University of Nottingham
UK | CHINA | MALAYSIA

research paper series

Globalisation, Productivity and Technology Programme

Research Paper 2022/12

Sequentially exporting products across countries

Facundo Albornoz, Hector F. Calvo Pardo and Gregory Corcos

GEP

Sequentially Exporting Products across Countries*

Facundo Albornoz † Héctor F. Calvo Pardo ‡ Gregory Corcos §
Emanuel Ornelas ¶

November 28, 2022

Abstract

Exploiting disaggregated data on French exporters, we show that firms expand their product scope and geographical presence sequentially. This process of internationalization is uneven over time, exhibiting more volatility early than later in the life cycle of exporters. Specifically, young exporters are particularly likely to exit, and if they keep exporting, to expand at the intensive and sub-extensive margins, doing so by widening product scope within a destination before entering new destinations. We also find that firms' core products are particularly resilient despite being used to "test the waters" when entering additional countries. Existing models of firm export dynamics are not designed to explain these empirical regularities. We argue that they can be rationalized by a mechanism where new exporters are uncertain about the profitability of their products in different markets, but learn from their initial export experiences and then adjust their sales, number of products and destination countries accordingly.

JEL Codes: F10; F14; D22; L25.
Keywords: Export dynamics, experimentation, uncertainty, multiproduct firms, market interdependence.

*We thank Costas Arkolakis and two anonymous referees for very useful suggestions. We also thank Andrew Bernard, Paola Conconi, Meredith Crowley, Swati Dhingra, Aaron Flaaen, Fredrik Heyman, Henrik Horn, Vincent Rebeyrol, Ariell Reshef, Felix Tintelnot, Maurizio Zanardi, as well as seminar participants at the 2021 European Winter Meeting of the Econometric Society, CESifo Global Economy Workshop, Recent Trends in Firm Organization and Trade Dynamics Conference, ETSG, FREIT EIIT, FREIT SETC, IFN, Erasmus University, University of Cambridge, University of Cergy-Pontoise, University of Paris-Est and CREST for valuable comments. This work was supported by a grant overseen by the French National Research Agency (ANR) as part of the "Investissements d'Avenir" Programme (LabEx ECODEC; ANR-11-LABX-0047), as well as a grant from the ANR's JCJC Programme. Research time spent on this work was partly funded by the ESRC through its Centre for Population Change, transition grant ES/R009139/1. Ornelas acknowledges financial support from the Brazilian Council of Science and Technology (CNPq).

†University of Nottingham, CITP, & CEPR. E-mail:facundo.albornoz@nottingham.ac.uk.

‡Economics Department, University of Southampton, CPC, CFS and ILB. E-mail:calvo@soton.ac.uk.

§Ecole polytechnique, IP Paris & CREST. E-mail:gregory.corcos@polytechnique.edu.

¶Sao Paulo School of Economics-FGV, CEPR, CESifo & CEP. E-mail:eaornelas@gmail.com. (Corresponding author)

1 Introduction

How do firms enter and expand within and across foreign markets? In an insightful recent survey of the literature on firm dynamics, Alessandria et al. (2021, p. 35) conclude that "despite the careful modeling of entry costs, the literature has largely avoided the treatment of a firm's dynamic decisions across multiple destinations. [...] Answers to key questions [...], such as the effects of bilateral trade wars, may be critically affected by the exact nature of trade costs across destinations and the opportunities for market switching." In this paper, we uncover novel facts about how firms export multiple products across different foreign markets. We show that firm export dynamics involves expansion, as well as contraction, at different (sub-)extensive margins. Over time, some firms reach new destinations and add products to current and new destinations. Meanwhile, others discontinue products, abandon countries, and sometimes quit exporting altogether. Interestingly, this process is much more pronounced for young exporters.

Exploiting data on all French exporters between 1993 and 2006, we start by documenting that, in line with previous research, exporters exhibit significant entry and exit in foreign markets as well as churning of products sold abroad, and that new exporters typically start small in volume, reaching a single market with a single product. Many quickly give up exporting. Conversely, the majority of those that keep serving foreign markets swiftly expand along all these dimensions: total volume, number of products sold abroad, and number of countries served. Moreover, branching out through new products and new countries often follows a sequential pattern, in which most of the expansion that happens early in a firm's export tenure is by adding products instead of countries.

These findings suggest a specific pattern of age dependence whereby there is more volatility in exporters' early years than later. There could be many reasons behind this pattern. We therefore carry out a detailed empirical analysis to scrutinize and refine it. Our methodology extends the approach of Albornoz et al. (2012) to the product dimension, where we compare the dynamics after a firm's first-ever export spell and after subsequent spells with old and new products in old and new destinations. To do so, we define categorical variables for the first year of a spell, the first product sold and the first country served by each firm. Using these variables, as well as double and triple interaction terms, we tease out age dependence in exporters' growth, exit, and entry behavior.

