Exporters’ and Multinational Firms’ Life-cycle Dynamics∗

Anna Gumpert Andreas Moxnes Natalia Ramondo Felix Tintelnot
LMU Munich U. of Oslo and NBER UCSD and NBER U. of Chicago and NBER

September 26, 2016

Abstract

This paper documents new facts on the life-cycle behavior of multinational firms and exporters based on panel data sets from Norway, France, and Germany. First, new exporters have substantially higher exit rates than new multinational affiliates, while export experience in a market prior to opening an affiliate lowers exit rates for the new affiliate only modestly. Second, once partial-year effects are taken into account, exporters do not look different from multinational firms in terms of their life-cycle sales profile, regardless of prior export experience. Finally, there is a significant difference in domestic size when a multinational firm starts—and exit—activities abroad; there is no such size difference for exporters.

We extend the model of trade and multinational activity in Helpman, Melitz, and Yeaple (2004) to a dynamic setting in which firm productivity follows a Markov process and multinational firms incur a sunk cost to enter foreign markets. These entry costs are key to match the salient facts in the data, both qualitatively and quantitatively. Moreover, giving firms the option of opening affiliates abroad allows the model to be better reconciled with the data on export dynamics and turns out to be key for trade liberalization episodes.

JEL Codes: F1; F2. Key Words: International trade; Multinational firm; Foreign direct investment; Dynamics; Markov process; Sunk costs.

∗We benefit from comments at various seminars. We would like to thank Costas Arkolakis, Lorenzo Caliendo, Kerem Cosar, Arnaud Costinot, Javier Cravino, Penny Goldberg, Sam Kortum, Eduardo Morales, Peter Schott, and Jonathan Vogel for their comments and suggestions. We specially thank Julien Martin for his help with the French data. Zhida Gui provided outstanding research assistance. All errors are our own.
1 Introduction

Multinational enterprises (henceforth, MNEs) are without doubt key actors in the current economy. Not only do they command most of the international trade, but also most of the innovation and production activities around the world. According to UNCTAD, by 2007, sales of MNEs affiliates were twice as large as exports, while comprehensive micro-level evidence shows that MNEs account for disproportionate shares of aggregate output and employment in many countries (Antrás and Yeaple, 2014) [4]). Yet, some key aspects of the MNE operations are not well understood, mostly due to the lack of appropriate data. In particular, the micro-level behavior of MNEs over their life-cycle has been relatively unexplored, both in the data and theoretically; in contrast, life-cycle dynamics of exporters and domestic firms has been extensively studied and documented.

In this paper, we fill the gap in the literature and document new facts on the life cycle dynamics of MNEs and compare them with the dynamic behavior of exporters. We exploit the unique characteristics of firm-level Norwegian panel data, for the period 1996-2006, and confirm our findings—whenever possible—with panel data from France as well as from Germany. The differences between the dynamic behavior of MNEs and their affiliates vis-a-vis exporters are striking. First, new exporters into a market have almost three times higher exit rates than new affiliates of MNEs in the same market; a similar pattern is observed for brand-new exporters versus brand-new MNEs. Around 40 percent of MNEs export to a foreign destination before opening an affiliate there. These affiliates have lower exit rates than those whose parents did not export, but the difference is not large. Furthermore, the exit rates from export activities in the first period after entry are strongly correlated with foreign country characteristics, whereas those of new affiliates do not exhibit such correlations. Second, the sales profiles of new affiliates and new export activities in a foreign destination are similar. This is observed only after correcting for partial year effects; in the raw data, new export activities exhibit a much steeper sales profile than new affiliates of MNEs. Finally, MNEs that open a new affiliate in a foreign country are larger than those firm that close foreign affiliates, in terms of sales in their domestic market; no such pattern is observed for exporters.

To capture the patterns observed in the data, we extend to a dynamic setting of the model of trade and Foreign Direct Investment (FDI) in Helpman, Melitz, and Yeaple (2004) [19]—henceforth, HMY. We introduce dynamics into a two-country version of the model by assuming that firm productivity, rather than being a fixed parameter, evolves according to a Markov process. Additionally, we assume that multinational activities are subject to a sunk cost, paid when operations in the foreign country are set up. As it is
well known in the literature, the sunk cost creates hysteresis, that is, a productivity range in which the firm behavior depends on its status: Domestic firms or exporters in this productivity range do not become MNEs because the difference in the expected stream of discounted profits does not cover the sunk costs, whereas equally productive MNEs do not exit because they do not want to give up the option value of having paid the sunk cost. Following HMY, we assume that there is a per-period fixed cost of exporting and of running a foreign affiliate, respectively, as well as a standard iceberg-type cost of shipping goods internationally, and an iceberg-type cost of opening affiliates abroad. With these assumptions, we preserve the proximity-concentration tradeoff present in HMY and ensure that the model delivers the well-established cross-sectional fact of MNEs being larger than exporters.

Despite its simplicity, the model captures qualitatively the patterns in the data. In particular, MNEs with previous export experience have a lower probability of exiting the foreign market than MNEs which were not exporters previously. This effect is due to the fixed costs of exporting which imply that exporters are larger than domestic firms. Firms become MNEs after receiving a positive productivity shock. Consequently, new MNEs with export experience are on average larger than MNEs without experience, and thus less likely to receive a subsequent shock negative enough to make them exit. Additionally, the model predicts that exit rates at age one are positively associated with trade costs—and negatively related to country size. This feature is also a consequence of including sunk entry costs for MNEs.

The model also captures quite well the patterns observed in the data quantitatively. A simple calibration of the model using moments from the Norwegian data is able to capture the exit profile for new MNEs, despite the fact that we did not target this dynamic feature of the data. The calibration also captures well the higher exit rates for new exporters upon entry, even though it gets only half the magnitude of the exit rate observed in the data at age one. The model is also able to capture extremely well the life-cycle sales profiles of new MNEs. Regarding exporters, the model predicts a flatter sales profile than the one observed in the raw data, but after those profiles are corrected by partial year effects in the data, exporters in the model have steeper profiles than in the data.

Comparing the results from the calibrated model with MNEs and one with exporters, but no MNEs, shows that the latter delivers sales profiles for young exporters that are much steeper than in the model with MNEs. The inclusion of an additional way of serving foreign markets, subject to sunk entry cost, slows down after age five exporters growth by 50 percent. More importantly, the presence of MNEs have consequences for the dynamic patterns of young exporters in trade liberalization episodes: Models without
MNEs predict different exit rates and growth patterns for young exporters from models with MNEs.\(^1\)

Overall, our findings point out to the key role of MNE sunk costs—and the persistence that they create—in explaining the life-cycle dynamic behavior of MNEs and exporters. Understanding the life-cycle dynamics of firms in general, and exporters and MNEs in particular, seems to have important consequences for aggregate outcomes. In fact, a large literature has studied the life-cycle patterns of domestic firms and exporters. For instance, early work by Baldwin (1988) [5], Baldwin and Krugman (1989) [6], and Dixit (1989) [9], followed by more recent work by Melitz and Ghironi (2005) [25], Das, Robert, and Tybout (2007) [12], Alessandria and Choi (2007) [2], and Impulliti, Irarrazabal, and Opromolla (2013) [21] point to the importance of the hysteresis created by sunk investments for understanding the effects of large and small changes in real exchange rates, as well as the impact of temporary and permanent changes in trade policy. Additionally, Ruhl and Willis (forth. 2017) [31], which document similar facts to ours, for Colombian exporters, show that matching the pattern observed in the data for the life-cycle dynamics of exporters has consequences for estimates of the sunk cost of exporting: Their estimate is three time smaller than the one coming from calibrated models that do not match firm-level life-cycle dynamics, such as Das et al. (2007) [12].\(^2\)

Additionally, Ruhl and Willis (forth. 2017) [31], for exporters, and Foster, Haltiwanger, and Syverson (2016) [17], for domestic firms, show that models with heterogeneous firms and firm-level productivity that evolves as a Markov process, like in Hopenhayn (1992) [20], deliver new firms that grow too large too fast; both papers conclude that demand-side fundamentals, such as learning, are needed to better match the data.\(^3\) We show that introducing into the dynamic trade model with heterogeneous firms the choice of serving markets through MNEs affiliates, after paying a sunk cost, delivers a similar result: Exporters grow slower.

In relation to exporters’ growth driven by demand factors, papers such as Eaton et al. (2014) [14], Albornoz et al. (2012) [1], and Morales et al. (2014) [26] focus on the dynamics of trade associated with learning. Conconi et al. (2014) [11] propose a learning mechanism to explain the fact that MNEs enter markets as exporters before opening an affiliate; they omit, however, firm heterogeneity and firms’ self-selection into different modes of internationalization, which together with sunk entry costs for MNEs, turn out

\(^{1}\)This result is reminiscent of the one in Ramondo and Rodríguez-Clare (2013) [28] for static models in which the gains from trade are modified when MNEs are considered.

\(^{2}\)Kohn, Leibovici, and Szkup (2015) [23] have a similar analysis for Chilean exporters to the one in Ruhl and Willis (forth., 2017) [31].

\(^{3}\)Relatively, Arkolakis (forth. 2016) [3] includes a cost of building a customer base into a dynamic model of trade and shows that his model matches several facts on growth, size, and survival observed in the data.
to be important in matching the observed firm-level life-cycle dynamics of both exporters and MNEs.\footnote{Additionally, contrary to their finding for Belgium, where 85 percent of MNEs experienced the foreign market previously as exporters, we find that around 40 percent of new Norwegian and French affiliates of MNEs were exporters previously.}

Finally, our paper is related to a smaller, but growing, literature devoted to the study of MNEs dynamics. In particular, Fillat, Garetto, and Oldenski (2015) [16] study the dynamics of trade and MNEs in an environment with sunk costs for these activities and aggregate demand shocks; they focus on the risk-premium implications of the model. Relatedly, Garetto, Oldenski, and Ramondo (2016) [18] study the specialization pattern between horizontal and export activities of affiliates of MNEs, through their life cycle; sunk costs of entry into export markets (for the MNE affiliate) and into MNE activity are important elements of their analysis. Ramondo, Rappoport, and Ruhl (2013) [27] embed the proximity-concentration tradeoff model in Helpman et al. (2004) [19] in an environment with aggregate uncertainty. While they show that properties of the international business cycle affect the choice of the entry mode into foreign markets, their model is intrinsically static and cannot address issues related to firm dynamics. Finally, the seminal work by Rob and Vettas (2003) [29] features demand uncertainty together with capacity constraints to study the mechanisms behind the choice of firms of exporting and opening affiliates in the same market.

2 Documenting the Facts

We document new facts about the life-cycle dynamics of MNEs and compare them to the dynamic behavior of exporters. Whenever the data allow it, we document the behavior of MNEs that were exporters to a market before opening an affiliate—we call them "experienced MNEs". Our facts are possible to compute from rich firm-level data sets that follow firms through time and space. We use data for Norway, Germany, and France. Only the Norwegian data allow us to compute all the facts. Norway, however, has a non-representative economic structure due to being a small country and its large oil sector, resulting in a relatively small (firm) sample size. To prove the robustness of our facts, we compute the same facts as for Norway using data for France and Germany. Given the size of these economies, the number of observations is large in these data sets. Unfortunately those data sets allow us to compute some aspects, but not all, of our facts. While the French data provide extremely detailed information on exports and affiliate location, they do not contain information on the sales of affiliates of French MNEs abroad. The
opposite is true for the German data, which contain very detailed information of the affiliates of German MNEs abroad, but do not provide any information on exporters—which implies that "experienced MNEs" cannot be observed.

