Multinational Firms and Export (Life-Cycle) Dynamics

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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
This paper

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- **Findings**
  1. Exit rates upon entry are twice as high for new exporters than new MNEs
     - export experience seems to convey a modest advantage
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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?
Literture

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 & Oprimolla (13), Liu (14), Ruhl & Willis (13);

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
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

<table>
<thead>
<tr>
<th>Experienced MNEs (% of all MNEs)</th>
<th>Norway</th>
<th>France</th>
<th>France*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exporting in $t - 1$</td>
<td>30</td>
<td>41</td>
<td>39</td>
</tr>
<tr>
<td>Exporting at least once in $[t - 5, t - 1]$</td>
<td>37</td>
<td>41</td>
<td>39</td>
</tr>
<tr>
<td>Exporting at some point before MNE entry</td>
<td>39</td>
<td>42</td>
<td>40</td>
</tr>
</tbody>
</table>

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

![Graphs showing exit rates for Norway and France](image)

- robustness: Firm level, Germany MNEs, Age in market, FDI mode, exit from market, definition of experienced MNE
I. Exit rate regressions

\[
\text{Exit}_{inmt} = \beta_0 \text{mne}_{int} + \beta_1 \text{age}_{inmt} + \beta_2 \text{mne}_{int} \times \text{age}_{inmt} \\
+ \beta_3 \text{exp}_{inmt} + \beta_4 \text{mne}_{int} \times \text{exp}_{inmt} + \alpha_n + \alpha_s + \alpha_t + \epsilon_{inmt}
\]

with \(i\): firm, \(n\): destination, \(m\): mode, \(t\): time, \(s\): sector; \(\alpha\): fixed effect

<table>
<thead>
<tr>
<th></th>
<th>— Norway —</th>
<th>— France —</th>
</tr>
</thead>
<tbody>
<tr>
<td>\text{age}_{inmt}</td>
<td>-0.044***</td>
<td>-0.044***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>\text{mne}_{in}</td>
<td>-0.22***</td>
<td>-0.23***</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>\text{mne}<em>{in} \times \text{age}</em>{inmt}</td>
<td>0.026***</td>
<td>0.026***</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>\text{exp}_{inm}</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.054)</td>
<td>(0.055)</td>
</tr>
<tr>
<td>\text{exp}<em>{inm} \times \text{mne}</em>{in}</td>
<td>0.073</td>
<td>0.057</td>
</tr>
<tr>
<td></td>
<td>(0.064)</td>
<td>(0.065)</td>
</tr>
<tr>
<td>\text{log sales}_{it, dom}</td>
<td>-0.03***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td></td>
</tr>
</tbody>
</table>

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.

- 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.

- similar pattern for Norway and Germany (MNEs)
- 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.

![Graphs showing sales trend by age for Exporters, MNEs, and MNEs with export experience.](image)

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
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)


<table>
<thead>
<tr>
<th>$t-1 \backslash t$</th>
<th>Domestic</th>
<th>Exporter</th>
<th>Non-experienced MNE</th>
<th>Experienced MNE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>7.89</td>
<td>8.88</td>
<td>11.5</td>
<td>12.9</td>
</tr>
<tr>
<td>Exporter</td>
<td>8.64</td>
<td>9.41</td>
<td></td>
<td>11.8</td>
</tr>
<tr>
<td>Non-experienced MNE</td>
<td>10.7</td>
<td>11.1</td>
<td>12.2</td>
<td></td>
</tr>
<tr>
<td>Experienced MNE</td>
<td>10.1</td>
<td>11.7</td>
<td></td>
<td>12.1</td>
</tr>
</tbody>
</table>
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.
- Infinite time horizon \( t=0,1,2, \ldots \)
- **Sunk costs of FDI** \( f_e^M > 0 \)
- **Markov productivity process:** \( \phi_t = \exp(z_t) \) with

\[
  z_t = \rho z_{t-1} + \sigma \epsilon_t \quad 0 < \rho < 1, \epsilon_t \sim N(0,1)
\]
Dynamics

**Endogenous decision** on domestic activity/ exporting vs. FDI

- Value function of domestic firm

\[
V(\phi, D) = \pi_d(\phi) + \max \left\{ \pi_m(\phi) - wf^m - wf_e^m + \beta EV(\phi', M | \phi), \right. \\
\left. \max (0, \pi_x(\phi) - wf^x) + \beta EV(\phi', D | \phi) \right\}
\]

