Multinational Firms and Export (Life-Cycle) Dynamics

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RIETI

August 4, 2016

Motivation

Multinational firms (MNEs) are important group of firms

- Larger than exporters or domestic firms.
- Disproportionate share of aggregate employment.
- Drivers of R&D and innovation

e.g. France: MNE affiliates account for

2.0% of manufacturing enterprises

31.8% of manufacturing sales

26.2% of manufacturing employment

27.4% of R&D spending in manufacturing sector

(Antràs & Yeaple, 2014, Table 2.1; figures for 2007.)

How are Multinational Enterprises (MNEs) born?

- Role of the transition from exporting to MNE
- Role of sunk costs of MNE entry (vs export entry)
- Role of learning

This paper

- **Novel facts on life-cycle dynamics: MNEs vs exporters**
  - detailed firm-level data from **Norway**, **France**, and Germany
  - key: we observe previous export experience of MNEs, by market

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     - MNEs with export experience are not different

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- **Theory & calibration (preliminary)**
  - simple dynamic extension of Helpman, Melitz, & Yeaple (04)
  - MNE sunk costs suffice to match data
  - Is there room for learning? Over what?

Literature

- Growing literature on FDI dynamics

  Rob & Vettas (03); Kotseva & Vettas (05); Ramondo, Rappoport & Ruhl (13); Egger, Fahn, Merlo & Wamser (14); **Conconi, Sapir, Zanardi (15)**; Cravino & Levchenko (15); Fillat & Garetto (15); Fillat, Garetto & Oldenski (15); Bilir, Morales (16); Garetto, Oldenski, Ramondo (16)

- Large literature on export dynamics

  Fact finding: e.g. Albornoz, Pardo, Corcos & Ornelas (12), Schmeiser (12);
  Exporters & sunk costs: Roberts & Tybout (97), Costantini & Melitz (07), Das, Roberts & Tybout (07), Alessandria & Choi (07, 14), Aw, Roberts & Xu (11), Burstein & Melitz (12), Impullitti, Irarrazabal & Opromolla (13), Liu (14), **Ruhl & Willis (13)**;
  Learning models: Akhmetova (2010), Akhmetova & Mitaritonna (2010), Eaton, Eslava, Jinkins, Krizan & Tybout (2014), Arkolakis, Papageorgiou & Timoshenko (2015), Morales, Sheu & Zahler (2015), Timoshenko (2015, 2015)

- Large literature on firm dynamics

  e.g. Luttmer (2008), Foster, Haltiwanger & Syverson (2008), Haltiwanger, Jarmin & Miranda (2013), Arkolakis (forthcoming), ... many many others

Data

1. **Norway, 1996-2006. Main data source.**
   - data on exports & foreign affiliates; also domestic firms
   - exports destination; location of foreign affiliates
   - domestic, export and foreign affiliate sales

2. **France, 1999-2011.**
   - data on exports & foreign affiliates; also domestic firms
   - exports destination; location of foreign affiliates
   - domestic and (monthly) export sales; foreign affiliates: no sales, some employment

3. **Germany, 1999-2011.**
   - only data on MNEs and their foreign affiliates; no exports, no domestic firms
   - location of foreign affiliates
   - sales and employment of foreign affiliates

▸ Summary Statistics

Internationalization Strategies

Three groups of firms (Manufacturing)

1. Exporters
2. Multinational enterprises (MNEs)
3. Experienced MNEs
   - MNEs that exported to a market "before" opening an affiliate there

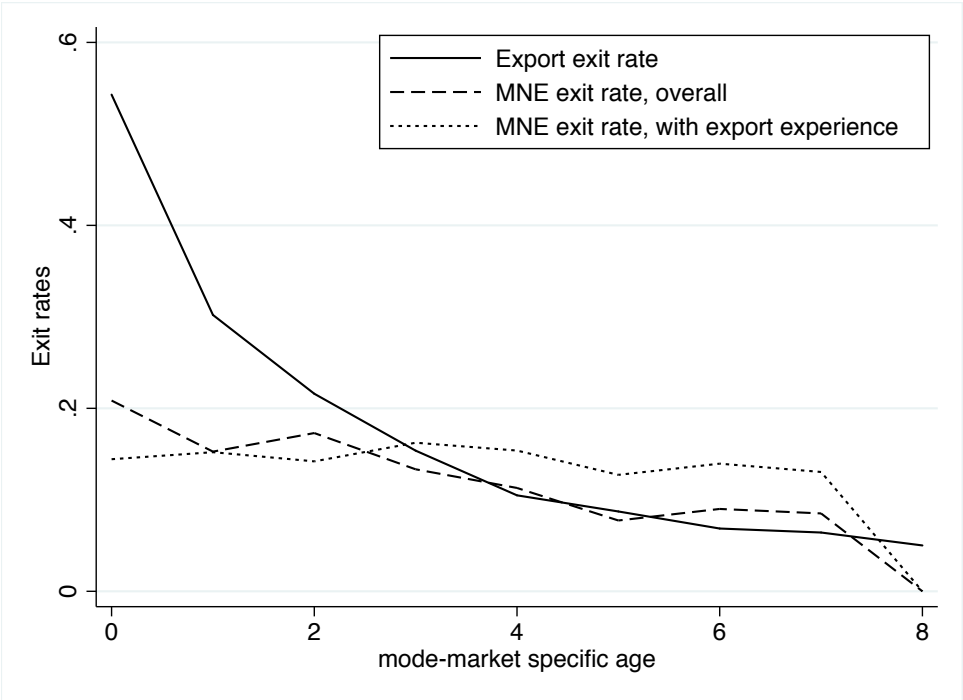
bigksip

Experienced MNEs (% of all MNEs)	Norway	France	France*
Exporting in $t-1$	30	41	39
Exporting at least once in $[t-5, t-1]$	37	41	39
Exporting at some point before MNE entry	39	42	40

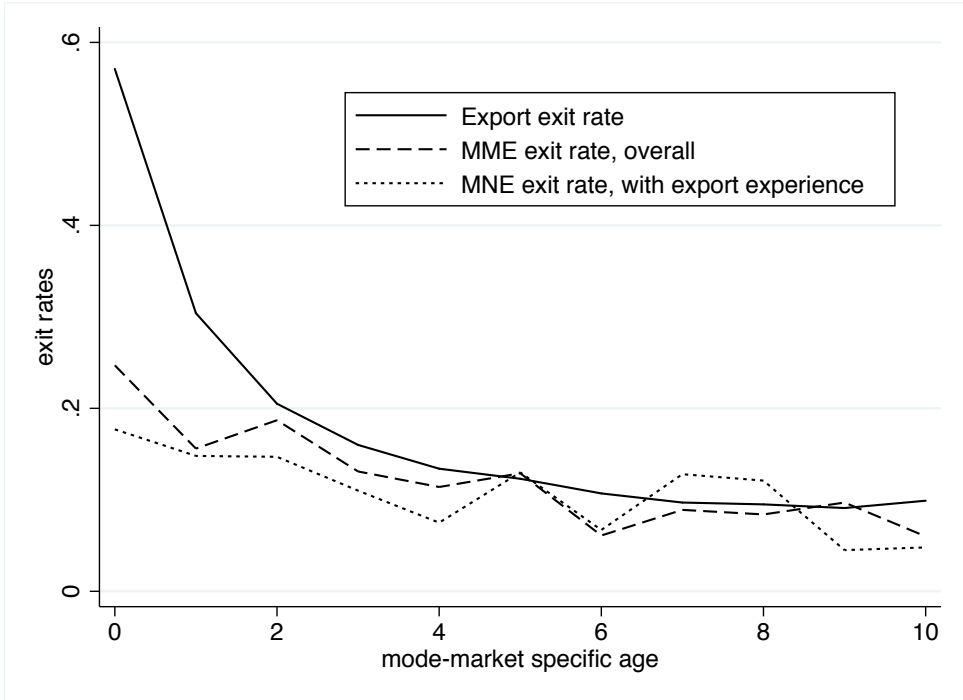
Note: (*) Restricting sample as in Conconi et al. (15). For Belgium: 95%.

I. Exit rates for new MNEs are lower than for new exporters

Firm-destination level. Exit = exit from mode. Age = years in mode. Mode = X,M



(a) Norway



(b) France

- robustness: Firm level, Germany MNEs, Age in market, FDI mode, exit from market, definition of experienced MNE

I. Exit rate regressions

$$Exit_{inmt} = \beta_0\, mne_{int} + \beta_1\, age_{inmt} + \beta_2\, mne_{int} \times age_{inmt}$$
$$+\beta_3\, exp_{inmt} + \beta_4\, mne_{int} \times exp_{inmt} + \alpha_n + \alpha_s + \alpha_t + \epsilon_{inmt}$$

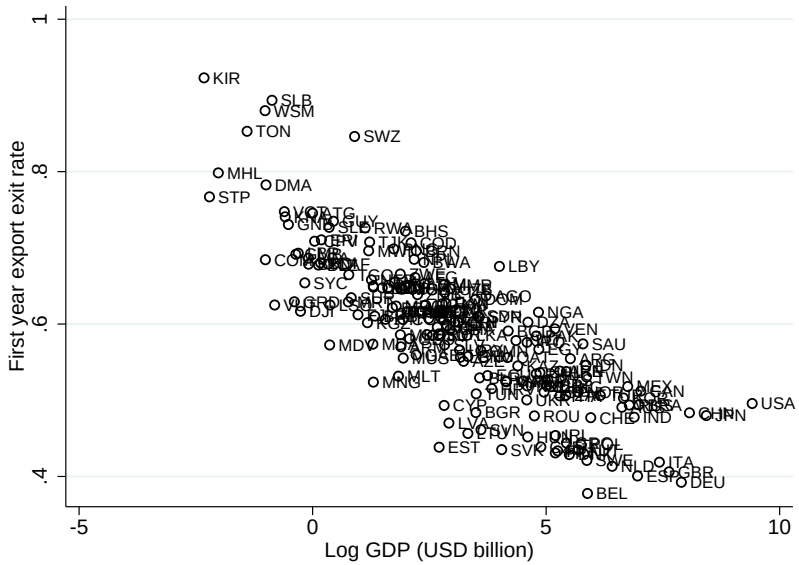
with i: firm, n: destination, m: mode, t: time, s: sector; α: fixed effect