2.1 Data

**Norway.** The firm-level data for Norway nest data for the Norwegian manufacturing sector from Statistics Norway’s Capital Database, customs declarations by destination country, and data on firms’ foreign operations from the Directorate of Taxes’ Foreign Company Report which comprises affiliate sales by destination. Affiliate sales are computed as total revenue of the affiliate adjusted by the parent’s ownership share. The data span the years 1996-2006. The coverage is comprehensive: All foreign affiliates of Norwegian firms in the manufacturing sector are included as well as 90 percent of Norwegian manufacturing revenues; only non-oil firms are included.

We restrict the sample to majority-owned affiliates, and drop MNE-country pairs and exporter-country pairs with repeated entry and exit over the sample period. The sample size varies from 8,044 in 1996 to 8,838 firms in 2002; 3,544 firms are present during all the period spanned by the data set, while the remaining firms either enter or exit the Norwegian market in the same period.

In 2005, only two percent of Norwegian firms have affiliates abroad, and almost 55 percent are non-MNE exporters; overall, 44 percent of Norwegian firms do not engage in international activities. Norwegian MNEs represent almost 13 percent of total employment in Norway, while exporters represent 67 percent. The median (mean) Norwegian MNE operates in 2 (4.6) markets, with a maximum at 29 markets, while the median (mean) exporter serves 3 (6.9) markets, with a maximum at 115 markets.

**France.** For France, we use firm-level information on domestic sales, exports and foreign affiliates. The export data are provided by the French customs. The data on domestic sales are taken from FICUS/FARE and the data on ownership links between different firms in France and firms in France and abroad from are taken from LiFi; these data bases are provided by INSEE. The data contains information about French exporters and the location of foreign affiliates of French MNEs, for each year; there is no data, however, on

---

5A 20 percent ownership threshold is used to distinguish direct investment from portfolio investment. Direct investment comprises investors’ share of equity in foreign companies and investors’ debt to and claims on foreign companies.

6The FICUS/FARE data bases provide balance sheet data on virtually all French firms. The principal data source are firms’ tax statements (amongst others under the so-called BRN).
affiliates’ sales. Importantly, exports are recorded at the monthly level allowing us to make corrections when it is needed. The information on MNEs is at the parent-affiliate level and records direct participations of French firms in foreign affiliates. We restrict our attention to majority-owned foreign affiliates. As for the Norwegian sample, we drop MNE-country and exporter-country pairs with repeated entry and exit during the sample period. Unlike the Norwegian data, the French data can be used consolidated or unconsolidated; that is, if firm A and B belong to firm C, the French data allow to consolidate all three of them since they belong to the same group. Following Kleinert, Martin and Toukal (2015) [22], for our baseline results, we consolidate the information on domestic activities, foreign affiliates and exports to the level of the French group. We keep a consolidated firm group if at least one of its domestic members is active in the manufacturing sector in at least one year. This implies that wholesale affiliates in France are part of our consolidated sample as long as they belong to a group with at least one member in the manufacturing sector. We present results using the unconsolidated data for robustness purposes. For individual firms, including affiliates abroad, we focus on those that operate in the manufacturing sector in at least one year.

The data span the years 1999-2011 with a total of 3,071,499 firm-year observations. Of those ones, only 0.3 percent are MNEs, and 10.1 percent are non-MNE exporters; 89.6 percent of French manufacturing firms do not engage in international activities. For each year, the sample size varies between 2,475 and 3,754 observations for MNEs, and between 153,882 and 182,311 for exporters, at the firm-destination level. The sample contains between 672 and 950 MNEs, and between 20,514 and 28,127 exporters, each year. Of those, 167 MNEs and 5,115 exporters are present during all our sample period. The median (mean) French MNE operates in only 1 (3.8) markets, with a maximum above 75 markets, while the median (mean) exporter serves 2 (6.8) markets, with a maximum above 164 markets.

Table 1 summarizes the sample size across firms with different international status, both at the firm-destination and firm level, for Norway and France. We sometime restrict the sample to the sub-period 1999-2007 in order to avoid structural breaks, as both the industry classification and the sales variable changed in 2008.

**Germany.** The source of data for Germany is the Microdatabase Direct investment

---

7Data on affiliates’ employment are available but almost 50 percent of observations are zero.
8We do not restrict the sample in terms of minimum sales other than the restriction embedded in the surveys.
9This is important for export activities since almost 50 percent of exports from France are done by wholesalers.
Table 1: Number of sample observations, Norway and France.

(a) Norway

<table>
<thead>
<tr>
<th>$t - 1$ \ $t$</th>
<th>firm-destination-year</th>
<th></th>
<th></th>
<th></th>
<th>firm-year</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>domestic</td>
<td>exporter</td>
<td>MNE</td>
<td>total</td>
<td>domestic</td>
<td>exporter</td>
<td>MNE</td>
</tr>
<tr>
<td>domestic</td>
<td>244,529 (80.2)</td>
<td>60,042 (19.7)</td>
<td>247 (0.9)</td>
<td>304,818 (100)</td>
<td>21,703 (6.4)</td>
<td>1,484 (0.5)</td>
<td>5 (0.02)</td>
</tr>
<tr>
<td>exporter</td>
<td>52,261 (27.3)</td>
<td>138,546 (72.5)</td>
<td>126 (0.17)</td>
<td>190,933 (100)</td>
<td>1,084 (4.4)</td>
<td>23,404 (95.3)</td>
<td>60 (0.24)</td>
</tr>
<tr>
<td>MNE</td>
<td>276 (5.9)</td>
<td>326 (6.9)</td>
<td>4,080 (87.1)</td>
<td>4,682 (100)</td>
<td>5 (0.1)</td>
<td>95 (8.7)</td>
<td>993 (90.8)</td>
</tr>
<tr>
<td>total</td>
<td>297,066 (59.3)</td>
<td>198,914 (39.7)</td>
<td>4,653 (0.93)</td>
<td>500,633 (100)</td>
<td>22,792 (46.7)</td>
<td>24,983 (51.2)</td>
<td>1,058 (2.2)</td>
</tr>
</tbody>
</table>

(b) France

<table>
<thead>
<tr>
<th>$t - 1$ \ $t$</th>
<th>firm-destination-year</th>
<th></th>
<th></th>
<th></th>
<th>firm-year</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>domestic</td>
<td>exporter</td>
<td>MNE</td>
<td>total</td>
<td>domestic</td>
<td>exporter</td>
<td>MNE</td>
</tr>
<tr>
<td>domestic</td>
<td>45,026,334 (99.4)</td>
<td>282,983 (0.6)</td>
<td>829 (0.0)</td>
<td>45,310,146 (100)</td>
<td>2,220,510 (4.9)</td>
<td>48,082 (2.1)</td>
<td>280 (0.0)</td>
</tr>
<tr>
<td>exporter</td>
<td>274,416 (16.1)</td>
<td>1,426,658 (83.7)</td>
<td>2,454 (0.1)</td>
<td>1,703,528 (100)</td>
<td>49,972 (18.8)</td>
<td>216,156 (81.3)</td>
<td>877 (0.3)</td>
</tr>
<tr>
<td>MNE</td>
<td>481 (1.5)</td>
<td>1,111 (3.5)</td>
<td>30,574 (95.1)</td>
<td>32,166 (100)</td>
<td>258 (3.0)</td>
<td>467 (5.5)</td>
<td>7,799 (91.5)</td>
</tr>
<tr>
<td>total</td>
<td>45,301,231 (96.3)</td>
<td>1,710,752 (3.6)</td>
<td>33,857 (0.1)</td>
<td>47,045,840 (100)</td>
<td>2,270,740 (89.2)</td>
<td>264,705 (10.4)</td>
<td>8,956 (0.4)</td>
</tr>
</tbody>
</table>

Notes: All firms are in the manufacturing sector. Exporters refer to non-MNE exporters. The total number of observations is lower than the number reported in the text because the mode in period $t - 1$ is not defined for entrants to the sample. Numbers in parenthesis indicate percentage of total observations in each row, for each level of observations. Each cell shows number of observations at time $t$ under mode $m$ (column) given mode $m'$ at time $t - 1$ (row).

(MiDi), consisting of information about affiliates abroad of German firms.\(^{10}\) The data set spans the years 1999 to 2011 and contains detailed balance sheet information about affiliate firms, but limited information about parent firms (such as total revenues and number of employees).\(^{11}\)

The observations are at the parent-affiliate level, both for direct and indirect ownership. We consolidate ownership shares and restrict our attention to majority-owned affili-

\(^{10}\)The Microdatabase Direct investment (MiDi) is a data set owned by the Deutsche Bundesbank (German central bank). It is accessible at the Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, [https://www.bundesbank.de/Redaktion/EN/Standardartikel/Bundesbank/Research_Centre/research_data_micro_data_midi.html](https://www.bundesbank.de/Redaktion/EN/Standardartikel/Bundesbank/Research_Centre/research_data_micro_data_midi.html). See Lipponer (2011) [24] for details.

\(^{11}\)For instance, it is not possible to distinguish domestic sales from exports.
iates, in each year, whose parent operates in the manufacturing sector in at least one year in which they are active, or whose parent is a holding company belonging to a corporate group in the manufacturing sector (in at least one year).\textsuperscript{12} This is equivalent to keeping about half of all parent-year pairs available in the data.\textsuperscript{13}

More than 95 percent of parent-country observations in our sample are present in the panel for consecutive years, including only one year, while only five percent of the observations in our sample have a repeated entry/exit pattern; 13 percent of observations are present during the whole period spanned by the panel.

Buch et al. (2005)\textsuperscript{10} report that, in 2002, 0.21 percent of manufacturing firms were MNEs and they accounted for 27 percent of total sales in Germany. Our sample of majority-owned affiliates covers 189,000 observations in 175 countries, in the manufacturing sector.\textsuperscript{14} The median (mean) parent firm operates in one (2.9) markets.

**Experienced MNEs.** We define "experienced MNE" as an MNE that exported to a given destination market in any year before opening a foreign affiliate there. This is our baseline definition. We also use as alternative definitions an MNE that exported to a given destination market in the year before to MNE entry, and in any year in the five-year window before MNE entry. Additionally, if we observe that a domestic exporter changes ownership previously, or contemporaneously, to entering the market as MNE, we consider that MNE as having previous export experience.

As shown in table 2, with our baseline definition, for Norway, 39 percent of new MNEs affiliates were exporters before opening production facilities in a given market. The share goes down to 37 and 30 percent if we consider our alternative definitions of "experienced MNE". For France, at the firm-destination level, 42 percent of new affiliates abroad has previous export experience, at any point before entry, similar to the number for Norway; this share barely changes if experienced MNE are defined as being an exporter the year before opening an affiliate, or being an exporter at any point in the previous five years of opening an affiliate.

Both shares for Norway and France, are in stark contrast with the findings in Conconi

\textsuperscript{12}In practice, we first restrict the sample to affiliates with either participation of ten percent and revenues of at least ten million DM (Euro equivalent), or participation of at least 50 percent and revenues of at least three million Euro. Then, we consolidate ownership shares and select the affiliates with more than 50 percent ownership. This procedure avoids the problem of some parents reporting on affiliates which should not be reported; if we consolidated first, we would treat those differently from affiliates belonging to firms following the reporting rules.

\textsuperscript{13}Parents change sectors over time; in particular, about a fifth of parents in manufacturing in some year(s) switch to a non-manufacturing sector, mainly holding sector, in some other year(s).