- Value function of MNE

\[
V(\phi, M) = \pi_d(\phi) + \max \left\{ \pi_m(\phi) - wf^m + \beta EV(\phi', M | \phi), \right. \\
\left. \max (0, \pi_x(\phi) - wf^x) + \beta EV(\phi', D | \phi) \right\}
\]

⇒ **Three cut-offs:**

- cut-off for exporting \( \phi^X \), cut-off for MNE entry \( \phi^M_e \), cut-off for MNE exit \( \phi^M \)
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**
## Calibration: Moments (firm-destination level, Norway)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Notation</th>
<th>Value</th>
<th>Description</th>
<th>Moments</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>mark-up</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>interest rate</td>
<td>5%</td>
</tr>
<tr>
<td>$\sigma$</td>
<td></td>
<td>5</td>
<td>Elasticity of substitution</td>
<td>$\beta$</td>
<td>Discount factor</td>
<td>0.95</td>
</tr>
<tr>
<td>$\beta$</td>
<td></td>
<td>0.95</td>
<td>Discount factor</td>
<td>$\tau$</td>
<td>trade iceberg cost</td>
<td>1.61</td>
</tr>
<tr>
<td>$\tau$</td>
<td></td>
<td>1.61</td>
<td>trade iceberg cost</td>
<td>$\rho$</td>
<td>AR(1) productivity</td>
<td>0.966</td>
</tr>
<tr>
<td>$\rho$</td>
<td></td>
<td>0.966</td>
<td>AR(1) productivity</td>
<td>$\sigma_\epsilon$</td>
<td>process</td>
<td>0.095</td>
</tr>
<tr>
<td>$\sigma_\epsilon$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>avg export to domestic sales</td>
<td>0.15</td>
</tr>
<tr>
<td>$\sigma_\epsilon$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AR(1) process for domestic sales (OLS)</td>
<td>0.966</td>
</tr>
<tr>
<td>$\epsilon$</td>
<td></td>
<td>0.095</td>
<td>process</td>
<td></td>
<td></td>
<td>0.38</td>
</tr>
<tr>
<td>$f^x$</td>
<td></td>
<td>0.040</td>
<td>export fixed cost</td>
<td></td>
<td>fraction of non-MNE exporters</td>
<td>0.4</td>
</tr>
<tr>
<td>$f^m$</td>
<td></td>
<td>3.9</td>
<td>FDI fixed cost</td>
<td></td>
<td>fraction of MNEs</td>
<td>0.015</td>
</tr>
<tr>
<td>$f^m_e$</td>
<td></td>
<td>2.5</td>
<td>FDI sunk cost</td>
<td></td>
<td>probability of MNE exit at age one</td>
<td>0.21</td>
</tr>
</tbody>
</table>
Calibration: Non-targeted moments

<table>
<thead>
<tr>
<th>Non-targeted moments</th>
<th>data (%)</th>
<th>model (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experienced MNEs (in all MNEs)</td>
<td>39</td>
<td>15</td>
</tr>
<tr>
<td>Prob. of export exit at age one</td>
<td>58</td>
<td>31</td>
</tr>
<tr>
<td>Prob. of becoming experienced MNE</td>
<td>0.17</td>
<td>0.52</td>
</tr>
<tr>
<td>Prob. of becoming non-experienced MNE</td>
<td>0.09</td>
<td>0.00</td>
</tr>
<tr>
<td>Prob. of experienced MNE exit at age one</td>
<td>16</td>
<td>13</td>
</tr>
</tbody>
</table>
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.**

<table>
<thead>
<tr>
<th></th>
<th>MNE</th>
<th>X</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full sample</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% firms, 2005</td>
<td>0.015</td>
<td>0.395</td>
<td>0.59</td>
</tr>
<tr>
<td>% employment, 2005</td>
<td>0.13</td>
<td>0.67</td>
<td>0.20</td>
</tr>
</tbody>
</table>

**Exporters & MNEs**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td># markets, MNEs</td>
<td>4.6</td>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td># markets, Exporters</td>
<td>6.9</td>
<td>3</td>
<td>115</td>
</tr>
</tbody>
</table>

