Firm clustered standard errors in parentheses.
Significant at 1% *** 5% ** and 10% *

Results: number of other destinations

Table: dependent variable y_{cit}

	OLS	AB	WG2	WG3
y_{cit-1}	41.40***	26.19***	19.50***	18.75***
	(0.09)	(0.14)	(0.12)	(0.12)
y_{cit-2}	20.33***	9.10***	4.54***	4.36***
	(0.08)	(0.10)	(0.08)	(0.08)
y_{cit-3}	15.30***	3.16***	-0.78***	-0.98***
	(0.07)	(0.10)	(0.07)	(0.08)
n_{cit-1}	0.68***	0.73***	0.69***	
	(0.01)	(0.02)	(0.01)	
n_{cit-2}	-0.07***	0.08***	0.11***	
	(0.01)	(0.01)	(0.01)	
n_{cit-3}	-0.15***	0.06***	0.09***	
	(0.01)	(0.01)	(0.01)	
controls	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	
controls	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	
controls	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	
FE	δ_t	δ_t, δ_{ci}	δ_t, δ_{ci}	$\delta_{it}, \delta_{ci}, \delta_{ct}$
Observations	19,696,400	19,696,400	19,696,400	19,696,400
Overall R^2	0.611	-	0.525	0.564

Firm clustered standard errors in parentheses.
Significant at 1% *** 5% ** and 10% *

Complementary entry cost specification

Instead of number of other export destinations, count countries with

- past colonial relationship
- contiguous border
- same currency
- similar distance from the U.S.
- same language
- same legal origin
- similar per capita income
- common geographic region (almost continent)
- common regional trade agreement

Results: number of complementary destinations

Table: dependent variable y_{cit}

	OLS	AB	WG2	WG3
y_{cit-1}	41.08***	26.08***	19.33***	18.76***
	(0.093)	(0.132)	(0.115)	(0.122)
y_{cit-2}	20.02***	9.04***	4.36***	4.22***
	(0.079)	(0.103)	(0.077)	(0.082)
y_{cit-3}	14.95***	3.13***	-0.94***	-1.11***
	(0.070)	(0.103)	(0.072)	(0.076)
n^{coly}_{cit-1}	0.11***	1.64***	-0.13***	-0.08**
	(0.032)	(0.172)	(0.038)	(0.041)
n^{ctig}_{cit-1}	0.51***	-0.08	0.51***	0.73***
	(0.038)	(0.132)	(0.045)	(0.047)
n^{curr}_{cit-1}	-0.69***	-0.42***	-0.26***	-0.21***
	(0.035)	(0.045)	(0.037)	(0.038)
n^{dist}_{cit-1}	0.40***	0.82***	0.49***	0.21***
	(0.018)	(0.079)	(0.021)	(0.021)
n^{lang}_{cit-1}	0.36***	0.55***	0.38***	0.28***
	(0.018)	(0.130)	(0.021)	(0.022)
n^{legl}_{cit-1}	0.44***	0.22***	0.45***	0.09***
	(0.016)	(0.072)	(0.018)	(0.018)
n^{pcap}_{cit-1}	0.38***	0.49***	0.24***	0.12***
	(0.012)	(0.030)	(0.013)	(0.014)
n^{regn}_{cit-1}	0.73***	-0.41***	0.72***	0.66***
	(0.021)	(0.113)	(0.025)	(0.026)
n^{rtag}_{cit-1}	0.08***	0.57***	0.10***	-0.02
	(0.017)	(0.039)	(0.018)	(0.019)
controls	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	
controls	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	
controls	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	
FE	δ_t	δ_t, δ_{ci}	δ_t, δ_{ci}	$\delta_{it}, \delta_{ci}, \delta_{ct}$
Observations	19,696,400	19,696,400	19,696,400	19,696,400
Overall R^2	0.611	-	0.530	0.565

Firm clustered standard errors in parentheses.
Significant at 1% *** 5% ** and 10% *