The results broadly confirm the stylized facts mentioned above. Growth in the second year of the first-ever spell is between 11 and 25 percentage points higher than growth after the second year of other spells with either the same product or country. Young exporters are also substantially more likely to expand scope in their first destination, and to take their first product to other destinations, than experienced exporters, although this last difference is smaller than the previous one. Furthermore, immediate exit is 15 percentage points more likely after an exporter's first-ever export spell than after a later spell with a different product in a different country, and the triple-interaction coefficient shows differential exit in firms' first market and first product of about 6 percentage points.

We show that these novel empirical findings are not driven by firm size or by changes in firms' productivity. They apply both to firms that start exporting very small (the large majority) and to firms that start exporting multiple products to multiple countries, or that are part of a multinational company. They remain valid when we allow for learning from export "pioneers" and when we control for firms' financial constraints. They are also robust to partial-year effect corrections, to different definitions of experienced exporters, and to controlling for a wide set of fixed effects.

This uneven "internationalization path" is difficult to reconcile with standard models of firm export dynamics. In particular, they are inconsistent with the "canonical model of export dynamics," as defined by Alessandria et al. (2021), where firms enter foreign markets in response to productivity shocks, after incurring sunk entry costs. Other mechanisms developed in recent papers could help to explain some of our empirical results, but as we discuss in section 4.2.3, they were not designed to accommodate the dynamics of multi-product firms in multiple destinations.

We discuss one such mechanism in Section 4.2.4, which we develop in detail in the theoretical Online Appendix B. It extends the model developed by Albornoz et al. (2012) to incorporate the product dimension. The key assumption is that, upon entry, firms operating a flexible manufacturing technology infer information about their ability to successfully export their core and non-core products in their first foreign destination as well as in other potential destinations. Firms incur fixed costs both to start selling to new countries and to expand/adapt their product scope within destinations. When export profitability is persistent over time and correlated across countries and products, uncertainty and fixed costs create destination and product scope option values for forward-looking firms, which then optimally engage in sequential product-and-destination exporting. Since uncertainty is highest for new exporters, first-ever export spells are characterized by high initial failure rates. Yet as firms learn their export profitability, if they decide to keep exporting, they tend to expand along all margins, increasing sales of their initial products in their initial destinations, adding products in their initial destinations, and entering new destinations with new and old products. The precise path dependence depends on the relative fixed costs of adding products vs. adding destinations.

After reviewing the literature in the next subsection, the rest of the paper is organized as follows. In Section 2, we document new facts about age-dependence in exporter dynamics at the extensive and sub-extensive margins. In Section 3, we carry out a similar exercise at the intensive margin. In Section 4, we report a series of robustness checks and discuss the interpretation of our results in light of the literature. Section 5 concludes.

1.1 Literature

Our paper connects the literature on firm export dynamics with that on multi-product firms in international markets. The two topics are often studied independently. For example, Alessandria et al. (2021) review the literature on firm export dynamics without explicit reference to multi-product firms. In turn, the literature on multi-product exporters concentrates on cross-sectional facts and steady-state analyses. Our focus on export dynamics of multi-product exporters intersects both lines of research with specific contributions to each of them.

Within the export dynamics literature, one stream emphasizes how geographic interdependence affects firm decisions to export to new countries. For example, Morales et al. (2019)'s "extended gravity" forces imply that entry in a destination facilitates entry in other related destinations according to contiguity, geographical or cultural distances. Defever et al. (2015), Albornoz et al. (2016) and Alfaro Ureña et al. (2021) follow related approaches. While those papers allow for interdependence across destinations, a key distinguishing feature of this paper is that we detect interdependence at the product and destination levels and show that both dimensions are key to understanding firms' export paths.

Another line of research investigates the role of experience and market interdependence under uncertainty. Inspired by pioneering work by Evenett and Venables (2002) and Eaton et al. (2008), Albornoz et al. (2012) develop and test the notion of export experience and profit correlation across destinations as a way to learn profitability in multiple destinations. This mechanism has been adapted and extended both to explain export dynamic patterns in specific contexts and to explain the process of firm internationalization more generally.[1] While this body of work shows evidence consistent with firms learning their own profitability abroad as they engage in exporting, it does not examine jointly the product and destination dimensions, as we do here.[2]

The literature on multi-product firms in international markets typically focuses on cross-sectional regularities in terms of export product scope, firm productivity, product quality, or the effect of trade liberalization via changes in the product mix.[3] The importance of understanding multi-product exporting is obvious: as Bernard et al. (2018) show, multi-product, multi-country firms account for most of a country's aggregate exports at any point in time. Our paper sheds light on the process through which multi-product firms expand their sales within and across countries. Another contribution is to establish new facts about "core" products in firm export dynamics.[4]