\textsuperscript{14}Only 11,000 observations are lost by restricting the sample to majority-owned affiliates.
Table 2: Experienced MNEs, Norway and France

<table>
<thead>
<tr>
<th></th>
<th>Norway (as % of new MNEs)</th>
<th>France (as % of new MNEs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exporting in ( t - 1 ) before MNE entry</td>
<td>30</td>
<td>41</td>
</tr>
<tr>
<td>Exporting at least once in the last five years before MNE entry</td>
<td>37</td>
<td>41</td>
</tr>
<tr>
<td>Exporting at least once before MNE entry</td>
<td>39</td>
<td>42</td>
</tr>
</tbody>
</table>

Notes: New MNE-country pairs with export experience as a share of new MNE-country pairs. Each row reports the share of "experienced MNEs" for a different definitions of experience: exporting in the last year; in at least one year in a five-year period; and at any point prior to opening an affiliate.

et al. (2014) [11] who finds a share of experienced MNEs for Belgium of more than 85 percent.\(^{15}\) It is worth noting that, for France, if we include MNEs which start exporting to a given market the same year in which they open an affiliate there, the share of experienced MNEs goes up to 80 percent. We decided against a definition that includes firms that start exporting in the year of MNE entry since it does not seem related to having some experience of the market prior to becoming MNE.

Figures 1a and 1b show that the share of experienced MNEs is quite stable over time. Figures 1c and 1d illustrate the number of years of export experience in a market. The entry year as MNE is normalized to \( t = 0 \). About a third of new Norwegian MNEs and more than 40 percent of French MNEs start exporting to a country in the year of MNE entry. Those that exported before mostly have one to two years of experience. Few firms have negative export experience, i.e. they start exporting after becoming MNEs in a country.

2.2 Fact I: Exit rates are lower for new MNEs than for new exporters.

Figure 2 plots the exit rates at the firm-destination and firm level, for Norway and France. As mentioned in the data description, the sample is restricted to firm-country observations with at most one exit per mode. In the upper panels, the x-axis refers to the number of years after entry spent in the market and in a given mode (e.g. exporter or MNE), with the entry year equal to zero. The exit rates on the y-axes are calculated as the number of multinational (exporting) firms that exit a given destination and mode, relative to the

---

\(^{15}\)One may suspect that Belgium is a special case due to its position within the European Union in carry-along trade, as documented by Bernard et al. (2016) [8]. To partially avoid the problem, Conconi et al. (2014) [11] restrict the sample to manufacturing exporters of at least five employees with exporters to countries outside the European Union. When we restrict our sample in the same way, the share of experienced MNEs barely changes with respect to the shares shown in table 2.
Notes: Upper panel: New foreign affiliates of Norwegian (left) and French (right) MNEs with previous export experience in a market, as a share of all new affiliates in a market. Lower panel: Distribution of new affiliate-destination pairs with $t$ years of export experience in that market before MNE entry ($t = 0$); negative years mean that export activities started after MNE entry (e.g. $t = -1$ means that we observe exports from Norway after one year of the creation of the affiliate). Minima (maxima) indicate an upper (lower) bound of the number of years of experience, i.e. a French firm with 12 years of experience has at least 12 years of experience, and a firm with $-4$ years of experience starts exporting four years after MNE entry or later.

number of active multinational (exporting) firms in that destination, at each age $x$. For the sub-set of experienced MNEs, the exit rate refers to MNEs that opened an affiliate in a given destination at age zero, but that were exporting to that destination in any of the previous years, relative to the number of active experienced MNEs in that at age $x$. The lower panels display exit rates at the firm level, rather than firm-destination level; hence,
Figure 2: Exit rates by age, Norway and France.

Firm-destination level

(a) Norway

(b) France

Firm level

(c) Norway

(d) France

Notes: The upper panels show exit rates defined as the number of firm-destination exits relative to the number of active firm-destinations by mode-market specific age, for exporters and MNE affiliates. In the lower panels, exit rates are defined as the number of firm exits relative to the number of active firms, by mode-specific age, for exporters and MNEs. Exit refers to exit the current mode of international operation (export or MNEs). In the upper (lower) panels, MNEs with export experience are the sub-set of foreign MNEs affiliates (MNEs) with one or more years of export experience before opening an affiliate (before becoming MNE). Sample of new firms with no re-entry, in manufacturing.

The figure captures the exit rates of first-time MNEs and first-time exporters, from their respective mode of international operation. Exit rates are computed at the firm-level as the share of multinational (exporting) firms exiting the mode, relative to the number of active multinational (exporting) firms at a given age x, independently of their destination country. Age on the x-axis is computed as the number of years after a firm first became an exporter or MNE.
Figures 2a and 2b show that, on average, new MNEs affiliates in a foreign market have much lower exit rates than new exports to a foreign country. Upon entry, exports are almost three times more likely to exit the destination market (and mode of operation) than MNEs affiliates.\textsuperscript{16} For both modes of internationalization, exit rates are declining with age, though more drastically for exporters. It is remarkably how similar magnitudes are for Norway and France.\textsuperscript{17}

Previous export experience entails, for affiliates of MNEs, an almost 10-percentage point lower exit rate, on average, in the first year after entry than new affiliates without such experience: The difference is 18 vs. 27 percent for Norway, and 17 vs 28 percent for France.

Similar patterns are observed in the lower panels of figure 2 where we consider exit rates at the firm, rather than firm-destination, level. Exit rates upon entry among first-time exporters exceed 40 percent, while for first-time MNEs exit rates are around 15 percent.\textsuperscript{18}

We confirm the patterns in figures 2a and 2b formally by estimating, using Ordinary Least Squares (OLS),

\[
D(\text{Exit}_{i\text{mnt}}) = \beta_0 \text{mne}_{i\text{nt}} + \beta_1 \text{age}_{i\text{mnt}} + \beta_2 \text{mne}_{i\text{nt}} \times \text{age}_{i\text{mnt}} \\
+ \beta_3 \text{exp}_{i\text{mnt}} + \beta_4 \text{mne}_{i\text{nt}} \times \text{exp}_{i\text{mnt}} + \alpha_n + \alpha_t + \alpha_s + \epsilon_{i\text{mnt}}
\]  

(1)

The variable \(D(\text{Exit}_{i\text{mnt}})\) is a dummy equal to one in the year \(t\) in which firm \(i\) exits mode \(m\) in market \(n\), and zero otherwise. The variable \(\text{mne}_{i\text{nt}}\) is one if the firm \(i\) is active in market \(n\) in year \(t\) as an MNE, and zero if it is active as an exporter. The variable \(\text{age}_{i\text{mnt}}\) denotes the age of the firm \(i\) in market \(n\) and mode \(m\) at time \(t\); and \(\text{exp}_{i\text{mnt}}\) is one if firm \(i\) who enters market \(n\) at time \(t\) under mode \(m\) has previous experience in mode \(m'\), \(m \neq m'\). The variables \(\alpha_n, \alpha_t\) and \(\alpha_s\) are destination country, year and sector fixed effects.

Analogously, to confirm the patterns in figures 2c and 2d, we estimate

\[
D(\text{Exit}_{i\text{mt}}) = \tilde{\beta}_0 \text{mne}_{i\text{t}} + \tilde{\beta}_1 \text{age}_{i\text{mt}} + \tilde{\beta}_2 \text{mne}_{i\text{t}} \times \text{age}_{i\text{mt}} \\
+ \tilde{\beta}_3 \text{exp}_{i\text{mt}} + \tilde{\beta}_4 \text{mne}_{i\text{t}} \times \text{exp}_{i\text{mt}} + \tilde{\alpha}_t + \tilde{\alpha}_s + \epsilon_{i\text{mt}}
\]  

(2)

\textsuperscript{16}Unconditional exit rates, i.e., the fraction of all exits in each mode, in each year and market, are 32 and 16 percent, respectively, for Norwegian exports and MNEs affiliates.

\textsuperscript{17}The exit rates of new exporters for Colombia, at the firm-destination level, documented in Eaton, Eslava, Kugler, and Tybout (2008) \cite{13} are similar to the ones we document for Norway and France.

\textsuperscript{18}Magnitudes for new exporters are similar to the ones documented by Ruhl and Willis (forth. 2017) \cite{31} for Colombia.
Table 3 shows the regression results. The upper panel of the table estimates (1), and the lower panel estimates (2). Columns 1-4 refer to the Norwegian sample and columns 5-7 provide results from the French sample. The French sample is restricted to 1999-2007 in order to avoid structural breaks, as both the industry classification and the sales variable changed in 2008.\footnote{Results are similar if we re-estimate the regression on the full sample without sales or industry fixed effects.}

The regression results are strikingly similar across countries. As the first row shows, the dummy $mne_{int}$ always has a negative coefficient indicating that affiliates of MNEs are significantly less likely (around 20 percent) to exit a given destination $n$ in year $t$ than exporters. Not only the sign, but also the order of magnitude of the coefficients is similar across countries. Additionally, as hinted by figure 2, exit profiles are declining with age, as indicated by $\beta_1 < 0$. The positive coefficient on the interaction term between $mne_{inmt}$ and $age_{inmt}$ shows that the decline in exit rates is less steep for MNE affiliates than for export activities. The regression does not show any significant effect of previous export experience on exit rates of MNEs for Norway, but previous export experience significantly decreases the likelihood of exit for France. This difference may be driven by the differences in the sample size between the two countries. The negative effect of experience is robust to adding size as a control in column 7: While, on average, a new affiliate without previous export experience in a market has a ten percent lower exit probability relative to a new (unexperienced) exporter, a new affiliate which has already experienced the market as an exporter has almost almost 18 percent lower probability, relative to the same reference group.

Results at the firm level are similar and also confirm the patterns shown in figures 2c and 2d. The effect of experience is only not significant in column 7.

Figure 3 shows the result of estimating (1) with age dummies rather than with a continuous variable for age. Specifically, for figure 3a, we estimate, by OLS,

$$D(Exit_{inmt}) = \beta_0mne_{int} + \sum_t \beta_1^tD(age_{inm} = t) + \sum_t \beta_2^t mne_{int} \times D(age_{inm} = t) + \alpha_t + \alpha_n + \epsilon_{inmt},$$

\[(3)\]

and calculate the implied difference in exit rates between MNEs and exporters, by age.
For figure 3b, we estimate, also by OLS,

\[
D(\text{Exit}_{inmt}) = \beta_0 \text{mne}_{int} + \sum_t \beta_t D(\text{age}_{inm} = t) + \sum_t \beta_t \text{mne}_{int} \times D(\text{age}_{inm} = t) + \\
\beta_3 \text{exp}_{inmt} + \beta_4 \text{exp}_{inmt} \times \text{mne}_{int} + \sum_t \beta_t \text{exp}_{inmt} \times D(\text{age}_{inm} = t) + \\
\sum_t \beta_6 D(\text{age}_{inm} = t) \times \text{mne}_{int} \times \text{exp}_{inmt} + \alpha_t + \alpha_n + \epsilon_{inmt},
\]

and calculate the implied difference in exit rates between experienced and non-experienced MNEs, by age. We include year, industry, and country fixed effects. As figure 3 shows, the difference in exit rates between exporters and MNEs, for France, of around 15 percentage points at age one and two is significant. It disappears at age three. For experienced vs non-experienced firms, the difference in exit rates is significant only at age one, with a value of around 12 percent, and disappears afterwards (though it is marginally significant at age two). For Norway, the difference can be as large as 10 percentage points in the entry year, for experienced vs non-experienced firms, but the confidence intervals are large, due to the relatively small sample.

Turning to the data on German multinational firms, we confirm the smooth decreasing exit probability for new MNEs, both at the country-firm and firm level. As figure 4 shows, the sample of multinational firms for our three countries are extremely similar both in terms of patterns as well as magnitudes.