Results: number of complementary destinations

Table: dependent variable y_{cit}

	OLS	AB	WG2	WG3
y_{cit-1}	41.08***	26.08***	19.33***	18.76***
	(0.093)	(0.132)	(0.115)	(0.122)
y_{cit-2}	20.02***	9.04***	4.36***	4.22***
	(0.079)	(0.103)	(0.077)	(0.082)
y_{cit-3}	14.95***	3.13***	-0.94***	-1.11***
	(0.070)	(0.103)	(0.072)	(0.076)
n^{coly}_{cit-1}	0.11***	1.64***	-0.13***	-0.08**
	(0.032)	(0.172)	(0.038)	(0.041)
n^{ctig}_{cit-1}	0.51***	-0.08	0.51***	0.73***
	(0.038)	(0.132)	(0.045)	(0.047)
n^{curr}_{cit-1}	-0.69***	-0.42***	-0.26***	-0.21***
	(0.035)	(0.045)	(0.037)	(0.038)
n^{dist}_{cit-1}	0.40***	0.82***	0.49***	0.21***
	(0.018)	(0.079)	(0.021)	(0.021)
n^{lang}_{cit-1}	0.36***	0.55***	0.38***	0.28***
	(0.018)	(0.130)	(0.021)	(0.022)
n^{legl}_{cit-1}	0.44***	0.22***	0.45***	0.09***
	(0.016)	(0.072)	(0.018)	(0.018)
n^{pcap}_{cit-1}	0.38***	0.49***	0.24***	0.12***
	(0.012)	(0.030)	(0.013)	(0.014)
n^{regn}_{cit-1}	0.73***	-0.41***	0.72***	0.66***
	(0.021)	(0.113)	(0.025)	(0.026)
n^{rtag}_{cit-1}	0.08***	0.57***	0.10***	-0.02
	(0.017)	(0.039)	(0.018)	(0.019)
controls	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	
controls	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	
controls	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	
FE	δ_t	δ_t, δ_{ci}	δ_t, δ_{ci}	$\delta_{it}, \delta_{ci}, \delta_{ct}$
Observations	19,696,400	19,696,400	19,696,400	19,696,400
Overall R^2	0.611	-	0.530	0.565

Firm clustered standard errors in parentheses.
Significant at 1% *** 5% ** and 10% *

Reduced form results are robust

Instead of number of other destinations

- Indicator for exported elsewhere ▸ elsewhere indicator
- Indicator for complementary destinations ▸ gravity indicator
- Indicator if ever exported ▸ ever exported

Change sample

- Re-estimate by firm size categories
- Balanced panel
- Allowing for firm birth and death

Why do we need a structural model?

- Only way to invert probabilities into dollar values
- Compare structural to reduced form
- Explicilty model forward looking behavior by firms
- Compare country specific entry costs across countries
- Counterfactual simulations:
  - "What if every country was as inexpensive to enter as Canada?"

Structural model overview

- Representative consumer with Cobb-Douglas utility over sectors
- Sectors are CES aggregate over varieties
- Monopolistic competition and CRS production
- No "round about" access to a country or goods arbitrage
- Only observe exporting and revenue level jointly (selection problem)
- Dynamic entry decision

Period profit per country

Parametrize log potential revenue as

$$r^*_{cit} = \alpha_c + \beta_c w_{it} + \gamma_c x_t + \eta_{cit}$$

where

w_{it} - log of full-time employment

x_t - log of U.S. manufacturing exports

$\eta_{cit} \sim N\left(0, \sigma^2_{c\eta}\right)$

This implies that

$$E\left[R_{cit} \mid w_{it}, x_t\right] = \exp\left(\alpha_c + \beta_c w_{it} + \gamma_c x_t + \frac{1}{2}\sigma^2_{c\eta}\right)$$

Before accounting for sunk entry cost, define gross operating profits as

$$\pi^g_{cit} = \varepsilon_c^{-1} E\left[R_{cit} \mid w_{it}, x_t\right] - f_c$$

Period profit for multiple destinations

Period profit

$$\pi\left(\mathbf{y_{it}}, \mathbf{y_{it-1}}, w_{it}, x_t\right) = \sum_c \left(\varepsilon_c^{-1} E\left[R_{cit} \mid w_{it}, x_t\right] - f_c\right) y_{cit} - \mathbf{b} \cdot \mathbf{e_{it}} - g \cdot e_{it}^g$$

- Expected revenue is a function of firm size, w_{it}, and demand, x_t
- Operating profit is a fraction of expected revenue minus fixed cost
- Choose vector of possible destinations, $\mathbf{y_{it}}$
- Pay country specific cost for every country entered, $\mathbf{e_{it}}$
- Pay global cost if enter any country, e_{it}^g