Very few papers within the multi-product firm literature study product-level export dynamics. Notable exceptions are Timoshenko (2015b) and Sheveleva and Krishna (2017).[5] The former finds that the variation in export scope declines with exporters' age in a new destination. This process of new exporters adding and dropping products in foreign countries is rationalized as learning about the "product appeal" of their products, in a context where marginal costs rise with firms' product scopes. Instead, Sheveleva and Krishna (2017) rationalize the same finding assuming that firms know the product appeal but not the value of the "brand" to foreign customers, which can only be unveiled by actual sales. We expand on this research by showing how the decision about adding products interacts with the decision about entry in new countries, creating a process whereby firms expand (and contract) through a broader set of sub-extensive margins.

[1] See, for example, Egger et al. (2014), Conconi et al. (2016), Holloway (2017), Chen et al. (2018), Chen et al. (2022), and Berlingieri et al. (2021).

[2] Several other papers on export dynamics allow for learning, but without interdependence across products or countries. For example, Berman et al. (2019) develop a Bayesian model of learning about product demand and find compelling evidence that French firms adjust volumes in line with that mechanism, especially early in their export-destination spells. Fitzgerald et al. (2019) find that the declining hazard rate over time and the observed quantity and price dynamics in Irish exports are explained by a process of gradual learning about demand, together with investment in marketing and advertising. Other contributions in this line of research include Freund and Pierola (2010), Nguyen (2012), Cadot et al. (2013), Aeberhardt et al. (2014), Timoshenko (2015a), Araujo et al. (2016), Cebreros (2016), Carrère and Strauss-Kahn (2017), Ruhl and Willis (2017), Arkolakis et al. (2018), Li (2018), Lawless and Studnicka (2019), and Esteve-Pérez (2021).

[3] See, for example, Eckel and Neary (2010); Bernard et al. (2011); Dhingra (2013); Qiu and Zhou (2013); Nocke and Yeaple (2014); Mayer et al. (2014, 2021); Eckel et al. (2016); and Arkolakis et al. (2021).

[4] These findings complement the pioneering work of Iacovone and Javorcik (2010), who establish that new exporters usually enter foreign countries with a product already sold domestically.

[5] Outside the trade literature, see Argente et al. (2022) for an insightful analysis of product-level dynamics for multi-product firms.

In Section 4, after presenting our empirical findings in detail, we provide a more targeted discussion of the literature in light of our findings.

2 Export Experience and Extensive Margin Dynamics

Firm export dynamics change substantially as firms acquire experience in foreign markets. We use data on French exports at the firm-product-country-year level between 1994 and 2006[6] to document these changes. In this section, we consider entry and exit patterns at the product-country level.

2.1 Entry

Firms expand their sales abroad largely by branching out products and destinations.[7] In a given destination, firms grow by introducing new products. For a given product, firms expand by reaching new destinations.[8] We document these patterns below.

2.1.1 Firm Expansion at the Product-Destination Sub-extensive Margins

Table 1 reports descriptive statistics about the number of products and countries firms export to, split by exporting age. The upper panel reports statistics on all active new exporters (a firm is excluded from the calculations once it exits). Among the 324,004 age-1 firms, the median number of products, countries and product-country pairs are all 1. Among the 64,543 exporters that are still active 4 years later ('age 5'), the median numbers of products and countries are both 2, while the median number of product-country pairs is 3. The average number in each of those dimensions increases monotonically with export age.

Of course, that increase may capture selective exit of the least profitable firms, which have fewer product-country pairs, rather than a true gradual expansion at the firm level. To see the dynamics net of that selection effect, in the lower panel of Table 1 we report the same statistics for the 40,078 firms that export in the five *consecutive* years (or more) after entry. The median and average numbers of products and countries rise gradually in that sub-population, too.

[6] Online Appendix A provides details on the construction of the dataset and descriptives on aggregate exports.
[7] We use the terms "market," "country" and "destination" interchangeably to denote a customs territory to which firms can export their products.
[8] See Section A.1.4 of the Online Appendix for a decomposition of the long difference in aggregate French exports across different margins.

Importantly, in both panels the jump from age 1 to age 2 is, by far, the largest, whereas after age 3 the expansion is less stark. Taken together, these facts suggest that successful new exporters tend to add countries and products gradually, but do so more actively early on in their life-cycle.