Robustness. The main robustness results relate to the definition of tenure in a market, and the definition of an experienced MNE.

First, concerning age, one may be worried that setting the age of an experienced MNE and the age of a non-experienced MNE to zero in the first year of MNE activity may be problematic; after all, the experienced MNE was active as an exporter in the destination before. To address this issue, we re-compute age as the number of years that the firm is active as an exporter or MNE in a destination; this is market-specific age. As shown in figure 5a, baseline results still hold, although, as expected, the difference between experienced and non-experienced MNEs is smaller; similar results are obtained for Norway. Second, we consider an alternative definition of experienced MNE: a firm that exported to the market prior to becoming MNE in the immediate previous year, rather than in any previous year. Figure 5b shows that results are unchanged.

\[\text{20 Even though exit rates at age one upon entry vary across sectors, from 10 to 30 percent, the exit profiles by age are similar. A regression analysis confirms the results (not shown).}\]
Figure 3: Exit Rates: Age dummies, France and Norway. OLS

France

(a) MNEs vs Exporters

(b) Experienced vs Non-experienced MNEs

Norway

(c) MNEs vs Exporters

(d) Experienced vs Non-experienced MNEs

Notes: Observations are at the firm-destination-year level. Exit rates are defined as the number of affiliate-destination exits in year t, relative to the number of active affiliates-destinations in year t-1. The base groups are exporters in left panels, and non-experienced MNEs in right panels. Coefficients from estimating (3) in left panels, and (4) in right panels, by OLS, with year, country, and industry fixed effects. Standard errors clustered by industry, for Norway; robust standard errors for France. French sample restricted to 1999-2007 to avoid structural break in industry classification.
Figure 4: Exit rates for new MNEs: German, French, and Norwegian data.

(a) Firm-destination level

(b) Firm level

Notes: In figure 4a, exit rates are defined as the number of affiliate-destination exits relative to the number of active affiliates-destinations, by age. In figure 4b, exit rates are defined as the number of MNEs exits relative to the number of active MNEs, by age.

Figure 5: Exit rates for experienced MNEs, robustness, France.

(a) Different definition of age

(b) Different definition of experienced MNE

Notes: Exit rates are defined as the number of affiliate-destination exits relative to the number of active affiliates-destinations, by age, an average of all firms in each group. In figure 5a, the age of experienced MNEs is computed from the year they entered the market as exporters. In figure 5b, experienced MNEs refer to firms which export to the market in the previous year before MNE entry.
Additionally, baseline results hold when we do the following changes in the French data: 1) Splitting the sample in EU and non-EU countries to address concerns on the different reporting thresholds for exports to EU members and exports to non-EU members; 2) Imputing ownership to years with missing data on this variable; 3) Correcting for partial-year-effects for exit rates of exporters; 4) Using the unconsolidated rather than the consolidated data (see figure 18 in the Appendix); and 5) splitting the sample into the 1999-2005 and 2006-2011 period.\footnote{Naturally, using the consolidated data (i.e., consolidating all firms belonging to the same group) leads to a much higher number of experienced MNEs, as share of total MNEs, than the number obtained with the unconsolidated data (42 vs 15 percent of observations at the firm-destination level).} For Norway, including cohort, rather than year, fixed effects does not alter the baseline results. Finally, using the German data, we can consider the exit rates for different modes of FDI entry, greenfield vs. M&A. One may expect some discrepancy in exit rates upon entry since M&A affiliates, being previously domestic firms, can be much older than greenfield affiliates which are by definition brand-new. Figure 19a in the Appendix shows that there is no difference in exit rates, on average, between the two groups of new German affiliates abroad.

### 2.3 Fact II: For exporters, exit rates at age one are larger in distant and smaller markets; for MNEs, they are not.

The previous fact pools firms across different destination countries. Country characteristics, however, may be an important determinant of firms’ exit decisions. To explore this issue, we next study the correlation of the exit rates of exporters and MNEs in the first year after entry and two country characteristics which are prominent in the international trade literature: the size of the foreign country, as measured by GDP, and the distance of the country from the domestic country of the firm.

Figure 6 shows scatter plots of the exit rate in the first year upon entry on the y-axes, and market size on the x-axes of scatters in the upper panels, and distance on the x-axes of scatters in the lower panel, for French exporters and MNEs. Each dot represents an average among at least ten firm-destination observations.

The cross-country patterns of exit at age one between the two modes of international operation are strikingly different: While exporters operating in smaller and more distant markets are more likely to stop operations there, it is not clear that affiliates of MNEs do. In fact, an OLS regression shows that the exit probability increases by 3.7 percent per additional kilometer of distance, and decreases by 3 percent when GDP increases by one billion USD; the effects on affiliates of MNEs are insignificant. The lack of a clear
pattern with respect to market size and distance to the home country is also observed for experienced MNEs (figure 22 in the Appendix).

A potential concern is that exporters and MNEs are active in different countries; French firms penetrate many more countries as exporters than as MNEs. As figure 21 in the Appendix shows, results are robust to considering the same set of countries for exporters and MNEs. The pattern for exports is less pronounced than in the full sample, but still clearly correlated with country characteristics.

The pattern for new exporters with respect to destination-market size and distance from the domestic country is similar for both Norwegian exporters and MNEs, as well as in the German data for MNEs. Figure 20 in the Appendix shows the results.

2.4 Fact III: Sales profiles for new MNEs and new exporters are similar.

We now turn to analyze the life-cycle dynamics of the intensive margin of multinational operations and exporters. We focus on sales as our intensive-margin variable. Figure 7a shows mean exports and affiliate sales by age from entry entry, relative to the entry year. To attenuate the bias created by including low-growth firms that exit the destination right upon entry, we focus on firms that survive through age four.

The pattern seems clear: While exporters enter small and grow fast until reaching by age four the "steady state" size, affiliates of MNEs enter large, closer to their "steady state" size. New affiliates sales are much larger than exporters sales (figure ??), but in terms of home sales, exporters grow fast enough to catch up at around age four (figure 7c). These features are robust to the inclusion of year, destination, and industry fixed effects (see table 8 in the Appendix).

Correction by partial-year effects. Figure 7 shows results using the raw data. But recent research has shown (Bernard et al., 2015) [7] that steep export sales profiles in the first year after entry may be an artifact of the data collection. Not all firms start exporting in January; as a consequence, a firm that starts exporting in September, for instance, may exhibit large growth between age zero and one simply because the comparison is made between a whole year of sales and only four months. This partial-year effect leads to

---

22 For Germany, the coefficients of first-year exit rates on (log of) GDP and geographical distance, respectively, are not significant.
23 Average sales relative to entry year for all firms, not only the ones surviving five or more years, are very similar.
24 Further evidence on new exporters’ and new MNEs affiliates’ sales profiles for Germany and France, respectively, is provided in figure 23 in the Appendix.
Figure 6: Exit rates at age one and market characteristics, France.

Market size

(a) Exporters

(b) MNEs

Distance

(c) Exporters

(d) MNEs

Notes: Exit rates are defined as the number of affiliate-destination exits, relative to the number of active affiliates-destinations, in the first year upon entry. Destinations with ten or more firm-year observations.
Figure 7: Foreign sales, Norway.

(a) relative to entry year
(b) absolute values
(c) relative to home sales

Notes: Firm-destination export (affiliate) sales, in logs: with respect to firm-destination export (affiliate) sales in the entry year (in logs), in figure 7a; absolute values, in figure 7b; and with respect to home sales (in logs). "Experienced MNEs" refers to the subset of foreign affiliates with one or more years of export experience before opening an affiliate. Means are taken over all firm-destination pairs with five or more years in the market, in each mode (export or MNE). (Log of) exports (affiliate sales) are demeaned by industry, year, and destination fixed effects.

erroneously high growth rates in the first year upon entry, for new exporters. Though we cannot correct for the partial year effects in the Norwegian data, the French export data record international shipments monthly, allowing us to make adjustments to the exporters growth profiles and eliminate partial-year effects. Figure 8a shows the sales profile for new exporters recomputed taking into account the month of the year in which the firm started exporting. The adjustment is substantial: After entry, the export sales growth in a given market when partial-year effects are taken into account is a third of the sales’ growth obtained using the calendar-year data. The sales profiles of new Norwegian and French exporters are strikingly similar as long as the data are not corrected by partial-year effects.

A similar problem may affect the sales profiles of MNEs affiliates. Sales growth rates may be biased because not all new affiliates start their operations in January. It is not possible to address this issue in the same way as for the export data due to the lack of monthly affiliate sales information. To nonetheless make progress, we exploit the idea that partial year effects should be more prevalent for new affiliates created through "greenfield FDI" than for those created through a Merger and Acquisition (M&A). In the case of greenfield FDI, the affiliate can start operating at any point during its first calendar year, so that the balance sheet reflects only part of those calendar-year operations. On the contrary, a

The procedure that corrects for partial-year effects takes into account the month of the year in which the first international shipment is observed into a given destination, for a French firm. Annual growth rates are then computed considering a twelve-month period after entry.

This magnitude is similar to the one obtained by Bernard et al. (2015) [7] for Peru, of more than 100 percent.
new affiliate created through an M&A—that is, by taking over an already existing firm—
reports sales for the entire calendar year. The German data distinguish new affiliates by
their entry mode from 2005 onwards. As figure 8b shows, the sales growth of greenfield
affiliates is much steeper than the one for affiliates acquired through M&A, which may
suggest some bias occurring because of partial-year effects.27

We conclude that, adjusted by partial-year effects, the export sales growth profile is,
on average, very similar to the one for M&A affiliates.

Figure 8: Partial-year effects: export and affiliate sales.

Notes: Firm-destination (log of) sales relative to firm-destination sales in the year of entry. Means are
taken over all firm-destination pairs with five or more years in the market. (Log of) sales are demeaned
by industry, year, and destination fixed effects. For Germany, the sample is restricted to the period
2005-2011, for which the information on entry mode is available.

In the Norwegian data, due to data availability, we are not able to correct by partial
year effects the sale profiles of exporters and MNEs. One way of tackling the problem is
to look to sales profiles excluding the entry year. Specifically, we calculate (log) sales at a
given age relative to sales one year after entry; that is, age one is the omitted age group
and age zero is still the entry year. Figure 9a plots the coefficient results from estimating,
by OLS,

\[
\log y_{inmt}/y_{inm1} = \beta_0 mne_{int} + \sum_t \beta_1^t D(age_{inm} = t) + \sum_t \beta_2^t mne_{int} \times D(age_{inm} = t) \\
+ \alpha_t + \alpha_n + \epsilon_{inmt},
\]

27 Another important factor may play a role in these profiles: Greenfield FDI are affiliates at the beginning
of their life-cycle, while M&A affiliates can be much older firms, that may have existed in their domestic
market for many years.
while figure 9b shows the results for

\[
\log \frac{y_{inm}}{y_{inm1}} = \hat{\beta}_0 mne_{int} + \sum_t \hat{\beta}_1 D(age_{inm} = t) + \sum_t \hat{\beta}_2 mne_{int} \times D(age_{inm} = t) + \\
\hat{\beta}_3 exp_{inm} + \hat{\beta}_4 exp_{inm} \times mne_{int} + \sum_t \hat{\beta}_5 exp_{inm} \times D(age_{inm} = t) + \\
\sum_t \hat{\beta}_6 D(age_{inm} = t) \times mne_{int} \times exp_{inm} + \alpha_t + \alpha_n + \hat{\epsilon}_{inm}. \tag{6}
\]

There is no significant difference between MNEs and exporters sales profiles, and also no significant difference between experienced and non-experienced MNEs.\textsuperscript{28}

Figure 9: Sale profiles, one year after entry: age dummies, Norway. OLS

(a) MNEs vs Exporters

(b) Experienced vs Non-experienced MNEs

Notes: Observations are at the firm-destination-year level. (Log) Sales are relative to sales one year after entry. The base groups are exporters in the left panel, and non-experienced MNEs in the right panel. Coefficients from OLS estimates of (5) and (6), respectively, with year, country, and industry fixed effects, and standard errors clustered by industry. Firm-destination pairs with more than 4 years of observations.