The dynamic problem

Bellman equation

$$V\left(\mathbf{y_{it-1}}, w_{it}, x_t, \epsilon_{it}\right) = \max_{\mathbf{y_{it}}} \left\{\pi\left(\mathbf{y_{it}}, \mathbf{y_{it-1}}, w_{it}, x_t\right) + \epsilon\left(\mathbf{y_{it}}\right) + \delta E\left[V\left(\mathbf{y_{it}}, w_{it+1}, x_{t+1}, \epsilon_{it+1}\right)\right]\right\}$$

Integrating ϵ out defines the expected value function

$$V\left(\mathbf{y_{it-1}}, w_{it}, x_t\right) \equiv E_\epsilon\left[V\left(\mathbf{y_{it-1}}, w_{it}, x_t, \epsilon_{it}\right)\right]$$

Assuming unobserved state, $\epsilon\left(\mathbf{y_{it}}\right)$, is T1EV $i.i.d.$ across firms, time, and choices provides closed form $E_\epsilon\left[\cdot\right]$ and the contraction that defines the expected value function. Use Chebyshev polynomials to find coefficients $\lambda_{\mathbf{y_{it-1}}}$ that approximate the value function in the contraction

$$\lambda_{\mathbf{y_{it-1}}}\Lambda\left(w_{it}, x_t\right) = \ln\left(\sum_{\mathbf{y_{it}^*}} \exp\left[\pi\left(\mathbf{y_{it}^*}, \mathbf{y_{it-1}}, w_{it}, x_t\right) + \delta E_{t+1}\left[\lambda_{\mathbf{y_{it}^*}}\Lambda\left(w_{it+1}, x_{t+1}\right)\right]\right]\right) + \gamma$$

The likelihood

The T1EV assumption also implies multinomial logit conditional choice probability

$$P\left[\tilde{\mathbf{y}}_{\mathbf{it}} \mid \mathbf{y}_{\mathbf{it-1}}, w_{it}, x_t\right] = \frac{\exp\left[\pi\left(\tilde{\mathbf{y}}_{\mathbf{it}}, \mathbf{y}_{\mathbf{it-1}}, w_{it}, x_t\right) + \delta E_{t+1}\left[V\left(\tilde{\mathbf{y}}_{\mathbf{it}}, w_{it+1}, x_{t+1}\right)\right]\right]}{\sum_{\mathbf{y}^*_{\mathbf{it}}} \exp\left[\pi\left(\mathbf{y}^*_{\mathbf{it}}, \mathbf{y}_{\mathbf{it-1}}, w_{it}, x_t\right) + \delta E_{t+1}\left[V\left(\mathbf{y}^*_{\mathbf{it}}, w_{it+1}, x_{t+1}\right)\right]\right]}$$

Combining this with the revenue distribution and an initial conditions correction gives the likelihood

$$L\left(\theta \mid \mathbf{y}, \mathbf{w}, \mathbf{x}, \mathbf{r}\right) =$$

$$\prod_{i=1}^{N}\prod_{t=2}^{T}\left(P\left[\tilde{\mathbf{y}}_{\mathbf{it}} \mid \mathbf{y}_{\mathbf{it-1}}, x_t, w_{it}\right]\prod_{c} f\left(r_{cit} \mid y_{cit}=1, w_{it}, x_t\right)\right)^{1\left(\tilde{\mathbf{y}}_{\mathbf{it}}=\mathbf{y}_{\mathbf{it}}\right)} P\left[\tilde{\mathbf{y}}_{\mathbf{i1}} \mid w_{i1}\right]^{1\left(\tilde{\mathbf{y}}_{\mathbf{i1}}=\mathbf{y}_{\mathbf{i1}}\right)}$$

$\mathbf{y}, \mathbf{w}, \mathbf{x}, \mathbf{r}$ - all participation, employment, total exports, and revenue data

MPEC Mathematical Programming with Equilibrium Constraints

Su and Judd (ECTA, 2012) and Dubé, Fox and Su (ECTA, 2012)

Estimate parameters and solve for expected value function in one step

$$\max_{\theta,\lambda} \quad \ln\left[L\left(\theta \mid \mathbf{y}, \mathbf{w}, \mathbf{x}, \mathbf{r}\right)\right]$$

$$subject\ to$$

$$\lambda_{\mathbf{y_{it-1}}}\Lambda\left(w_{it}, x_t\right) = \ln\left(\sum_{\mathbf{y^*_{it}}} \exp\left[\pi\left(\mathbf{y^*_{it}}, \mathbf{y_{it-1}}, w_{it}, x_t\right) + \delta E_{t+1}\left[\lambda_{\mathbf{y^*_{it}}}\Lambda\left(w_{it+1}, x_{t+1}\right)\right]\right]\right)$$