	— Norway —			— France —		
age_{inmt}	-0.044***	-0.044***	-0.042***	-0.072***	-0.072***	-0.055***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)
mne_{in}	-0.22***	-0.23***	-0.21***	-0.29***	-0.28***	-0.22***
	(0.027)	(0.032)	(0.034)	(0.022)	(0.022)	(0.022)
$mne_{in} \times age_{inmt}$	0.026***	0.026***	0.028***	0.048***	0.048***	0.039***
	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.003)
exp_{inm}		-0.063	-0.019		-0.135***	-0.116***
		(0.054)	(0.055)		(0.011)	(0.011)
$exp_{inm} \times mne_{in}$		0.073	0.057		0.109***	0.183***
		(0.064)	(0.065)		(0.014)	(0.018)
log $sales_{it,dom}$			-0.03***			-0.04***
			(0.004)			(0.001)
Observations	114,426	114,426	109,092	2,158,576	2,158,576	925,990
R-squared	0.066	0.066	0.077	0.135	0.120	0.126

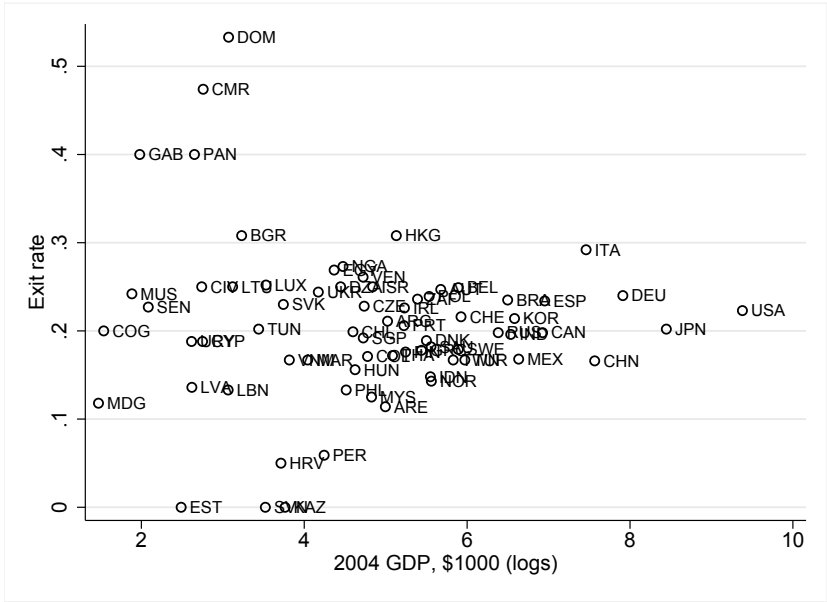
II. Exit rates and market size

First-year export exit rates decrease with market size; MNEs' do not

Firm-destination level. France.



(c) exports



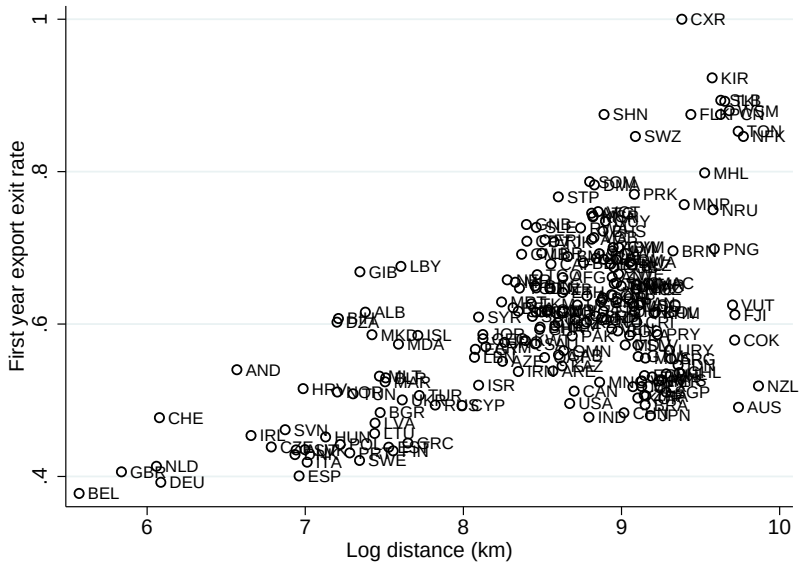
(d) MNEs

- similar pattern for Norway and Germany (MNEs)
- robust to considering the same set of countries across modes

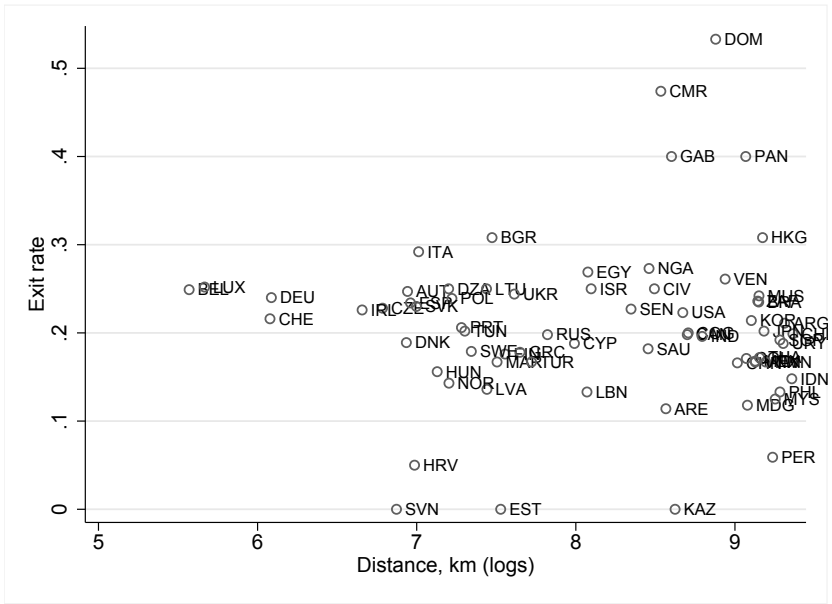
Fact II: Exit rates and distance

First-year export exit rates increase with distance; MNEs' do not

Firm-destination level. France.



(e) exports



(f) MNEs

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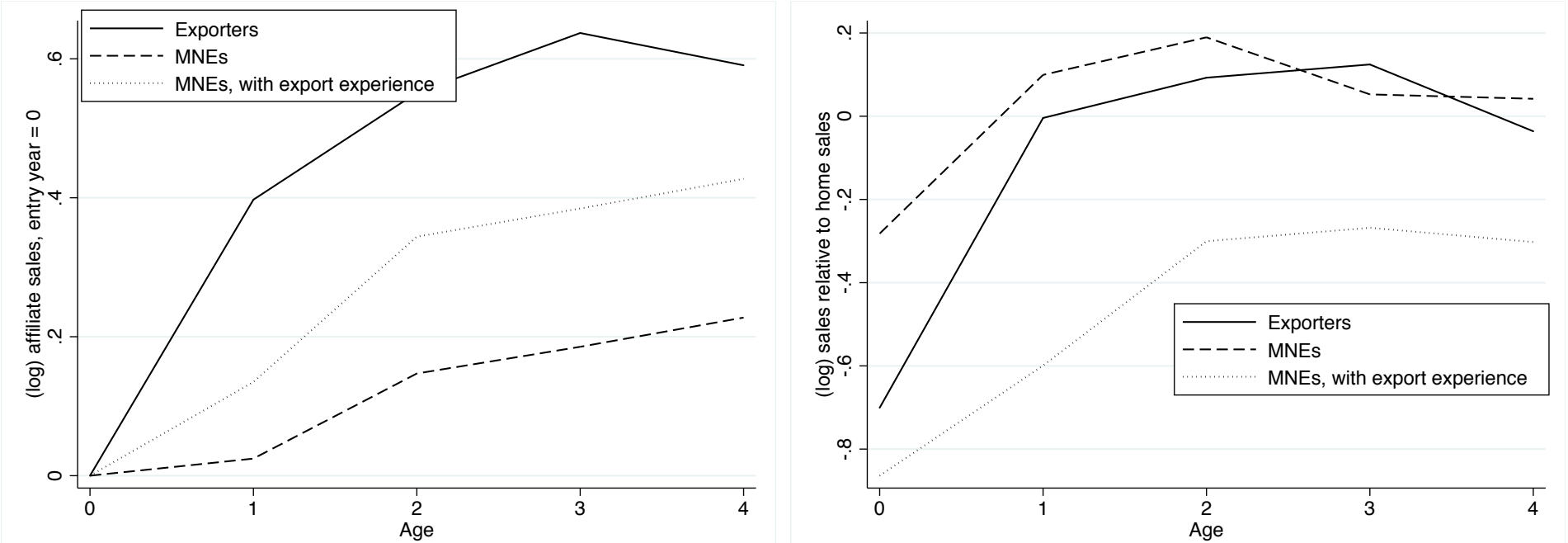
- robust to considering the same set of countries across modes

III. Sales by age flatter for new MNEs than new exporters

Firm-destination level. Norway.