\textsuperscript{28}The difference at age zero is positive because MNE sales are flatter the year after entry than for exports.
Table 3: Exit rates, OLS.

<table>
<thead>
<tr>
<th></th>
<th>Norway</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>( D(\text{Exit}_{\text{inmt}}) )</td>
<td>Exit rate, firm-destination level, by mode-destination specific age</td>
<td></td>
</tr>
<tr>
<td>( mne_{\text{int}} )</td>
<td>(-0.22^{***})</td>
<td>(-0.23^{***})</td>
</tr>
<tr>
<td>( \text{age}_{\text{inmt}} )</td>
<td>(-0.044^{***})</td>
<td>(-0.044^{***})</td>
</tr>
<tr>
<td>( mne_{\text{int}} \times \text{age}_{\text{inmt}} )</td>
<td>(0.026^{***})</td>
<td>(0.026^{***})</td>
</tr>
<tr>
<td>( \text{exp}_{\text{inmt}} )</td>
<td>(-0.063)</td>
<td>(-0.019)</td>
</tr>
<tr>
<td>( mne_{\text{int}} \times \text{exp}_{\text{inmt}} )</td>
<td>(0.073)</td>
<td>(0.057)</td>
</tr>
<tr>
<td>( \log \text{sales}_{\text{it,domestic}} )</td>
<td>(-0.03^{***})</td>
<td>(-0.03^{***})</td>
</tr>
<tr>
<td>Year FE</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Destination FE</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Industry FE</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Destination-year FE</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Observations</td>
<td>114,426</td>
<td>114,426</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.066</td>
<td>0.066</td>
</tr>
</tbody>
</table>

**D(Exit_{int})** Exit rate, firm level, by mode specific age

<table>
<thead>
<tr>
<th></th>
<th>Norway</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>( mne_{\text{it}} )</td>
<td>(-0.17^{***})</td>
<td>(-0.17^{***})</td>
</tr>
<tr>
<td>( \text{age}_{\text{int}} )</td>
<td>(-0.039^{***})</td>
<td>(-0.039^{***})</td>
</tr>
<tr>
<td>( mne_{\text{it}} \times \text{age}_{\text{int}} )</td>
<td>(0.028^{***})</td>
<td>(0.028^{***})</td>
</tr>
<tr>
<td>( \text{exp}_{\text{int}} )</td>
<td>(0.14)</td>
<td>(0.14^{#})</td>
</tr>
<tr>
<td>( mne_{\text{it}} \times \text{exp}_{\text{int}} )</td>
<td>(-0.14)</td>
<td>(-0.096)</td>
</tr>
<tr>
<td>( \log \text{sales}_{\text{it,domestic}} )</td>
<td>(-0.066^{***})</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Year FE</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Industry FE</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Observations</td>
<td>13,842</td>
<td>13,842</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.044</td>
<td>0.044</td>
</tr>
</tbody>
</table>

Notes: \( D(\text{Exit}_{\text{inmt}}) \) is one if firm \( i \) exits destination \( n \) and mode \( m \) at age \( t \), and zero otherwise; the variable \( mne_{\text{int}} \) is one if the firm \( i \) is active in destination \( n \) as an MNE at age \( t \), and zero if it is active as an exporter; the variable \( \text{age}_{\text{inmt}} \) denotes the age of the firm \( i \) in destination \( n \) and mode \( m \) at age \( t \); and \( \text{exp}_{\text{inmt}} \) is one if firm \( i \) that is active in destination \( n \) in mode \( m \) at age \( t \) has previous experience in mode \( m' \), \( m' \neq m \). \( \text{sales}_{\text{it,domestic}} \) denotes sales of firm \( i \) at time \( t \) in the domestic country. In columns 1-4, observations are from Norway (1996-2006), while in columns 5-7 they are from France (1999-2007). Standard errors, clustered by industry, are in parentheses. ***\( p < 0.01 \), **\( p < 0.05 \), *\( p < 0.1 \).
2.5 Fact IV: Domestic size at entry and exit.

The following transition matrix shows the size of domestic sales for French firms who transition from one mode of international operation to another. The matrix is computed at the firm-destination level. To such end, we expand the data set at the firm-destination-year level: Every firm can be domestic, exporter, experienced or unexperienced MNE in every destination, in every year. That is, firms without international activities are domestic in all destinations, firms that export to (invest in) some destinations but not others are counted as exporters (MNEs) in these destinations, but domestic in all others.

As previously documented, the diagonal axis shows that (continuing) domestic firms are smaller than (continuing) exporters, that in turn are smaller than (continuing) MNEs. Among this last group, experienced MNEs seems to be the largest, on average. The cells off the diagonal axis provide new insights concerning firm dynamics. Domestic firms that become exporters have on average 25 million euros higher sales than exporters that turn back domestic. Notably, domestic firms that become multinational (i.e. non-experienced MNEs) are two and a half times larger, with sales of almost 800 million euros, than those in the group of non-experienced MNEs that turn domestic (296 million euros), or decide to only export (614 million euros). Similarly, with sales of around 1,880 million euros, exporters that turn multinational are on average very similar in size in their domestic market to experienced MNEs that decide to only export (2,080 million euros), but much larger than firms that exit the international market (268 million euros). Finally, it is worth noting that exporters that become MNEs are larger (1,880 million euros) than domestic firms that become MNEs (799 million euros) as well as larger than incumbent non-experienced MNEs (1,500 millions euros). Table 9 in the Appendix shows results at the firm level.

For Norway, we present the data in a slightly different format. Table 5 shows average size at entry and exit for exporters, experienced MNEs, and non-experienced MNEs (standard errors and number of observations are also reported). Size is, alternately, given by foreign sales and home sales. The pattern is similar to the one shown for France: Exporters and non-experienced MNEs are entry are larger than at exit; experienced MNEs are larger at entry than at exit when domestic size is considered, but differences are small; MNEs are much larger at entry and at exit than exporters, more so for experienced MNEs.
Table 4: Transition matrix: domestic size, firm-destination level, France.

<table>
<thead>
<tr>
<th>$t - 1 \ \backslash \ t$</th>
<th>Domestic</th>
<th>Non-MNE exporter</th>
<th>Non-experienced MNE</th>
<th>Experienced MNE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>46</td>
<td>150</td>
<td>799</td>
<td>1,630</td>
</tr>
<tr>
<td></td>
<td>31,400,000</td>
<td>192,357</td>
<td>497</td>
<td>16</td>
</tr>
<tr>
<td>Non-MNE exporter</td>
<td>124</td>
<td>343</td>
<td>1,880</td>
<td></td>
</tr>
<tr>
<td></td>
<td>177,541</td>
<td>961,164</td>
<td></td>
<td>1,880</td>
</tr>
<tr>
<td>Non-experienced MNE</td>
<td>296</td>
<td>614</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>123</td>
<td>116</td>
<td></td>
<td>1,578</td>
</tr>
<tr>
<td>Experienced MNE</td>
<td>268</td>
<td>2,080</td>
<td>3,675</td>
<td></td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>235</td>
<td></td>
<td>3,620</td>
</tr>
</tbody>
</table>

Notes: Each cell reports the mean sales (in millions of Euros) in the French market, as well as the number of observations. Each cell shows size at time $t$ under mode $m$ (column) given mode $m'$ at time $t - 1$ (row).

Table 5: Size at entry and exit, Norway.

<table>
<thead>
<tr>
<th></th>
<th>Foreign sales</th>
<th>Home sales</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exporters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>entry</td>
<td>0.007 (0.013)</td>
<td>0.291(0.011)</td>
<td>27,355</td>
</tr>
<tr>
<td>exit</td>
<td>-0.306 (0.017)</td>
<td>0.132 (0.015)</td>
<td>13,445</td>
</tr>
<tr>
<td><strong>Non-experienced MNEs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>entry</td>
<td>5.719 (0.125)</td>
<td>1.134 (0.117)</td>
<td>313</td>
</tr>
<tr>
<td>exit</td>
<td>5.296 (0.226)</td>
<td>0.596 (0.244)</td>
<td>107</td>
</tr>
<tr>
<td><strong>Experienced MNEs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>entry</td>
<td>4.653 (0.160)</td>
<td>2.152 (0.132)</td>
<td>234</td>
</tr>
<tr>
<td>exit</td>
<td>4.821 (0.234)</td>
<td>2.060 (0.138)</td>
<td>97</td>
</tr>
</tbody>
</table>

Notes: Foreign sales (in logs) are demeaned by destination, sector, and year fixed effects. Home sales (in logs) are demeaned by sector and year fixed effects. Standard errors are in parenthesis. Size is recorded for the year after entry and the year before exit, respectively.
3 A Simple HMY Dynamic Model

In this section, we extend the model of trade and FDI by Helpman, Melitz, and Yeaple (2004) [19] to a dynamic setup.

Time is discrete. There are two countries, Home and Foreign, that differ only in their size. Labor is the only factor of production and supplied in fixed quantity. The wage in each country is pinned down by a constant-return-to-scale freely tradable homogeneous good sector, and normalized to one, \( w = w^* = 1 \).

Goods that are exported to a foreign country are subject to an iceberg-type trade cost, \( \tau \geq 1 \), while production in foreign affiliates is subject to an efficiency loss given by \( \gamma \geq 1 \). A firm that exports to a foreign market incurs a per-period fixed cost, \( f^x \), and a firm that operates an affiliate in a foreign market incurs a per-period fixed cost \( f^m \), with \( f^m > f^x \). There is also a sunk cost of opening an affiliate in the foreign market, \( f^m_e > 0 \). We do not include sunk costs of exporting, following the literature that concludes that they are small, and given our facts in the previous section. These costs are paid in units of labor in the home market.

There exists a continuum of firms that compete monopolistically, each of which have access to a continuum of differentiated products. Preferences are CES, and the elasticity of substitution among different goods is denoted by \( \sigma \). We consider the case in which the mass of firms, \( N \), is fixed and normalized to one.

A firm is characterized by its country of origin, and a core efficiency level at time \( t \), \( \phi_t \equiv \exp(z_t) \). The core efficiency evolves over time in the following way

\[
    z_t = \rho z_{t-1} + \sigma \epsilon_t,
\]

where \( 0 \leq \rho < 1 \) and \( \epsilon_t \sim N(0, 1) \).

Firms optimally charge a constant mark-up \( \kappa = \frac{\sigma}{\sigma - 1} \) over marginal costs, so that sales follow the standard CES formula. Let \( E \equiv \kappa^{1-\sigma} X/P^{1-\sigma} \), which captures size of demand in a country. We assume that \( E = 1 \) so that \( E^* \) is the relative size of the Foreign country.

Domestic sales are

\[
    s_d(\phi) = \phi^{\sigma - 1}
\]

Exports to the foreign market from Home are

\[
    s_x(\phi) = E^* \phi^{\sigma - 1} \tau^{1-\sigma},
\]
while sales of Home affiliates in Foreign are

\[ s_m(\phi) = E^* \phi^{\sigma-1} \gamma^{1-\sigma}, \tag{9} \]

In terms of production locations, the firm has two possible states: producing in the domestic market only (D) or in both markets (M).