θ - structural parameters including country specific and global entry costs
λ - Chebyshev coefficients

Results: Main partners

▸ SIC 346

Table: Structural estimates: top 5 destinations

Metal Forgings and Stampings (SIC 346)

	Canada	Japan	Mexico	U.K.	Germany
			Net profit parameters ($m)		
global entry cost (g)			0.02		
country entry cost (b)	3.70	4.16	3.58	4.22	3.63
			Percent of firms that export		
data	58.76	9.94	21.55	21.47	16.77
model	58.07	10.06	20.82	19.94	16.45
			Model correctly predicts country-firm-year export status		
percent	57.75	84.74	71.99	72.72	74.72
			Export revenue ($m), mean (standard deviation)		
data	0.94 (2.76)	0.60 (1.92)	0.55 (1.85)	0.61 (3.44)	0.41 (1.10)
model	1.31 (2.90)	0.57 (0.58)	0.63 (0.74)	0.51 (0.39)	0.50 (0.36)

Conclusions

Conclusions for the universe of U.S. firms

- Entry costs are mostly country specific
- "Point-to-point" participation network is a good approximation
- Shocks transmitted through a common partner likely to be small
- Global entry costs are around $20 thousand while country specific are $3.6-$4.25 million for SIC 346
- Anecdotal explanation: marketing/market research likely to be mainly local

Results: elsewhere indicator

back

Table: dependent variable y_{cit}

	OLS	AB	WG2	WG3
y_{cit-1}	44.12***	25.66***	20.92***	18.77***
	(0.09)	(0.14)	(0.13)	(0.13)
y_{cit-2}	22.17***	9.06***	5.57***	4.39***
	(0.08)	(0.11)	(0.09)	(0.08)
y_{cit-3}	17.20***	3.34***	0.17***	-0.99***
	(0.08)	(0.10)	(0.08)	(0.08)
$\max_{j \neq c}(y_{jit-1})$	0.69***	-1.94***	0.09***	0.25
	(0.01)	(0.03)	(0.01)	(0.25)
$\max_{j \neq c}(y_{jit-2})$	0.51***	-0.95***	0.03***	0.44**
	(0.01)	(0.02)	(0.01)	(0.21)
$\max_{j \neq c}(y_{jit-3})$	0.69***	-0.41***	0.02	-0.17
	(0.02)	(0.02)	(0.02)	(0.20)
controls	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	
controls	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	
controls	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	
FE	δ_t	δ_t, δ_{ci}	δ_t, δ_{ci}	$\delta_{it}, \delta_{ci}, \delta_{ct}$
Observations	19,696,400	19,696,400	19,696,400	19,696,400
Overall R^2	0.603	-	0.522	0.566

Firm clustered standard errors in parentheses.
Significant at 1% *** 5% ** and 10% *

Results: indicator of extended gravity destination

back

Table: dependent variable y_{cit}

	OLS	AB	WG2	WG2
y_{cit-1}	42.65***	26.35***	20.47***	18.73***
	(0.093)	(0.133)	(0.123)	(0.123)
y_{cit-2}	21.05***	9.38***	5.19***	4.33***
	(0.081)	(0.103)	(0.083)	(0.082)
y_{cit-3}	16.02***	3.46***	-0.20**	-1.00***
	(0.075)	(0.102)	(0.078)	(0.076)
$\max_{j \neq c}\left(1(coly_{jc})y_{jit-1}\right)$	1.51***	0.47***	1.09***	-0.08
	(0.040)	(0.087)	(0.048)	(0.047)
$\max_{j \neq c}\left(1(ctig_{jc})y_{jit-1}\right)$	2.42***	1.97***	2.43***	1.42***
	(0.048)	(0.110)	(0.059)	(0.055)
$\max_{j \neq c}\left(1(curr_{jc})y_{jit-1}\right)$	-0.54***	2.10***	0.53***	0.06
	(0.066)	(0.144)	(0.074)	(0.077)
$\max_{j \neq c}\left(1(dist_{jc})y_{jit-1}\right)$	0.86***	-1.47***	0.38***	0.15***
	(0.026)	(0.058)	(0.030)	(0.032)
$\max_{j \neq c}\left(1(lang_{jc})y_{jit-1}\right)$	0.02	-0.98***	0.01	0.04
	(0.024)	(0.064)	(0.028)	(0.032)
$\max_{j \neq c}\left(1(legl_{jc})y_{jit-1}\right)$	0.27***	-0.75***	0.09***	-0.03
	(0.020)	(0.048)	(0.024)	(0.029)
$\max_{j \neq c}\left(1(pcap_{jc})y_{jit-1}\right)$	0.29***	0.31***	0.36***	0.05**
	(0.018)	(0.047)	(0.021)	(0.024)
$\max_{j \neq c}\left(1(regn_{jc})y_{jit-1}\right)$	0.57***	-0.69***	0.51***	0.23***
	(0.030)	(0.077)	(0.035)	(0.038)
$\max_{j \neq c}\left(1(rtag_{jc})y_{jit-1}\right)$	0.25***	1.68***	0.23***	0.01
	(0.028)	(0.090)	(0.031)	(0.036)
controls	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	
controls	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	
controls	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	
FE	δ_t	δ_t, δ_{ci}	δ_t, δ_{ci}	$\delta_{it}, \delta_{ci}, \delta_{ct}$
Observations	19,696,400	19,696,400	19,696,400	19,696,400
Overall R^2	0.607	-	0.526	0.574