Notes: Sales demeaned by destination, sector, and year fixed effects. Sample of firms that survive for at least 5 years.

(g) relative to entry year

(h) relative to parent sales

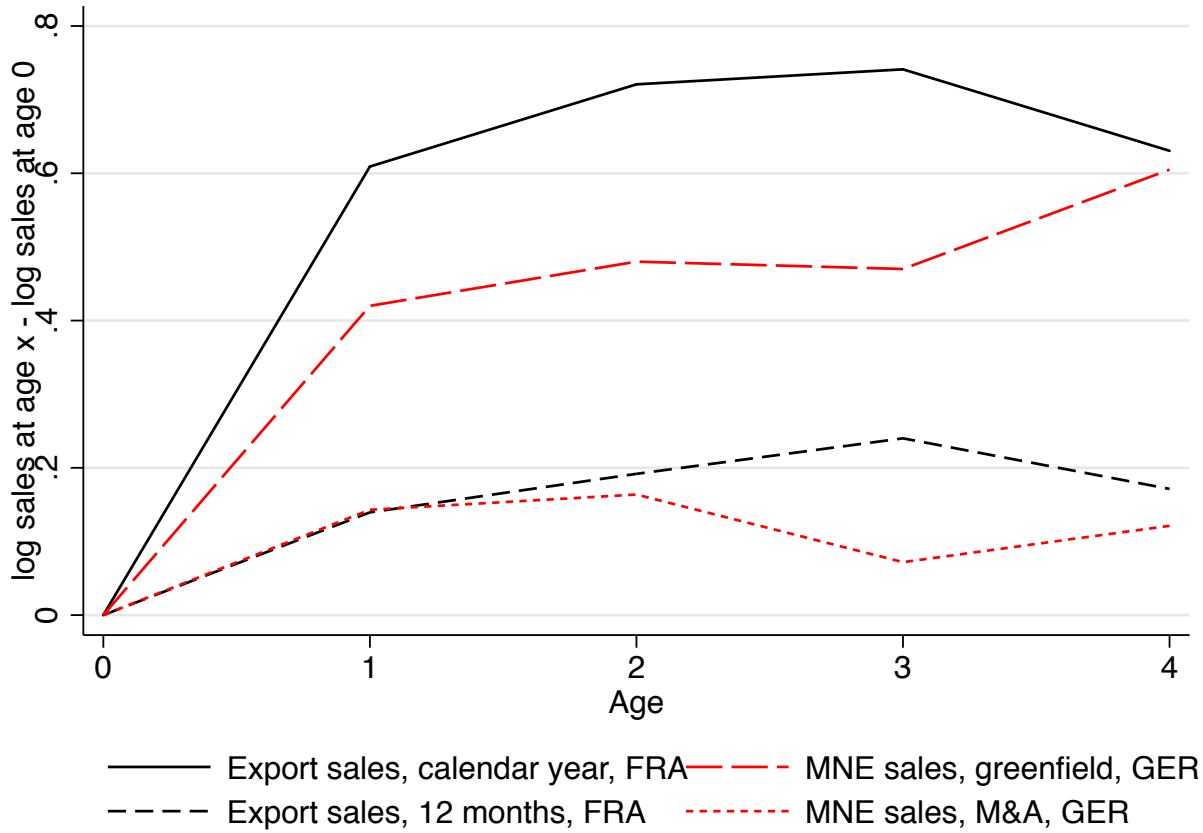
- profile of experienced MNEs is not statistically different from non-experienced MNEs

Regressions | NOR vs. GER vs. FRA | France proxy

III. Sales by age flatter for new MNEs than new exporters?

Corrections for partial year effects

- export sales: use monthly shipments. France
- affiliate sales: use M&A entries. Germany



Sales demeaned by destination, sector and year fixed effects. Sample of firms that survive for at least 5 years.

IV. Domestic Size at Entry and Exit (in progress)

Firm-destination level. Avg log **domestic** sales. France.

$t-1 \setminus t$	Domestic	Exporter	Non-experienced MNE	Experienced MNE
Domestic	7.89	8.88	11.5	12.9
Exporter	8.64	9.41		11.8
Non-experienced MNE	10.7	11.1	12.2	
Experienced MNE	10.1	11.7		12.1

Facts Summary

I. Exit rates are lower for new MNEs than for new exporters
   - new MNEs with previous export experience in a market have the lowest exit rates, but differences are small

II. First-year export exit rates vary with country characteristics;
first-year MNE exit rates do not

III. Life-cycle (adjusted) sales profiles for MNEs and for exporters are similar
   - new MNEs with previous export experience in a market are not different

IV. MNEs are larger domestically at entry than at exit;
exporters are not

Model: Set Up

Helpman, Melitz & Yeaple (2004)

- Two symmetric countries; only labor
- Continuum of firms, monopolistic competition, CES preferences
- Three possible activities: domestic D, exporting X, FDI M
  - per-period fixed costs of exporting f^X and FDI f^M
  - iceberg-type transport costs $\tau \geq 1$
  - assumption: $f^M > \tau^{\sigma-1} f^X$
- Trade-off: High MP fixed cost vs high export marginal cost.

Plus

- Infinite time horizon t=0,1,2, ...
- **Sunk costs of FDI** $f_e^M > 0$
- **Markov productivity process**: $\phi_{\mathbf{t}} = \mathbf{exp}(\mathbf{z_t})$ with

$$z_t = \rho z_{t-1} + \sigma_\epsilon \epsilon_t \qquad 0 < \rho < 1,\ \epsilon_t \sim N(0,1)$$

Dynamics

Endogenous decision on domestic activity/ exporting vs. FDI

- Value function of domestic firm

$$V(\phi, D) = \pi_d(\phi) + \max\{\pi_m(\phi) - wf^m - wf_e^m + \beta EV(\phi', M \mid \phi), \max(0, \pi_x(\phi) - wf^x) + \beta EV(\phi', D \mid \phi)\}$$

- Value function of MNE

$$V(\phi, M) = \pi_d(\phi) + \max\{\pi_m(\phi) - wf^m + \beta EV(\phi', M \mid \phi), \max(0, \pi_x(\phi) - wf^x) + \beta EV(\phi', D \mid \phi)\}$$

$\Rightarrow$ **Three cut-offs**:
cut-off for exporting $\bar{\phi}^X$, cut-off for MNE entry $\bar{\phi}_e^M$, cut-off for MNE exit $\bar{\phi}^M$

Results

1. **Band of inaction**
   - MNEs are more productive than exporters
   - MNEs that enter are more productive than MNEs that exit

$$\bar{\phi}^X < \bar{\phi}^M < \bar{\phi}_e^M$$

2. **Exit rate of experienced MNEs is lower than of non-experienced MNEs**
   - as experienced MNEs are larger when entering, they are less likely to exit

3. **First year exporters' exit rates increase with trade costs; MNEs' do not**

▶ First-year exit numerical

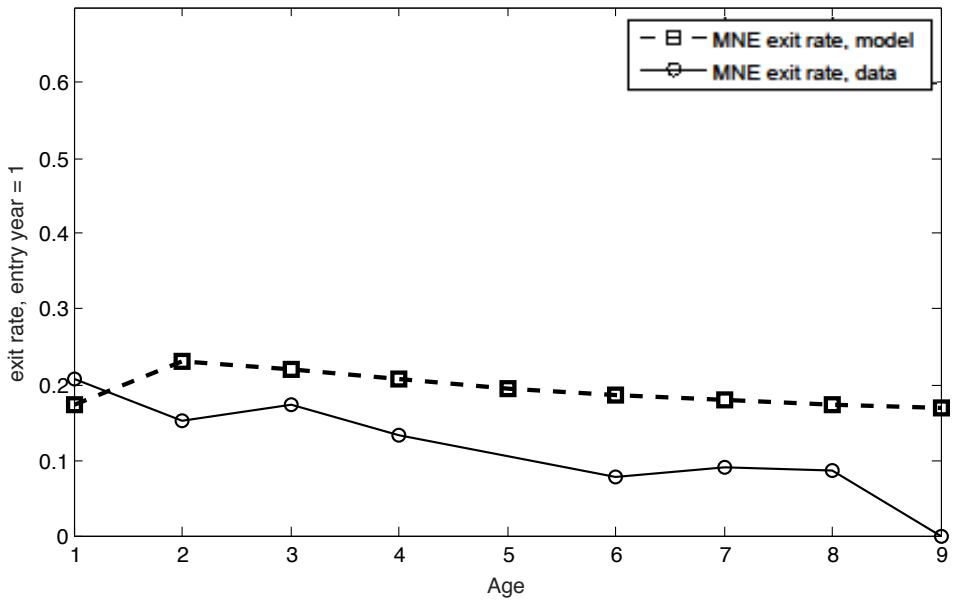
Calibration: Moments (firm-destination level, Norway)

Parameters			**Moments**	
Notation	Value	Description	Description	Value
σ	5	Elasticity of substitution	mark-up	20%
β	0.95	Discount factor	interest rate	5%
τ	1.61	trade iceberg cost	avg export to domestic sales	0.15
ρ	0.966	AR(1) productivity	AR(1) process for domestic	0.966
σ_ϵ	0.095	process	sales (OLS)	0.38
f^x	0.040	export fixed cost	fraction of non-MNE exporters	0.4
f^m	3.9	FDI fixed cost	fraction of MNEs	0.015
f_e^m	2.5	FDI sunk cost	probability of MNE exit at age one	0.21