The value of being a multinational with core productivity \( \phi \) is given by

\[ V(\phi, M) = \frac{s_d(\phi)}{\sigma} + \max \left\{ \frac{s_m(\phi)}{\sigma} - f^m + \beta EV(\phi', M | \phi), \right. \]

\[ \left. \max(0, \frac{s_x(\phi)}{\sigma} - f^x) + \beta EV(\phi', D | \phi) \right\}. \tag{10} \]

A multinational firm chooses between continuing its operations abroad, for which the per-period fixed cost \( f^m \) is incurred, shutting down the affiliate and becoming an exporter, for which the per-period fixed cost \( f^x \) is incurred, or abandoning international activities altogether.

The value of being a domestic firm with core productivity \( \phi \) is given by

\[ V(\phi, D) = \frac{s_d(\phi)}{\sigma} + \max \left\{ \frac{s_m(\phi)}{\sigma} - f^m - f_e^m + \beta EV(\phi', M | \phi), \right. \]

\[ \left. \max(0, \frac{s_x(\phi)}{\sigma} - f^x) + \beta EV(\phi', D | \phi) \right\}. \tag{11} \]

A domestic firm can choose to become a MNE, for which the per period fixed cost \( f^m \) as well as the entry sunk cost \( f_e^m \) are incurred, to export with per-period fixed cost \( f^x \), or to operate only in its home market.

Exporting is essentially a static decision. A domestic firm will export whenever \( \bar{x}^x < \phi < \bar{x}^m \), where the lower bound export cutoff is defined by

\[ \frac{1}{\sigma} s_x(\bar{x}^x) - f^x = 0. \tag{12} \]

The upper bound export cutoff, which is equivalent to the lower bound MP entry cutoff \( (\phi^e) \), is defined by the value of \( \phi \) for which the firm is indifferent between choosing D or M in the problem defined in equation (11).

The firm will stop being a multinational if choice D leads to larger profits than choice M. Denote the cutoff value of productivity by \( \phi^m \). It is straightforward that \( \phi^m < \bar{x}^m \), whenever \( f_e^m > 0 \). A firm that wants to enter multinational production faces the addi-
tional hurdle of overcoming \( f^m \), which is not faced by the incumbent multinational firm. Whether \( \bar{\phi}^m > \bar{\phi}^e \) depends on parameters. The following proposition states formally the result.

**Proposition 1.** Assume that \( f^m > f^x(\frac{2}{\gamma})^{1-\sigma} \), and \( f^e > 0 \). Then,

\[
\bar{\phi}^e < \bar{\phi}^m < \bar{\phi}^m.
\]

When \( \phi \in [\bar{\phi}^m, \bar{\phi}^m] \), domestic firms wait to become multinationals and, if this is profitable, just export. MNEs with \( \phi \in [\bar{\phi}^m, \bar{\phi}^m] \) keep their status. This is the "inaction" zone that exists by virtue of the sunk cost of doing FDI.

Additionally, with this ordering of cutoffs, it follows naturally that multinational firms are more productive than exporters, that in turn, are more productive than domestic firms; this is consistent with the previous literature and captured by the static models of the proximity-concentration tradeoff. The difference in size between exporters and MNEs subsists in the time series.

Fixed and sunk costs together lead to an interesting proposition about the impact of export experience on the exit behavior of MNEs.

**Proposition 2.** The probability that a new MNE exits right after entry is lower if the firm previously served the market as an exporter.

This theoretical result captures Fact I portrayed in figure 2 and table 3. Firms who have export experience, according to the model, enter the multinational status with a productivity level that is larger than the productivity level of a firm with no export experience. Since the exit cutoff is the same for both types of firms, larger firms at the time of entry are less likely to have a productivity shock that leads their productivity level to fall below the exit cutoff in the subsequent period. While the fact that new MNEs with export experience are less likely to exit may have been interpreted as evidence consistent with learning, it is worth noting that a simple dynamic model of trade and FDI without learning delivers the same prediction.

With respect to Fact II, the model explains why exit rates for exporters vary with GDP and transport costs and exit rates for MNEs do not (see figure 6). Sunk costs for multinational entry cause hysteresis, or state dependence: The productivity level required for MNE entry exceeds the productivity level at exit. The higher the sunk costs, the higher the option value of staying in a country and hence, the less sensitive the exit behavior to differences in variable profits due to differences in market size and transport costs (con-
Figure 10: Iceberg trade costs, market size, and exit rates, numerical example.

(a) Iceberg trade costs

(b) Market size

Notes: Simulation results for different values of iceberg trade costs $\tau$ (market size, $E^*$) on firms’ exit rates at age one, and twenty, respectively.

...ional on entry). Figure 10 illustrates the point through a simple simulation.

Figure 11 further shows how sales at age one and age 20, respectively, with respect to sales in the entry year, change with iceberg trade costs and market size, for MNEs and exporters, respectively. Growth rates for exporters that are one year old are strongly decreasing with $\tau$—more so if they are older; such pattern is not observed for MNEs. It is interesting to notice that growth rates at age one are higher for exporters than for MNEs, but do not change with market size. In contrast, sales at age 20 have grown steeply with market size for MNEs, but they have decreased for exporters.

Additionally, concerning Fact III, the model predicts that growth rates at the firm level should be the same at home and in the foreign market, either for exporters or MNEs. This fits the empirical finding that growth rates are similar, once the bias due to partial year effects is taken into account. The differences in growth profiles between exporters and MNEs arise due to the extensive margin (i.e., entry and exit) by virtue of which in any cross section we observe firms of different age.

Finally, the counterpart of capturing the fact that experienced MNEs have lower exit rates upon entry, is that experienced MNEs are larger than non-experienced MNEs. This results is in line what we observe in figure ??: At age one, MNEs with export experience are larger than the ones with no experience in their domestic market. Consistent with Fact IV, the model predicts that multinational firms that exit the FDI mode in order to become exporters are the least productive multinationals. Likewise, exporters that eventually become multinational firms are the most productive exporters. Other features portrayed
by Fact IV are also captured by the model just because of the difference between sunk and fixed costs for MNEs (i.e. due to the band-of inaction for MNEs).

In the next section, we ask: how far does the model go in capturing quantitatively the patterns observed in the data?

4 Calibration

Procedure. We use moments from the Norwegian data to calibrate key parameters of the model. The goal is to compare the facts in section 2 with the simulated data. The calibrated parameters, as well as the data targets, are listed in table 6.

We set $\sigma = 4$ which implies a mark-up over unit cost of 33 percent and it is the common value estimated for the trade elasticity. The discount factor for firms, captured by the parameter $\beta$, is set to 0.95 which implies an interest rate of five percent. The measure of firms $N$ in each country is normalized to one in each country.

We calibrate the parameter $E^*$ as the output-side real GDP (at chained PPPs, in 2011 US dollars) of the average country in the world with respect to Norway, an average over the period 2000-2005, from PWT(9.0), which is 1.36.

The variable trade cost, $\tau$, is pinned down by the ratio of exports to domestic sales, $r^{de} = (s_x(\phi)/s_d(\phi))^{1/(1-\sigma)}$, $E^*$, and $\sigma$: $\tau = (r^{de}/E^*)^{1/(1-\sigma)}$. The average ratio of export to domestic sales, weighted by revenues, for domestic sales of Norwegian firms, is 0.058,
Table 6: Model parameters and targeted data moments.

<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>σ</td>
<td>4</td>
<td>elasticity of substitution</td>
<td>mark-up</td>
<td>mark-up</td>
<td>33%</td>
</tr>
<tr>
<td></td>
<td>β</td>
<td>0.95</td>
<td>discount factor</td>
<td>interest rate</td>
<td>interest rate</td>
<td>5%</td>
</tr>
<tr>
<td>E∗</td>
<td>1.36</td>
<td></td>
<td>relative size of Foreign</td>
<td>avg real GDP, relative to Norway’s</td>
<td>1.36</td>
<td></td>
</tr>
<tr>
<td>τ</td>
<td>2.86</td>
<td></td>
<td>trade iceberg cost</td>
<td>avg export to domestic sales</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>γ</td>
<td>1.22</td>
<td></td>
<td>MNE iceberg cost</td>
<td>avg MNE sales to domestic sales</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>ρ</td>
<td>0.96</td>
<td></td>
<td>AR(1) productivity</td>
<td>AR(1) process for domestic sales</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>σε</td>
<td>0.14</td>
<td></td>
<td>process</td>
<td>sales, OLS</td>
<td>0.41</td>
<td></td>
</tr>
</tbody>
</table>

| f^x        | 0.012    | export fixed cost         | fraction of non-MNE exporters    | 0.54 |
| f^m        | 2.967    | MNE fixed cost            | fraction of MNEs                 | 0.02 |
| f^e_m      | 1.163    | MNE sunk cost             | probability of MNE exit at age one | 0.21 |

Notes: Moments in the data, except for the mark-up and interest rate, refer to observations at the firm-destination level, for Norway.

which together with \( \sigma = 3.85 \) and \( E^* = 1.36 \), implies \( \tau = 2.86 \). Following the same procedure for the iceberg cost for MNEs, and using an average (weighted) ratio of affiliate sales to domestic sales of 0.755, entails \( \gamma = 1.22 \).²⁹

The parameters characterizing the Markov process for firm-level productivity, \( \rho \) and \( \sigma_\epsilon \), come from an AR(1) regression of domestic sales, for all Norwegian firms (i.e., unbalanced panel): \( \rho_s = 0.956 \) and \( \sigma_s = 0.407 \), which imply \( \rho_z = \rho_s = 0.956 \) and \( \sigma_\epsilon = \sigma_s / (1 - \sigma) = 0.143 \).³⁰

Per period fixed costs of exporting, \( f^x \), and FDI, \( f^m \), as well as sunk costs of FDI, \( f^e_m \), are jointly calibrated by targeting the fraction of non-MNE exporters, the fraction of MNEs and the probability of MNE exit. The upper panel of table 7 shows the targeted moments and our model estimates; its lower panel of table shows the non-targeted moments.

**Results.** As proved in Proposition 2, the calibrated model correctly captures the fact that new experienced MNEs have lower exit rates than non-experienced MNEs. Yet, the calibrated model delivers virtually zero new MNEs which were not previously exporters; this group, however, is also very small in the data (0.09 percent of domestic firms become

---

²⁹The calculation of the ratio of exports (affiliate sales) to domestic sales considers firms with at least three years in the mode.

³⁰The first-order autoregressive process is estimated including year and industry fixed effects, with robust standard errors clustered by industry, using all firms in Norway. Results using employment are similar.
Table 7: Moments, data and model.

<table>
<thead>
<tr>
<th>Targeted moments</th>
<th>data (in %)</th>
<th>model (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-MNE exporters</td>
<td>54.0</td>
<td>54.5</td>
</tr>
<tr>
<td>MNEs</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>probability of MNE exit at age one, all MNEs</td>
<td>21</td>
<td>20.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-targeted moments</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Experienced MNEs</td>
<td>39</td>
<td>96.6</td>
</tr>
<tr>
<td>probability of export exit at age one</td>
<td>54.3</td>
<td>27.2</td>
</tr>
<tr>
<td>probability of MNE exit at age one, non-experienced MNEs</td>
<td>27</td>
<td>31.0</td>
</tr>
<tr>
<td>probability of MNE exit at age one, experienced MNEs</td>
<td>14.4</td>
<td>20.9</td>
</tr>
<tr>
<td>probability of becoming experienced MNE</td>
<td>0.24</td>
<td>0.70</td>
</tr>
<tr>
<td>probability of becoming non-experienced MNE</td>
<td>0.11</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes: Moments in the data refer to observations at the firm-destination level, for Norway. The fraction of non-MNE exporters and MNE are relative to all firms in the data set. The fraction of (new) experienced MNEs is calculated relative to all new MNEs into a market. The probability of becoming an experienced MNE is calculated relative to the number of exporters, while the probability of becoming a non-experienced MNE is relative to all domestic firms.