Firm clustered standard errors in parentheses.
Significant at 1% *** 5% ** and 10% *

Results: ever exported indicator

back

Table: dependent variable y_{cit}

	OLS	AB	WG2	WG3
y_{cit-1}	44.26***	25.98***	20.91***	18.75***
	(0.09)	(0.14)	(0.13)	(0.12)
y_{cit-2}	22.27***	9.18***	5.56***	4.36***
	(0.08)	(0.11)	(0.09)	(0.08)
y_{cit-3}	17.25***	3.35***	0.16***	-0.98***
	(0.08)	(0.10)	(0.08)	(0.08)
$ever_{it-1}$	-0.11***	-3.72***	-0.62***	
	(0.02)	(0.05)	(0.03)	
$ever_{it-2}$	0.05***	-0.14***	-0.18***	
	(0.03)	(0.03)	(0.02)	
$ever_{it-3}$	1.19***	-0.28***	-0.35***	
	(0.03)	(0.04)	(0.03)	
controls	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	x_{it-1}, x_{ct-1}	
controls	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	x_{it-2}, x_{ct-2}	
controls	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	x_{it-3}, x_{ct-3}	
FE	δ_t	δ_t, δ_{ci}	δ_t, δ_{ci}	$\delta_{it}, \delta_{ci}, \delta_{ct}$
Observations	19,696,400	19,696,400	19,696,400	19,696,400
Overall R^2	0.602	-	0.517	0.564

Firm clustered standard errors in parentheses.
Significant at 1% *** 5% ** and 10% *

Arellano and Bond (1991) details back

- GMM not 2SLS so no "first stage" to report.
- Instruments are deeper lags of the covariates (all possible using 4-7 periods ago)
- The moment conditions in AB are valid only if there is no serial correlation in the idiosyncratic errors.
- The AB AR(2) test has a null of no autocorrelation in the second lag of the first differenced errors with $p - value = 0.289$ for the "global" specification and $p - value = 0.153$ in the "complementary" specification.

Summary Statistics

back

Table: Summary Statistics

Variable	Mean	St. Dev.
Export status times 100 ($y_{cit} \times 100$)	7.16	25.78
Number of other countries served (n_{it-1})	3.37	7.08
Log real wage (w_{it-1})	-3.43	0.39
Log employment (e_{it-1})	4.35	1.11
Log real average U.S. exports ($\bar{x}_{ct-1}$)	-0.36	0.60
Log number of U.S. exporting firms (N_{ct-1})	8.03	0.70
Log real U.S. exchange rate (rer_{ct-1})	2.43	2.32

Metal Forgings and Stampings (SIC 346)

back

3462 Iron and Steel Forgings

Aircraft forgings, ferrous: not made in rolling mills

...

Wheels, car and locomotive: forged-not made in rolling mills

3463 Nonferrous Forgings

Aircraft forgings, nonferrous: not made in hot-rolling mills

...

Titanium forgings, not made in hot-rolling mills

3465 Automotive Stampings

Automotive stampings: e.g., fenders, tops, hub caps, body parts, trim

...

Moldings and trim, automotive: stamped

3466 Crowns and Closures

Bottle caps and tops, stamped metal

...

Tops, jar: stamped metal

3469 Metal Stampings, Not Elsewhere Classified

Appliance parts, porcelain enameled

...

Wastebaskets, stamped metal