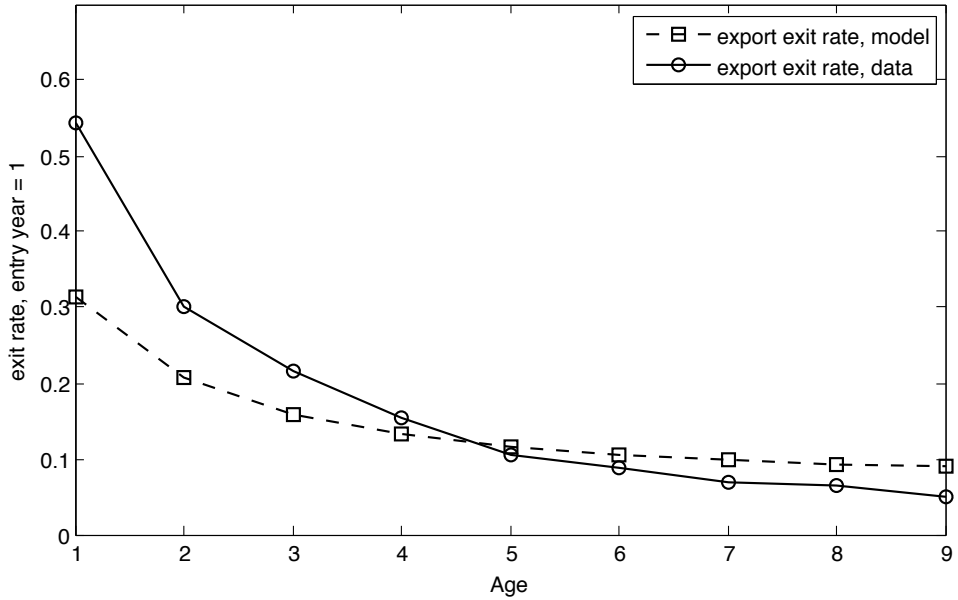
Calibration: Non-targeted moments

Non-targeted moments	data (%)	model (%)
Experienced MNEs (in all MNEs)	39	15
Prob. of export exit at age one	58	31
Prob. of becoming experienced MNE	0.17	0.52
Prob. of becoming non-experienced MNE	0.09	0.00
Prob. of experienced MNE exit at age one	16	13

Calibration: Exit rates

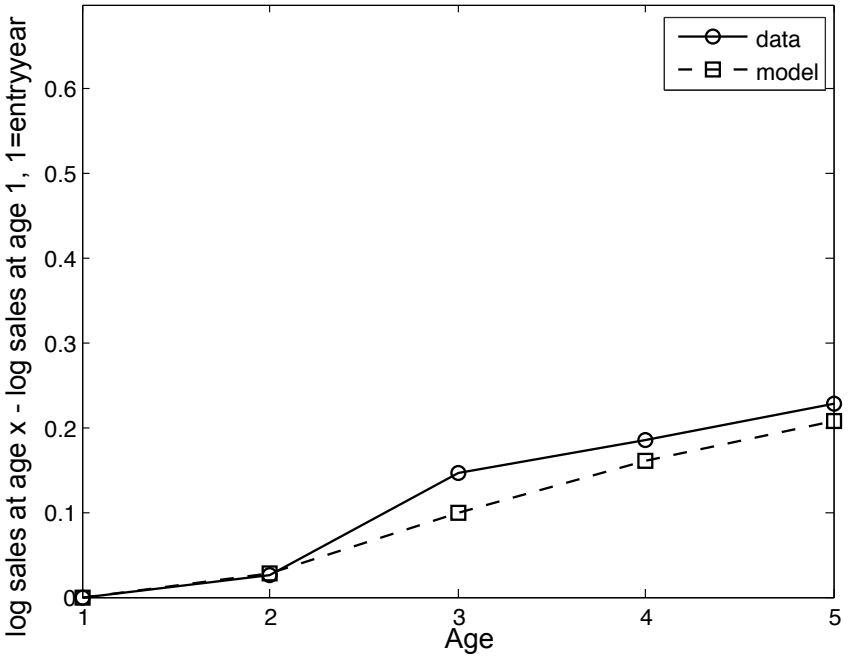


(i) MNEs

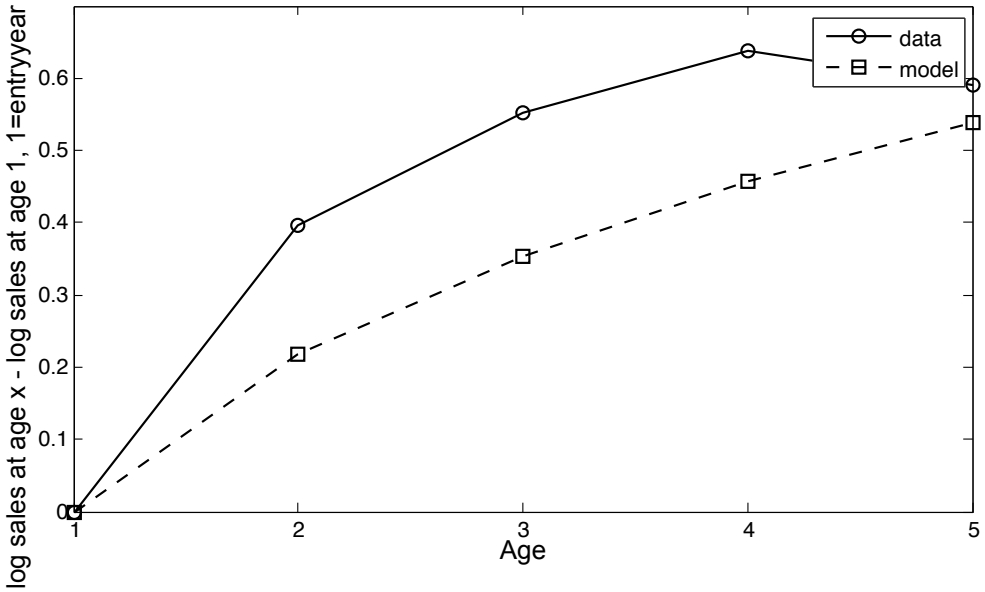


(j) Exports

Calibration: Sales relative to entry year

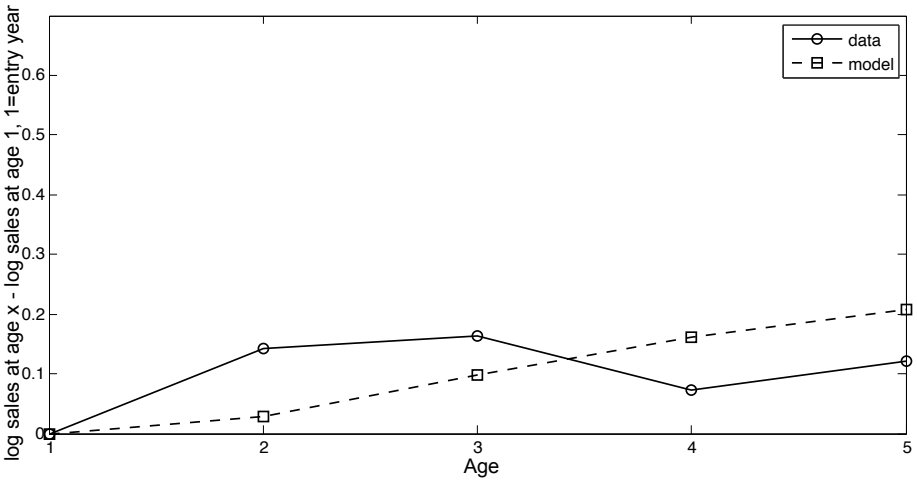


(k) Affiliate sales

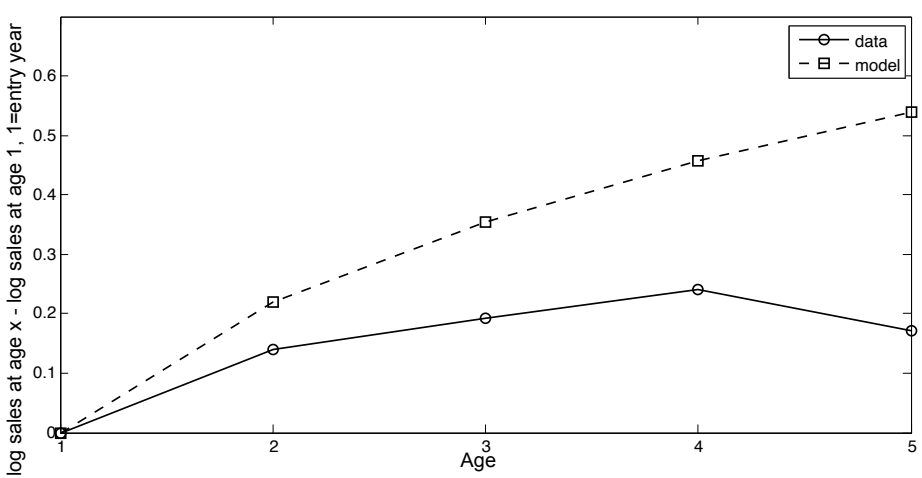


(l) Exports

Calibration: Sales relative to entry year (PYE)



(m) Affiliate sales — data: German M&A



(n) Exports — data: French exporters, 12 mo

Final remarks

- New facts on MNE vs. exporter dynamics
  - lower exit rates for new MNEs than of new exporters
  - after adjustment for partial-year effects, life-cycle sales profiles are similar
  - experienced MNEs do not seem that different in those dimensions
- Model with sunk costs, but no learning, captures salient facts fairly well
- Role for sunk costs of FDI ... What is the role for learning?