MNEs). Figure 12 shows the ability of the model to capture the exit profiles observed in the data. The quantitative model captures fairly well the exit patterns across new MNEs in different cohorts. Still, the model fails to capture the steepness of the exit profile for exporters: It only captures half of their initial exit rate.

Figure 13 shows the ability of the model to capture the growth profiles for new MNEs and new exporters depicted in figure 7a for Norway. The calibrated model does a relatively good job at picking growth profiles for new MNEs. Concerning exports, we apply the correction to control for partial-year effects, as suggested by the French data. The smooth growth observed in the data is present also in the model. Still, exporters in the model growth too much with respect to the adjusted data.
Figure 12: Exit rates, model and data.

Notes: Data are for Norway, at the firm-destination level, as in figure 2a.

Figure 13: Foreign sales, model and data.

Notes: Data are for Norway, at the firm-destination level, as in figure 7a. Export sales in the data are adjusted by partial-year effects, from France.
5 The Role of MNEs in Exporters’ Dynamics

In this section, we compare the model with MNEs to a model without MNEs. Moreover, we study the difference of responses for exporters to changes in iceberg trade costs, iceberg MNE costs, and market size, in the two models. For comparison purposes, and to portrait the asymmetry of effects, we also show results from a model with MNEs, but not exporters.

First, the model with only exporters and no MNEs is calibrated to the share of exporters observed in the data. Targeting that moment, we pin down the per-period fixed cost of exporting, \( f^x \), which turns out to be of almost the same value as in the baseline calibrated model. Results for the model with and without MNEs for exit rates and sales profiles are shown in figure 14. While no change is observed in the pattern of exit for young exporters, the difference in sales profiles is dramatic: While by age 10 export sales, relative to entry, in the model with only exporters is ten-percentage points higher, by age 20 the difference widens to 30 percentage point. The model with only supply fundamentals, but MNEs, is able to slow down exporters’ growth by a significant amount.

Figure 14: Exit rates and sales profiles, model without MNEs.

(a) Exit rates

(b) Sales, relative to entry (in logs)

The differences between the response of exporters in the two models, portrayed in figure 14, has major consequences if one were to analyze (a permanent) trade liberalization episode, and effects on markets of different size. Figure 15 depicts exit rates and sales (relative to entry) at age one and twenty, for exporters, stemming from the model with and without MNEs, respectively.
Figure 15a shows that the model without MNEs would predict a smooth change between two steady states with trade costs that are half as high, while the model with MNEs would predict drastic changes: Moving from $\tau = 8$ to $\tau = 4$ would cut exit rates at age one for exporters in 25 percent (from 0.4 to 0.3), while in the model with MNEs, those exit rates would decrease by almost 60 percent (from 0.7 to 0.3). The difference is equally pronounced if one looked at exit rates for exporters with 20 years in the market. A similar pattern is obtained for first-year growth rates: The model without MNEs would not predict very different growth rates for different levels of trade costs, while the model with MNEs will (from $\tau = 8$ to 4, first-year growth rate would increase from less than five percent to almost 25 percent. The model without MNEs, however, would predict a much steeper sales profiles, as already shown above, between age 1 and age 20, as indicated by comparing the two panels in figure 15b.

Differences between the two models across markets of different sizes, for exit rates of young exporters are not large (figure 15d); sales patterns, however, and indeed different, as evidenced in figures 15d.

Finally, we show a comparison between the model with MNEs and the model without exporters and analyze if MNEs life-cycle patterns are different across the two models, for different trade costs ($\tau$), and across markets of different size ($E^*$). Figure 16 shows that the calibrated model without exporters, but MNEs, is almost identical to the one with exporters and MNEs, in regard to the dynamic behavior of MNEs.

Changing the relative size of the foreign market, however, has different implications for the life-cycle dynamic of MNEs, if we consider or not exports. Exit rates of young MNEs are almost identical across markets of different size and of MNEs at age 20 when the model does not consider exports, in figure 17a. The model that incorporates the possibility of exporting to a foreign market shows that for young MNEs exit rates decrease smoothly with market size, as already portrayed in figure 10b, and there is much larger decrease in exit rates at age 20 than in the model without exports. Figure 17b further shows that the implied sales dynamics is quite different across both models for market of different size.
Figure 15: Trade liberalization, market size, and exporters’ dynamics.

Trade costs

(a) Exit rates

(b) Sales, relative to entry (in logs)

Market size

(c) Exit rates

(d) Sales, relative to entry (in logs)
Figure 16: Exit rates and sales profiles, model without exporters.

(a) Exit rates

(b) Sales, relative to entry (in logs)

Figure 17: Market size and MNEs’ dynamics.

(a) Exit rates

(b) Sales, relative to entry (in logs)
6 Conclusions

This paper documents new facts on the life-cycle dynamics of exporters and multinational enterprises (MNEs). Using very detailed panel data at the firm level for France, Norway, and Germany, we document that exit rates for exporters at age one are twice as large as for MNEs. Moreover, MNEs with previous exports to the market have a significant survival advantage at age one. Second, we show that exit rates at age one are strongly correlated with characteristics of the destination market in the case of exporters, but not for MNEs. While new exporters’ exit rates show a sharp decrease (increase) with market size (distance), MNEs’ do not. Third, life-cycle sales profiles for new exporters are not different from the ones for MNEs, once partial-year effects are taken into account; experienced MNEs do not seem different in this respect. Finally, MNEs are larger (in their domestic market) at entry than at exit, while exporters are not. Moreover, exporters that either enter or exit are smaller than MNEs that exit, and experienced MNEs that enter are larger than non-experienced MNEs.

A simple extension of the static model of trade and Foreign Direct investment (FDI), in Helpman et al. (2004) [19], to a dynamic setting with sunk costs of MNE entry captures fairly well salient features of the data, both qualitatively and quantitatively. The role of MNEs and the sunk costs associated with their entry into a market are key for exporters’ life-cycle dynamics: A model without MNEs would predict a much steeper sales profiles for exporters. For trade liberalization exercises, the decrease in exit rates—and increase in first-year sales growth—for young exporters when trade costs decrease, are much higher in the model with MNEs than in the model without them.

References


A Proofs

A.1 Proof of Proposition 1

Define \( \mu^D(\tilde{\phi}^m) \equiv EV(\phi', D/\tilde{\phi}^m) \) and \( \mu^M(\tilde{\phi}^m) \equiv EV(\phi', M/\tilde{\phi}^m) \). Also, define \( \pi^m(\phi) \equiv s^m(\phi)/\sigma - f^m \), and \( \pi^x(\phi) \equiv s^x(\phi)/\sigma - f^x \).

Then, in the stationary equilibrium, for \( \phi = \bar{\phi}^m \), (10) can be written as

\[
V(\phi, M) = \max \left\{ \pi^m(\bar{\phi}^m) + \beta \mu^M(\bar{\phi}^m), \pi^x(\bar{\phi}^m) + \beta \mu^D(\bar{\phi}^m) \right\},
\]

while (11) is

\[
V(\phi, D) = \max \left\{ \pi^m(\bar{\phi}^m) - w f^m + \beta \mu^M(\bar{\phi}^m), \pi^x(\bar{\phi}^m) + \beta \mu^D(\bar{\phi}^m) \right\}.
\]

The productivity cutoff for exporters is given, from (12), by

\[
\bar{\phi}^x = \left( \frac{\sigma w f^x}{E^*} \right)^{\frac{1}{1 - \sigma}} (\tau w),
\]

while the productivity cutoff for multinationals who exit is

\[
\bar{\phi}^m = \left( \frac{\beta \mu^D(\bar{\phi}^m) - \beta \mu^M(\bar{\phi}^m) + w f^m - w f^x}{E^* ((w^*)^{1 - \sigma} - (\tau w)^{1 - \sigma})} \right)^{\frac{1}{\sigma - 1}}.
\]

Hence, \( \bar{\phi}^x < \bar{\phi}^m \), as long as

\[
\beta (\mu^D(\bar{\phi}^m) - \mu^M(\bar{\phi}^m)) < f^m - f^x \left( \frac{w^*}{w^*} \right)^{1 - \sigma}.
\]

Since the left-hand side of the inequality is always negative, and \( f^m > f^x \left( \frac{w^*}{w^*} \right)^{1 - \sigma} \), then it follows that \( \bar{\phi}^x < \bar{\phi}^m \).

With \( f^m_e > 0 \), it is straightforward that the multinational entry productivity cutoff, \( \bar{\phi}^m_e \), has to be the largest,

\[
\bar{\phi}^m_e = \left( \frac{\beta \mu^D(\bar{\phi}^m_e) - \beta \mu^M(\bar{\phi}^m_e) + w f^m_e + w f^m - w f^x}{E^* ((w^*)^{1 - \sigma} - (\tau w)^{1 - \sigma})} \right)^{\frac{1}{\sigma - 1}}.
\]
A.2 Proof of Proposition 2

Since any previously exporting firm have had higher productivity than any any previously non-exporting firm, in the period before becoming a multinational, we will prove the proposition by showing that if a firm had lower productivity in the period before becoming a multinational, this firm is more likely to exit in the year after entry.

Let

\[ f(a) = \frac{\int_{-\infty}^{\log \phi_e^m} \Pr(\rho x + \sigma \epsilon \leq \log \phi_e^m \mid x)g(x - \rho a)dx}{1 - G(\log \phi_e^m - \rho a)} \]

denote the probability of exit from multinational status in t+1 for a firm that is not yet a multinational in t - 1 and that has a productivity level of a in t-1. The functions \( g(\cdot) \) and \( G(\cdot) \) denote, respectively the probability and cumulative density functions of a normal distribution with mean zero and dispersion parameter \( \sigma_\epsilon \).