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

2. **France.**

<table>
<thead>
<tr>
<th></th>
<th>MNE</th>
<th>X</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full sample</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% firms, 2005</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
</tr>
<tr>
<td>% employment, 2005</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
</tr>
</tbody>
</table>

**Exporters & MNEs**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td># markets, MNEs</td>
<td>4.1</td>
<td>2</td>
<td>&gt;84</td>
</tr>
<tr>
<td># markets, Exporters</td>
<td>5.3</td>
<td>2</td>
<td>&gt;158</td>
</tr>
</tbody>
</table>

3. **Germany.**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNEs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># markets</td>
<td>3.3</td>
<td>1</td>
<td>72</td>
</tr>
</tbody>
</table>
I. Exit rates are lower for new MNEs than for new exporters

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

(o) Norway

(p) France
I. Exit rates are lower for new MNEs than for new exporters


![Graph showing exit rates over age for Domestic, Export, and MNE firms. The graph demonstrates that exit rates decrease with age for all categories, with MNE exit rates consistently lower than Export and Domestic exit rates.]
I. Exit rates are lower for new MNEs than for new exporters

Firm-destination level. MNEs. Exit = exit from mode. Age = years in mode.
I. Exit rates are lower for new MNEs than for new exporters

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

![Graph showing exit rates for exporters, MNEs, and experienced MNEs over age.]
I. Exit rates are lower for new MNEs than for new exporters

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

![Graph showing exit rates for Greenfield and M&A entry methods over age.]

Gumpert, Moxnes, Ramondo, Tintelnot
I. Exit rates are lower for new MNEs than for new exporters

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

\[(q)\] MNEs vs Exporters

\[(r)\] Experienced vs Non-experienced MNEs
II. Life-cycle sales regressions. Norway

<table>
<thead>
<tr>
<th>Dep variable</th>
<th>( \log s_{inm,t} - \log s_{inm,t-1} )</th>
<th>( \log s_{im,t} - \log s_{im,t-1} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( mne_{in} )</td>
<td>(-0.064^{**}) (0.032)</td>
<td>(-0.132^{**}) (0.065)</td>
</tr>
<tr>
<td>( age_{inmt} )</td>
<td>(-0.04^{**}) (0.006)</td>
<td>(-0.041^{***}) (0.006)</td>
</tr>
<tr>
<td>( mne_{in} \times age_{inmt} )</td>
<td>0.002 (0.014)</td>
<td>0.006 (0.016)</td>
</tr>
<tr>
<td>( exp_{inm} )</td>
<td></td>
<td>-0.039 (0.110)</td>
</tr>
<tr>
<td>( mne_{in} \times exp_{inm} )</td>
<td>0.301 (0.135)</td>
<td></td>
</tr>
<tr>
<td>( mne_{i} )</td>
<td>(-0.28^{***}) (0.042)</td>
<td>(-0.32^{***}) (0.098)</td>
</tr>
<tr>
<td>( age_{imt} )</td>
<td>(-0.042^{***}) (0.007)</td>
<td>(-0.042^{***}) (0.007)</td>
</tr>
<tr>
<td>( mne_{i} \times age_{imt} )</td>
<td>0.042^{**} (0.021)</td>
<td>0.040^{*} (0.022)</td>
</tr>
<tr>
<td>( exp_{im} )</td>
<td></td>
<td>-0.039 (0.489)</td>
</tr>
<tr>
<td>( mne_{i} \times exp_{im} )</td>
<td>0.016 (0.501)</td>
<td>0.196 (0.496)</td>
</tr>
<tr>
<td>( \log sales_{it,nor} )</td>
<td>0.017^{**} (0.001)</td>
<td>0.020^{***} (0.008)</td>
</tr>
</tbody>
</table>

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

(s) affiliate sales

(t) exports
III. Sales by age flatter for new MNEs than new exporters

Firm-destination level. Sales vs. employment.

(u) Germany MNEs

Sales/employment demeaned by destination, sector, and year fixed effects.
Numerical exercise: variation in transport costs

- Iceberg trade cost
- Exit rate in first year upon entry
- Exporters
- Experienced MNEs
- Non-experienced MNEs

Gumpert, Moxnes, Ramondo, Tintelnot
Multinational Firms and Export Dynamics
07/02/2016