Data sources

1. **Norway.**
   - Capital Database from Statistics Norway:
     balance sheet information for manufacturing sector
   - Customs declarations: exports by destination
   - Foreign Company Report from Directorate of Taxes: foreign affiliates

2. **France.**
   - Ficus/Fare: balance sheet information
   - Customs declarations: exports by destination
   - Lifi: location of foreign affiliates

   Only manufacturing firms.

3. **Germany, 1999-2011.**
   Microdatabase Direct investment (MiDi).
   Only manufacturing firms.

Summary statistics

1. **Norway.**

Full sample	MNE	X	D
% firms, 2005	0.015	0.395	0.59
% employment, 2005	0.13	0.67	0.20

Exporters & MNEs	Mean	Median	Max
# markets, MNEs	4.6	2	29
# markets, Exporters	6.9	3	115

Export-experienced MNEs: 33% of MNEs, 39% of MNE-country pairs.

2. **France.**

Full sample	MNE	X	D
% firms, 2005	XX	XX	XX
% employment, 2005	XX	XX	XX

Exporters & MNEs	Mean	Median	Max
# markets, MNEs	4.1	2	>84
# markets, Exporters	5.3	2	>158

3. **Germany.**

MNEs	Mean	Median	Max
# markets	3.3	1	72

back

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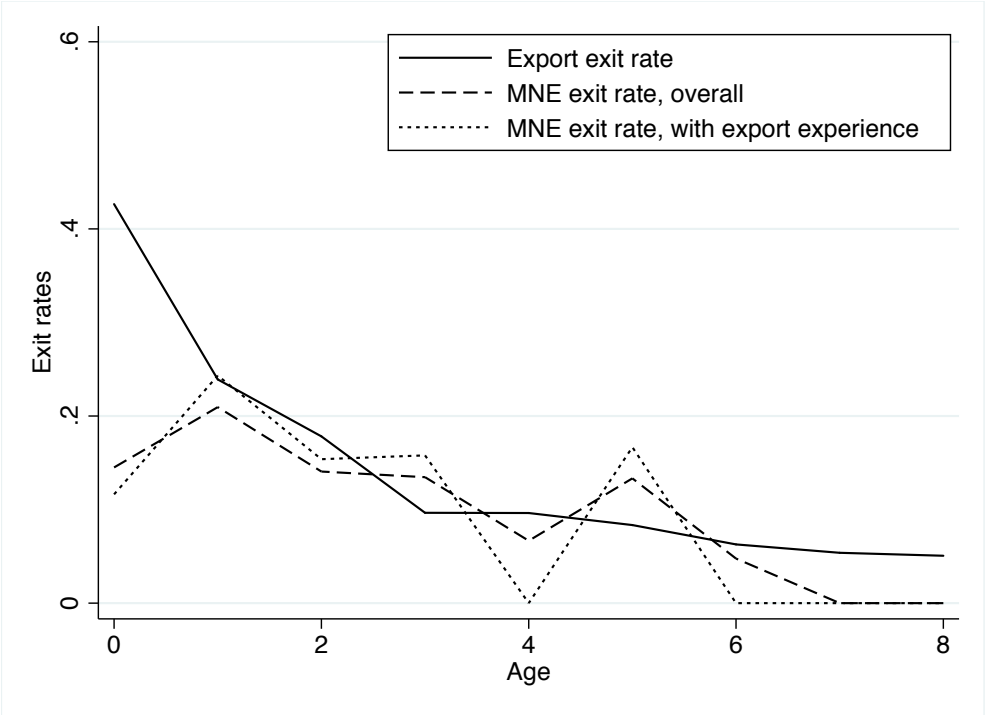
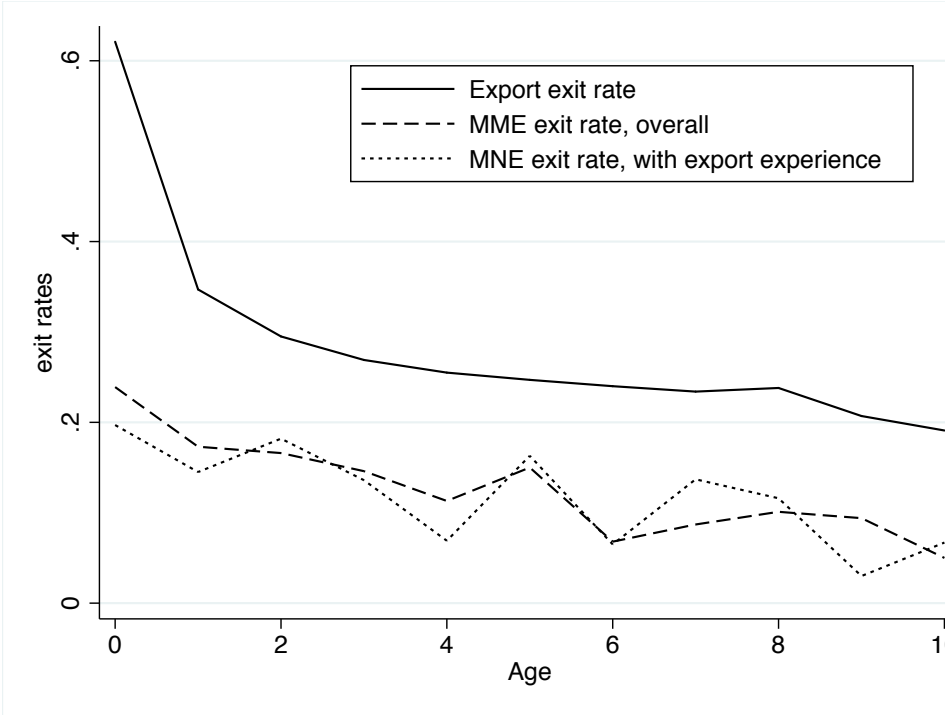
Firm level. Exit = exit from mode. Age = years in mode.



(o) Norway



(p) France

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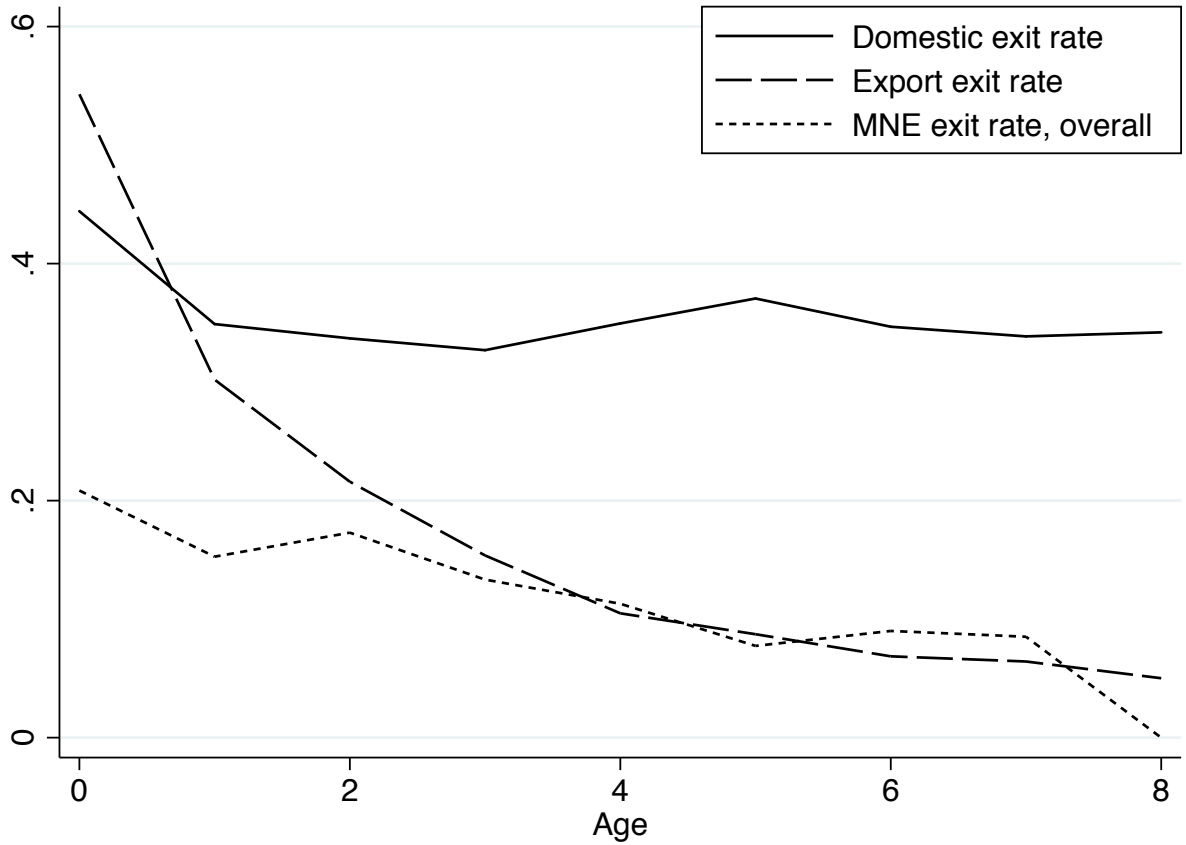
Firm-destination level. Norway. Domestic firms.