Let \( \xi \to 0 \), with \( \xi > 0 \). We want to show that

\[
\int_{-\infty}^{\log \phi_e^m} \Pr(\rho x + \sigma \epsilon \leq \log \phi_e^m \mid x)g(x - \rho a)dx
- \int_{-\infty}^{\log \phi_e^m} \Pr(\rho x + \sigma \epsilon \leq \log \phi_e^m \mid x)g(x - \rho a + \rho \xi)dx
\]

\[
\int_{-\infty}^{\log \phi_e^m} \Pr(\rho x + \sigma \epsilon \leq \log \phi_e^m \mid x)(g(x - \rho a)(1 - G(\log \phi_e^m - \rho a + \rho \xi)) - g(x - \rho a + \rho \xi)(1 - G(\log \phi_e^m - \rho a)))dx
\]

\[
= \frac{\int_{-\infty}^{\log \phi_e^m} \Pr(\rho x + \sigma \epsilon \leq \log \phi_e^m \mid x)g(x - \rho a)dx - \int_{-\infty}^{\log \phi_e^m} \Pr(\rho x + \sigma \epsilon \leq \log \phi_e^m \mid x)g(x - \rho a + \rho \xi)dx}{(1 - G(\log \phi_e^m - \rho a))(1 - G(\log \phi_e^m - \rho a + \rho \xi))} < 0
\]

Note that the denominator is always positive so it will be sufficient to show that the numerator is negative. Further note that \( \Pr(\rho x + \sigma \epsilon \leq \log \phi_e^m \mid x) \) is decreasing in \( x \) and that

\[
\int_{-\infty}^{\log \phi_e^m} \frac{g(x - \rho a)dx}{1 - G(\log \phi_e^m - \rho a)} - \int_{-\infty}^{\log \phi_e^m} \frac{g(x - \rho a + \rho \xi)dx}{1 - G(\log \phi_e^m - \rho a + \rho \xi)} = 0.
\]

Therefore, if we can show that there only exists one point \( m \in [c, \infty] \) s.t. when \( x < m \),

\[
g(x - \rho a)(1 - G(\log \phi_e^m - \rho a + \rho \xi)) - g(x - \rho a + \rho \xi)(1 - G(\log \phi_e^m - \rho a)) < 0 \]

and when \( x > m \), \( g(x - \rho a)(1 - G(\log \phi_e^m - \rho a + \rho \xi)) - g(x - \rho a + \rho \xi)(1 - G(\log \phi_e^m - \rho a)) > 0 \), then we can show that \( f(a) - f(a - \epsilon) < 0 \). Since, when \( \xi > 0 \) and \( \xi \to 0 \), \( G(x - \xi) = G(x) - \xi g(x) \) and \( g(x - \xi) = g(x) - \xi g'(x) \), we can simplify

\[
g(x - \rho a)(1 - G(\log \phi_e^m - \rho a + \rho \xi)) - g(x - \rho a + \rho \xi)(1 - G(\log \phi_e^m - \rho a))\]
\[ g(x - \rho a)(1 - G(\log \bar{\phi}_e^m - \rho a) - \rho \xi g(\log \bar{\phi}_e^m - \rho a)) - (g(x - \rho a) + \rho \xi g'(x - \rho a))(1 - G(\log \bar{\phi}_e^m - \rho a)) \]
\[ = g(x - \rho a)(-\rho \xi g(\log \bar{\phi}_e^m - \rho a) - \rho \xi g'(x - \rho a))(1 - G(\log \bar{\phi}_e^m - \rho a)) \]
\[ = g(x - \rho a)\rho \xi \left( -g(\log \bar{\phi}_e^m - \rho a) + \frac{x - \rho a}{\sigma^2} (1 - G(\log \bar{\phi}_e^m - \rho a)) \right), \]
where the last equality follows from \( g'(x - \rho a) = -\frac{x - \rho a}{\sigma^2} g(x - \rho a). \) Setting this last term equal to zero and dividing by \( g(x - \rho a) \rho \xi > 0 \) illustrates that there exists a unique \( x = m \) that solves this equation.

We next show that when \( x < m \) the expression above is negative, and positive when \( x > m. \) Denote
\[ k(x) = \left( -g(\log \bar{\phi}_e^m - \rho a) + \frac{x - \rho a}{\sigma^2} (1 - G(\log \bar{\phi}_e^m - \rho a)) \right). \]

Because \( (1 - G(\log \bar{\phi}_e^m - \rho a)) \) and \( g(\log \bar{\phi}_e^m - \rho a) \) are positive constants, suppose that \( \frac{g(\log \bar{\phi}_e^m - \rho a)}{(1 - G(\log \bar{\phi}_e^m - \rho a))} = c > 0. \) Then \( m - \rho a \sigma^2 = c \Rightarrow m = cc^2 + \rho a. \) Because \( k'(x) = \frac{(1 - G(\log \bar{\phi}_e^m - \rho a))}{\sigma^2} > 0, \) when \( x < m, k(x) < k(m) = 0, \) and when \( x > m, k(x) > k(m) = 0. \) Therefore, we showed that \( f(a) \) is a decreasing function. ■

**B Additional figures**

Figure 18: Exit Rates: Consolidated vs unconsolidated data, France.

(a) exports  (b) MNEs  (c) experienced MNEs

Notes: Exit rates are defined as the number of affiliate-destination exits, relative to the number of active affiliates-destinations, an average for each group. “Baseline” refers to consolidated data (i.e. aggregated at the group level) while “robustness” refers to the unconsolidated data.
Figure 19: Greenfield FDI vs M&A FDI, Germany.

(a) Exit rates

(b) Absolute sales (in logs)

Notes: Exit rates are defined as the number of affiliate-destination exits, relative to the number of active affiliates-destinations, an average for each group.
Notes: Exit rates are defined as the number of affiliate-destination exits, relative to the number of active affiliates-destinations, in the first year upon entry. Scatter plots include only destinations where at least 10 (Norway) and 11 (Germany) respectively parent companies are active.
Figure 21: Exit rates and market characteristics, same set of countries. France.

(a) Exporters – market size

(b) MNEs – market size

(c) Exporters – distance

(d) MNEs – distance

Notes: Exit rates are defined as the number of affiliate-destination exits, relative to the number of active affiliates-destinations, in the first year upon entry. Scatter plots include only destinations where at least 10 parent companies are active.
Figure 22: Exit rates and market characteristics, experienced MNEs. France.

(a) Experienced MNEs – market size

(b) Experienced MNEs – distance

Notes: Exit rates are defined as the number of affiliate-destination exits, relative to the number of active affiliates-destinations, in the first year upon entry. Scatter plots include only destinations where at least 10 parent companies are active.

Figure 23: Foreign sales, France, Germany, and Norway.

(a) Affiliate sales

(b) Export sales

Notes: Firm-destination (log of) affiliate sales (export sales) relative to firm-destination affiliate sales (export sales) in the year of entry. Means are taken over all firm-destination pairs with five or more years in the market. (Log of) affiliate sales are demeaned by subtracting industry, year, and destination fixed effects.
C Additional Tables for Section 2

We estimate the following equation, by OLS,

\[ \log y_{inm,t} - \log y_{inm,0} = \beta_0 mne_{int} + \beta_1 age_{inmt} + \beta_2 mne_{int} \times age_{inmt} + \beta_3 exp_{inmt} + \beta_4 mne_{int} \times exp_{inmt} + \epsilon_{inmt}. \] (19)

The variable \( y_{inm,t} \) denotes sales of firm \( i \) in year \( t \) that is active in destination \( n \) under mode \( m \); \( mne_{int} \) is one if the firm \( i \) is active in market \( n \) in year \( t \) as an MNE, and zero if it is active as an exporter; the variable \( age_{inmt} \) denotes the age of the firm \( i \) that is active in market \( n \) and mode \( m \) at time \( t \); and \( exp_{inmt} \) is one if firm \( i \) who enters market \( n \) at time \( t \) under mode \( m \) has previous experience in mode \( m', m \neq m' \). We include year, destination, and industry fixed effects. Table 8 shows results for observations at the firm-destination and firm level. The coefficient on the dummy on MNE status is negative and significant which means that sales with respect to entry, controlling by age, are smaller for MNEs than for exporters, consistent with the idea that MNEs are born large and grow little over their life cycle. As expected, the sale profile is increasing with age, as indicated by \( \beta_1 > 0 \). Regarding experienced MNEs, they seem to grow faster than the overall MNE average, but the difference does not show up as significant in the regressions. Moreover, these affiliates are almost of equal size in terms of sales than new non-experienced affiliates, but are much smaller in terms of their parent sales in the Norwegian market. These two facts together implies that parents of experienced MNEs seem to be much larger in their domestic market. Results are unchanged if we include cohort, instead of year fixed effects. Moreover, the inclusion of age dummies, and its corresponding interactions, rather than a continuos variable for age, delivers similar results: The MNE dummy is negative and significant; all age dummies are positive and significant; the interaction between age dummies and the MNE dummy is negative and mostly significant; and the interactions capturing a differential effect of export experience are not significant.

In table 9 we compute the transition matrix at the firm level, rather than at the firm-destination level, for domestic firms, non-MNE exporters, non-experienced MNEs, and experienced MNEs: Domestic firms are the ones only active in France; exporters are the ones that export to one or more destinations; non-experienced MNEs are firms that invest outside France, but do not export to their investment or another destination beforehand; and experienced MNEs are firms that invest abroad and exported to the investment or another destination beforehand.
Table 8: Foreign sales, Norway. OLS.

<table>
<thead>
<tr>
<th>Dep variable</th>
<th>log $y_{inm,t} - \log y_{inm,0}$</th>
<th>log $y_{im,t} - \log y_{im,0}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>$mne_{in}$</td>
<td>-0.33***</td>
<td>-0.417***</td>
</tr>
<tr>
<td></td>
<td>(0.074)</td>
<td>(0.123)</td>
</tr>
<tr>
<td>$age_{inmt}$</td>
<td>0.135***</td>
<td>0.135***</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>$mne_{in} \times age_{inmt}$</td>
<td>-0.046</td>
<td>-0.048</td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td>(0.039)</td>
</tr>
<tr>
<td>$exp_{inm}$</td>
<td>0.204</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$mne_{in} \times exp_{inm}$</td>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$mne_{i}$</td>
<td>-0.345***</td>
<td>-0.410***</td>
</tr>
<tr>
<td></td>
<td>(0.092)</td>
<td>(0.104)</td>
</tr>
<tr>
<td>$age_{imt}$</td>
<td>0.201***</td>
<td>0.194***</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>$mne_{i} \times age_{imt}$</td>
<td>-0.175**</td>
<td>-0.154**</td>
</tr>
<tr>
<td></td>
<td>(0.067)</td>
<td>(0.071)</td>
</tr>
<tr>
<td>$exp_{im}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$mne_{i} \times exp_{im}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log $y_{it,nor}$</td>
<td>0.039*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>27,840</td>
<td>27,840</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.0433</td>
<td>0.0470</td>
</tr>
</tbody>
</table>

Notes: $y_{inm,t}$ are sales of firm $i$ in year $t$ and market $n$ under mode $m$; the variable $mne_{int}$ is one if the firm $i$ is active in market $n$ as an MNE, and zero if it is active as an exporter; the variable $a_{int}$ denotes the age of the firm $i$ in market $n$ at time $t$ in mode $m$; $exp_{inm}$ is one if firm $i$ is active in market $n$ under mode $m$ and has previous experience in mode $m', m \neq m'$; and $y_{it,nor}$ refers to sales of firm $i$ in year $t$ in their home market (Norway). In columns 1-4, observations are at the firm-destination level, while in columns 5-7 are the firm level. All regressions with year, destination, and industry fixed effects. Standard errors, clustered by industry, are in parentheses. Levels of significance are denoted $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$. 

49
### Table 9: Transition matrix: domestic size, firm level, France.

<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>614</td>
<td>5,837</td>
<td>112,000</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>1,432,653</td>
<td>18,956</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exporter</td>
<td>2,584</td>
<td>47,138</td>
<td>n/a</td>
<td>73,077</td>
</tr>
<tr>
<td></td>
<td>19,384</td>
<td>128,690</td>
<td></td>
<td>462</td>
</tr>
<tr>
<td>Non-experienced MNE</td>
<td>1,149</td>
<td>28,955</td>
<td>340,000</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experienced MNE</td>
<td>709</td>
<td>47,969</td>
<td>n/a</td>
<td>110,000</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>68</td>
<td></td>
<td>990</td>
</tr>
</tbody>
</table>

Notes: Each cell reports the mean sales (in thousand of Euros) in the French market, as well as the number of firm-level observations. Each cell shows size at time $t$ under mode $m$ (column) given mode $m'$ at time $t - 1$ (row). Sample of French firms for the period 1999 to 2007.

### D Additional Figures for Section 4

Figure 24: Productivity distribution: New MNEs and new exporters. Model.

![Figure 24: Productivity distribution](image)

Notes: Probability density function (pdf) for the productivity parameter $z$. 

50