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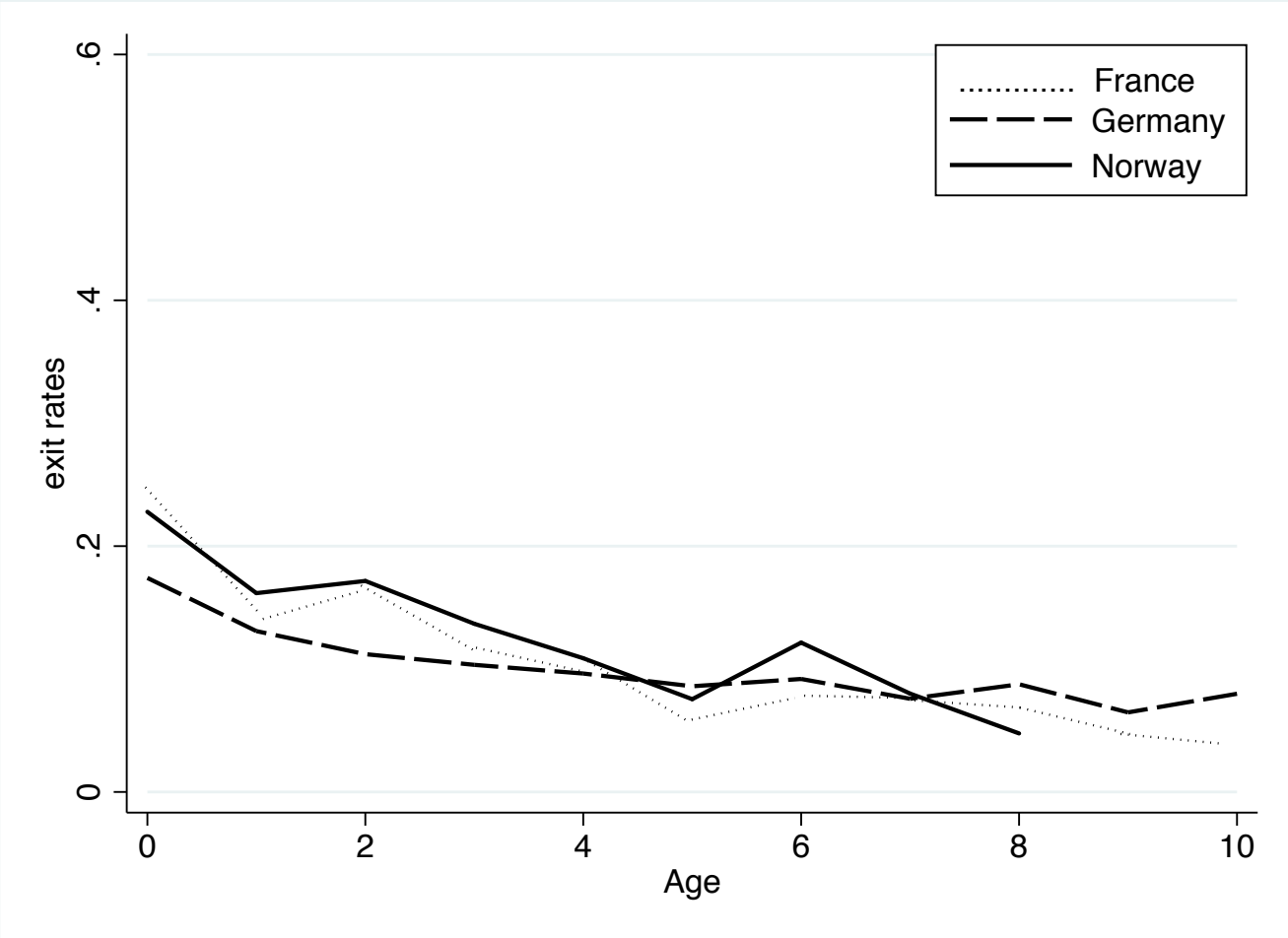

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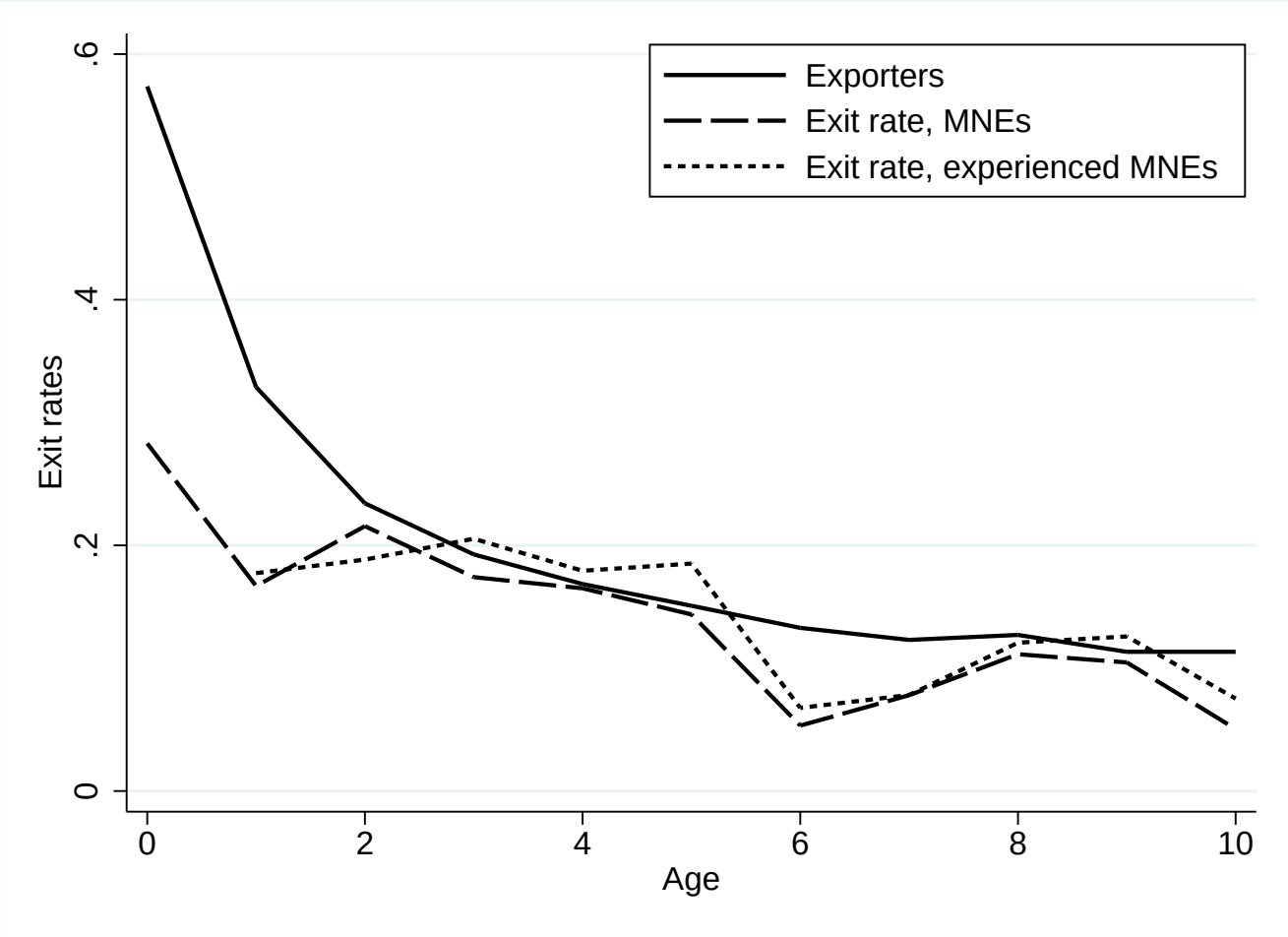
I. Exit rates are lower for new MNEs than for new exporters

Firm-destination level. France. Exit = exit from mode. Age = years in market.



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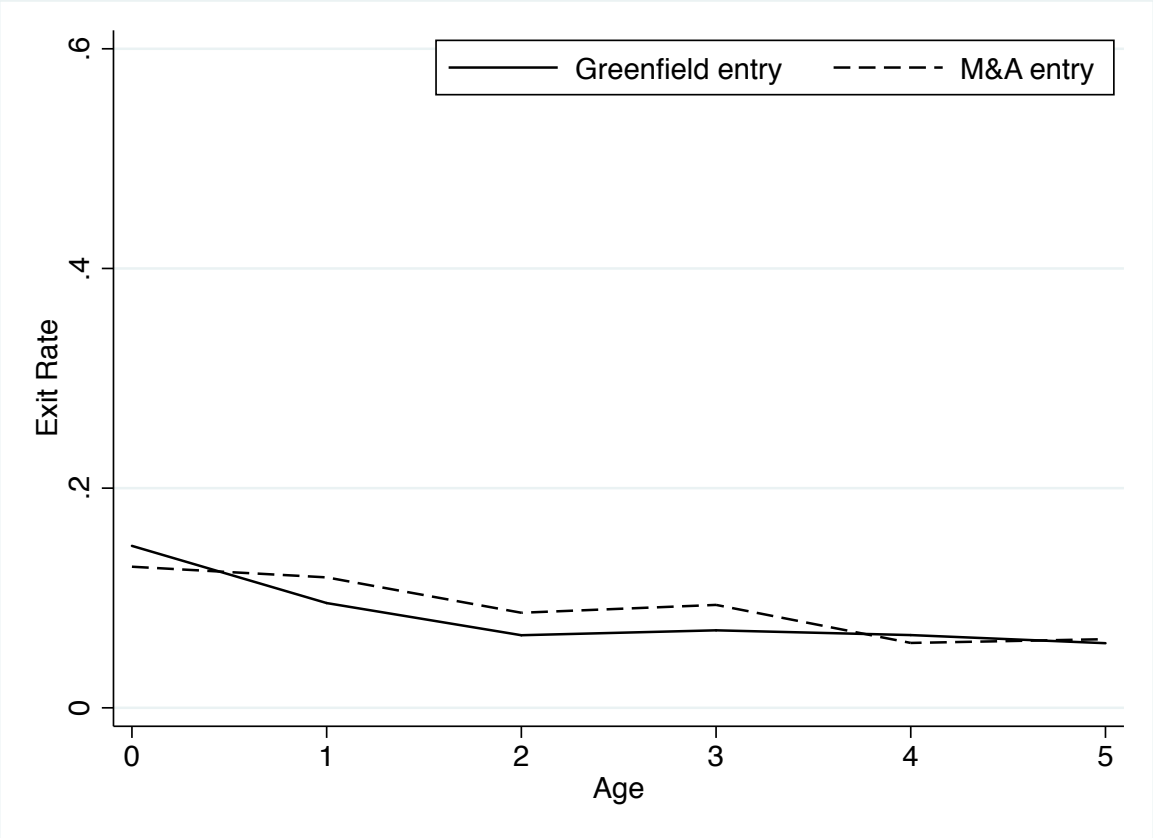
Firm-destination level. Germany. Exit = exit from mode. Age = years in mode.



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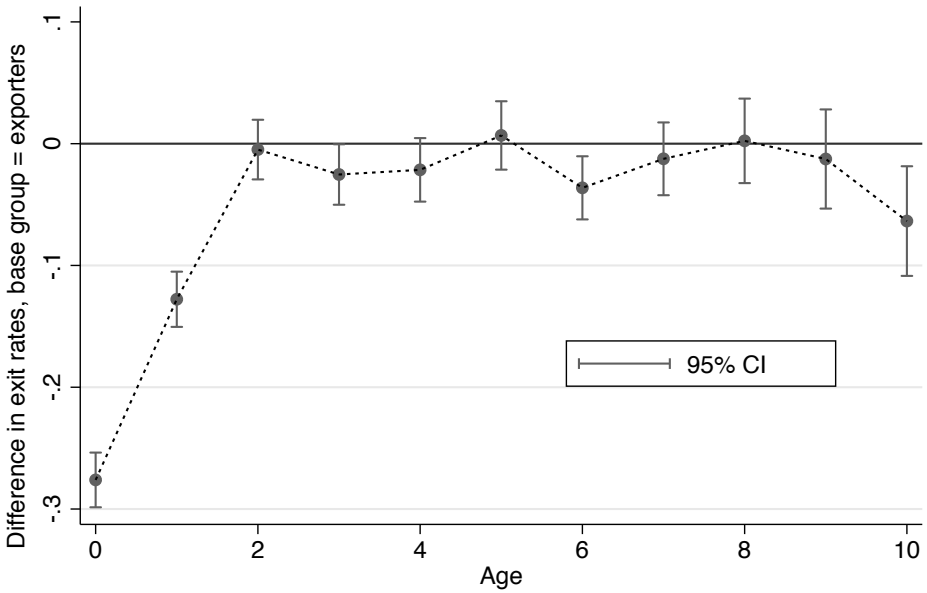
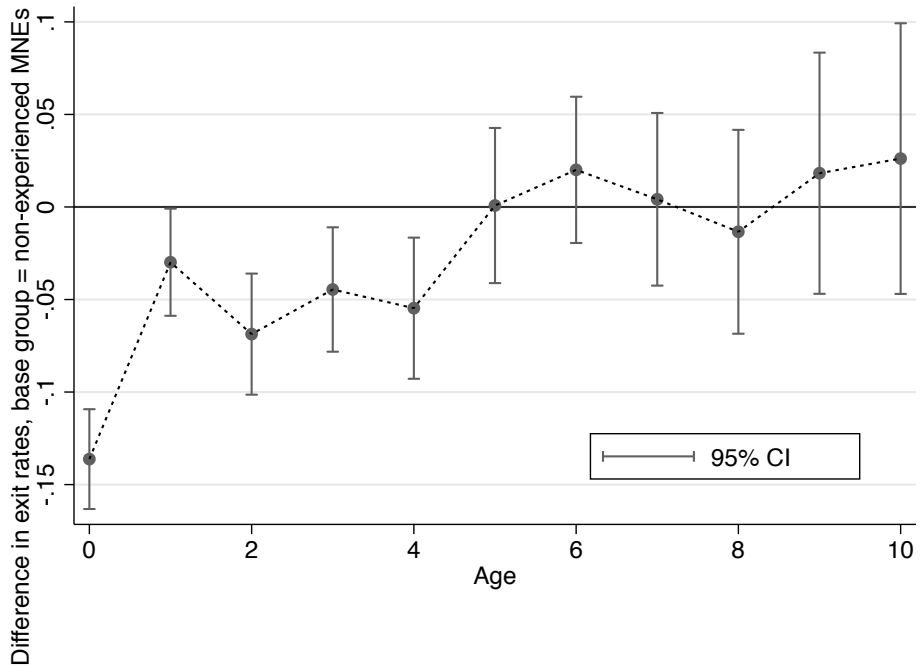


(q) MNEs vs Exporters



(r) Experienced vs Non-experienced MNEs

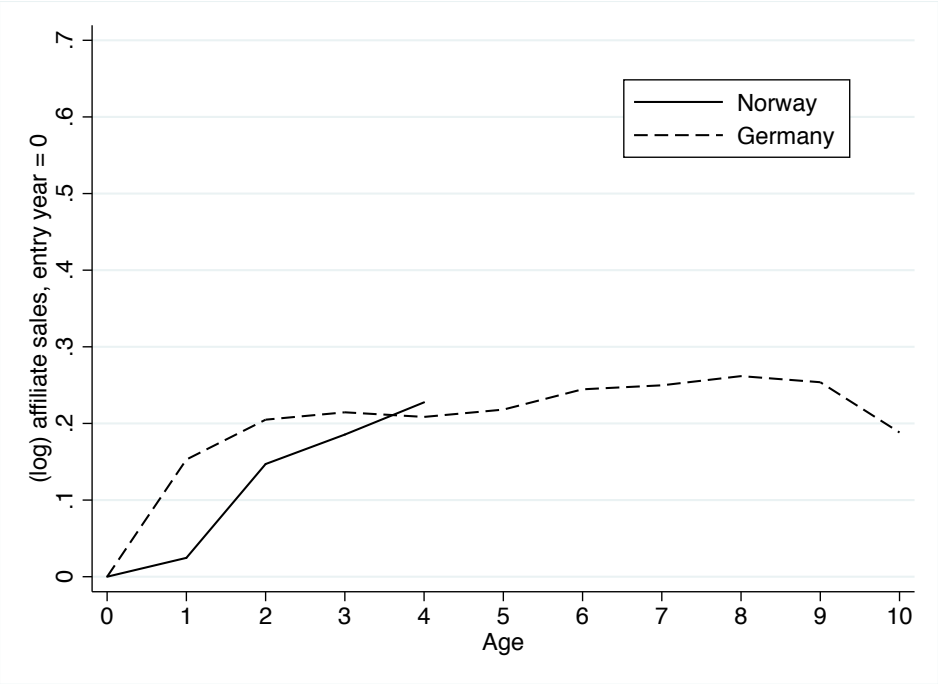
back

II. Life-cycle sales regressions. Norway

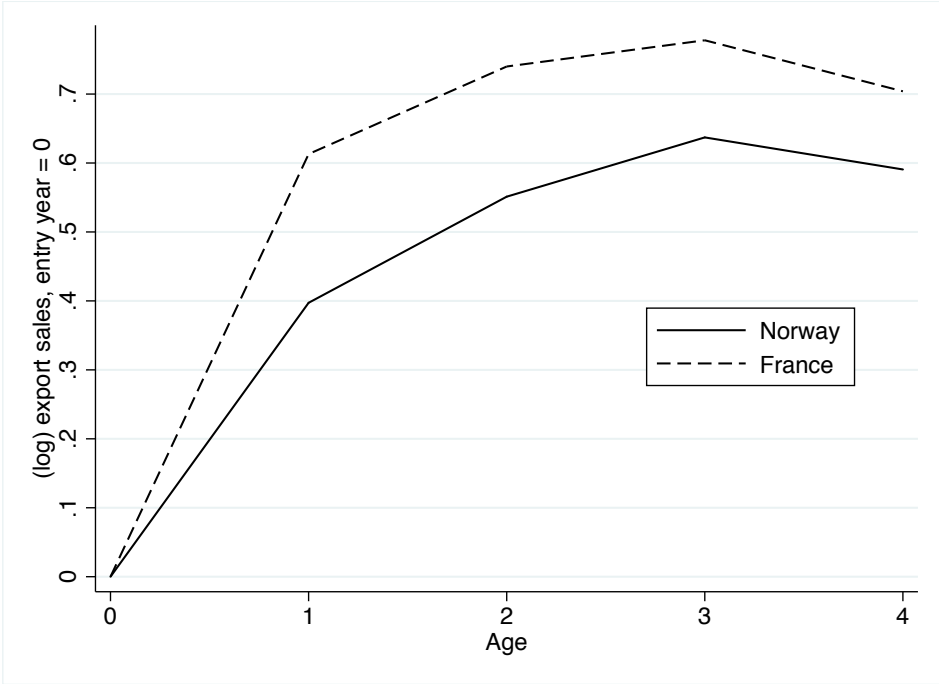
Dep variable	$\log s_{inm,t} - \log s_{inm,t-1}$			$\log s_{im,t} - \log s_{im,t-1}$		
mne_{in}	-0.064**	-0.071	-0.132**			
	(0.032)	(0.065)	(0.065)			
age_{inmt}	-0.04**	-0.040***	-0.041***			
	(0.006)	(0.006)	(0.006)			
$mne_{in} \times age_{inmt}$		0.002	0.006			
		(0.014)	(0.016)			
exp_{inm}			-0.039			
			(0.110)			
$mne_{in} \times exp_{inm}$			0.301			
			(0.135)			
mne_{i}				-0.28***	-0.32***	-0.38***
				(0.042)	(0.098)	(0.089)
age_{imt}				-0.042***	-0.042***	-0.045***
				(0.007)	(0.007)	(0.007)
$mne_{i} \times age_{imt}$				0.042**	0.040*	0.049**
				(0.021)	(0.022)	(0.023)
exp_{im}					-0.039	-0.058
					(0.489)	(0.481)
$mne_{i} \times exp_{im}$					0.016	0.196
					(0.501)	(0.496)
$\log sales_{it,nor}$			0.017**			0.029***
			(0.001)			(0.008)
Observations	67,987	67,987	67,987	9,507	9,507	9,333
R-squared	0.0053	0.0053	0.0054	0.0045	0.0046	0.0058

back

II. Life-cycle sale profiles: Norway, Germany, and France



(s) affiliate sales

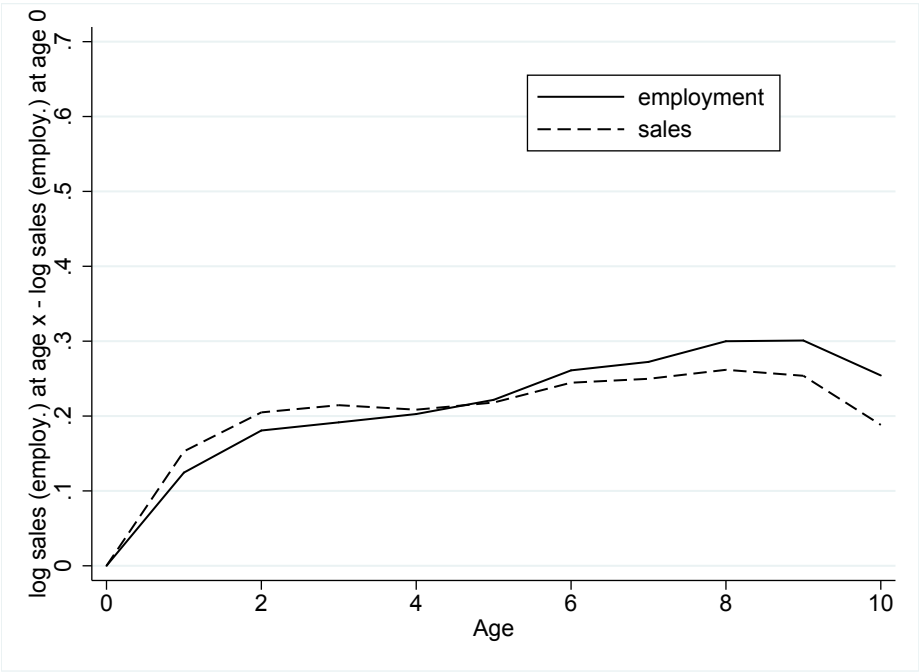


(t) exports

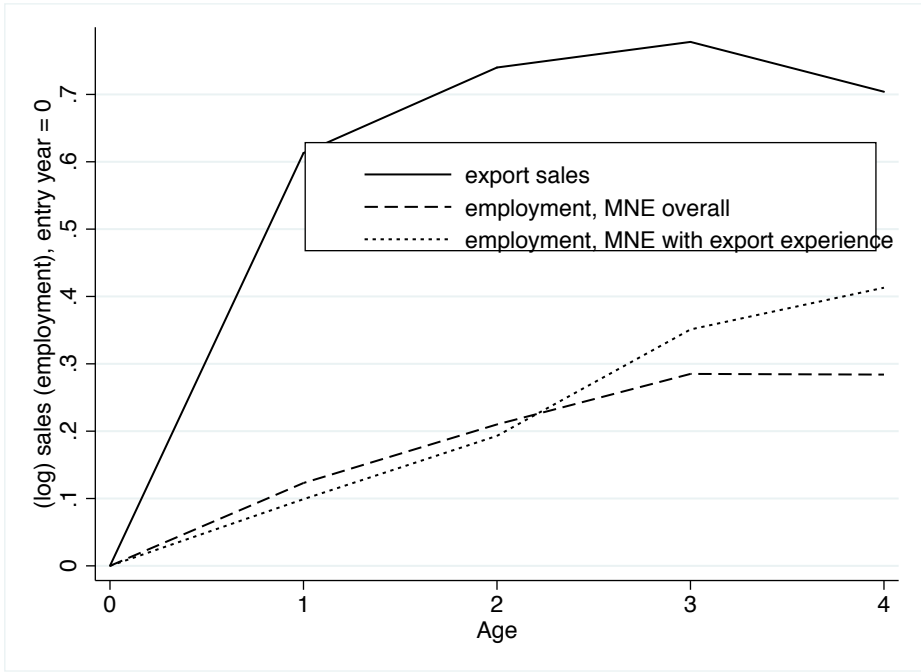
back

III. Sales by age flatter for new MNEs than new exporters

Firm-destination level. Sales vs. employment.



(u) Germany MNEs

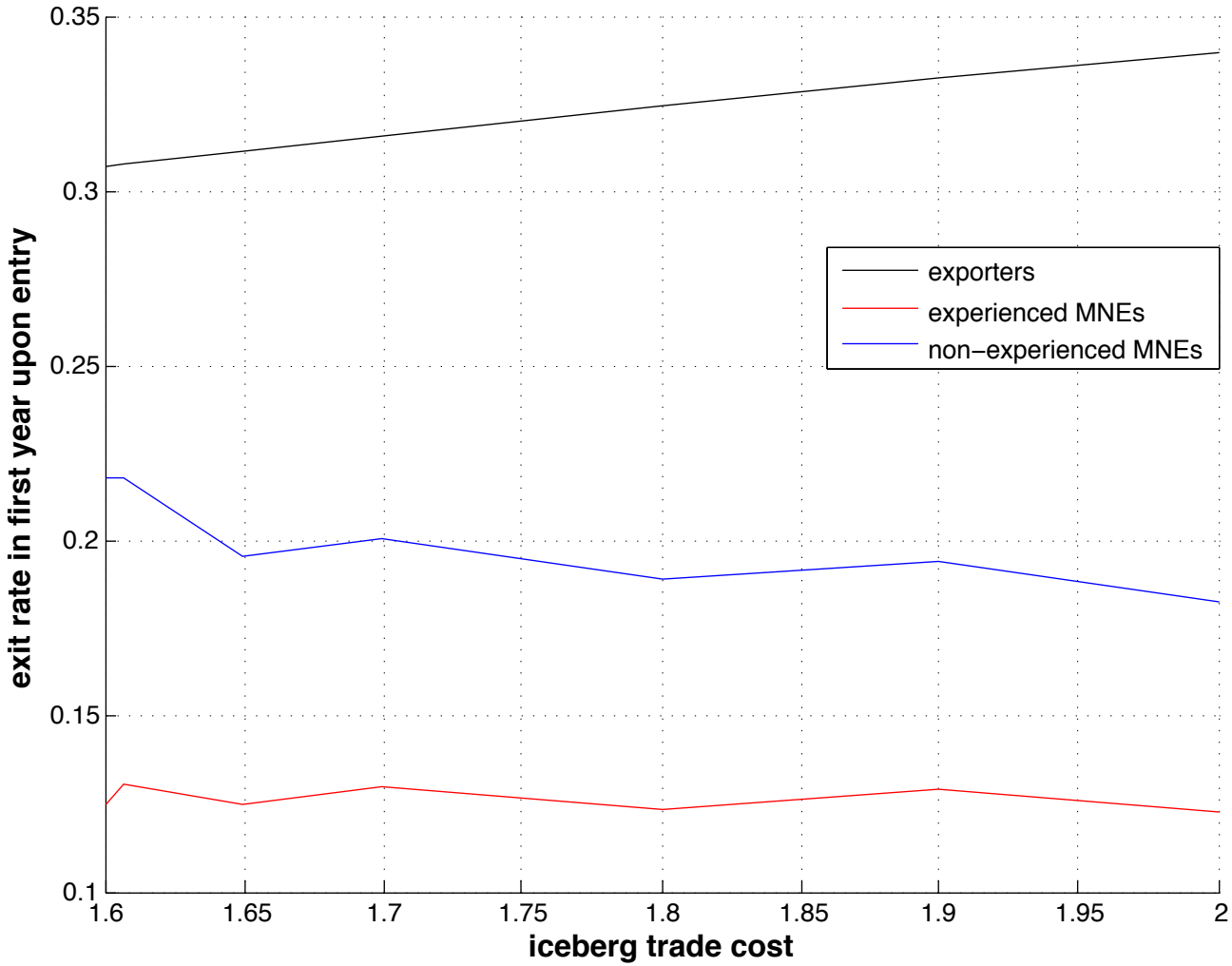


(v) France

Sales/employment demeaned by destination, sector, and year fixed effects.

back

Numerical exercise: variation in transport costs



back