Table 1: Number of products and countries by exporting age among all new active exporters (upper panel) and among new exporters exporting for five consecutive years (lower panel)

All new exporters

	Number of products		*Number of countries*		*Number of product-country pairs*		
age	mean	median	mean	median	mean	median	number of firms
1	1.91	1	1.52	1	2.72	1	324,004
2	3.86	2	2.80	1	7.17	2	115,820
3	4.33	2	3.17	1	8.47	2	91,595
4	4.66	2	3.46	1	9.47	2	76,099
5	4.92	2	3.64	2	10.3	3	64,543

All new exporters with 5 years of consecutive exports

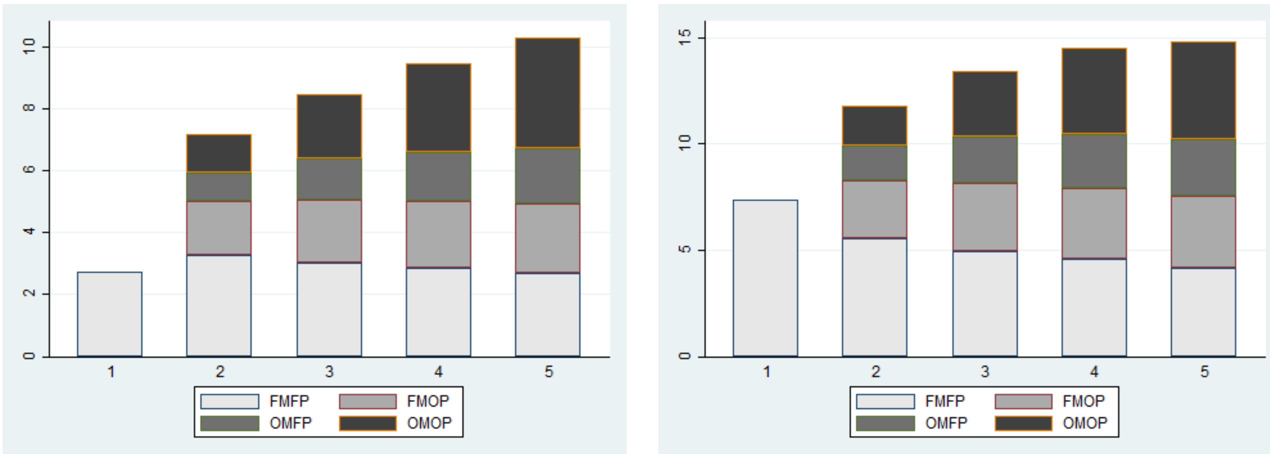
	Number of products		*Number of countries*		*Number of product-country pairs*		
age	mean	median	mean	median	mean	median	number of firms
1	3.869	2	2.916	1	7.358	2	40,078
2	5.697	2	4.105	2	11.759	4	40,078
3	6.311	3	4.530	2	13.435	4	40,078
4	6.582	3	4.819	2	14.468	4	40,078
5	6.543	3	4.860	2	14.809	4	40,078

Notes: The table reports the mean and median number of products, countries and product-country pairs by exporting age, for all new active exporters (upper panel) and for new exporters exporting 5 consecutive years (lower panel).

To help discern patterns in new exporting firms' gradual expansion, Figure 1 describes the number of product-country pairs by exporting age in further detail. We break down product-country pairs in four categories: pairs involving initial products *and* initial countries (FMFP)[9]; pairs involving products other than the firm's first in the firm's first export countries (FMOP); pairs involving initial products in countries other than the firm's first (OMFP); and pairs involving other products in other countries (OMOP). The left panel considers the whole sample of entrants; the right panel considers only firms exporting for five consecutive years after entry. Clearly, the latter enter with more products and into more markets than the former.

[9]The number of FMFP pairs may increase with age. This can happen when a firm starts exporting more than one product and serving more than one destination. Thus, multiple products will have the status of "FP" and multiple markets will have the status of "FM." Then, if the firm subsequently sells one of its FPs in a different FM than where it was first sold, we have an increase in the number of FMFP pairs for that firm. In practice, such cases are rare.

Figure 1: Number of product-countries by exporting age: firms (left); firms exporting for five consecutive years (right)



Notes: The figures show the average number of product-destinations added by firms' exporting age, for all new exporters (left panel) and for those continuously exporting during the first five years (right panel). Product-destinations are grouped in four categories: pairs involving initial products and initial countries (FMFP); pairs involving products other than the firm's first in the firm's first export countries (FMOP); pairs involving initial products in countries other than the firm's first (OMFP); and pairs involving other products in other countries (OMOP).

Figure 1 confirms that firms' sub-extensive expansion happens primarily between years 1 and 2 of their presence abroad. It also reveals that the product-destination margin with the highest growth rate between a firm's first and second years as exporter involves adding products in the initial destination(s). These regularities hold both when we consider all new exporting firms (left-hand-side panel) and when we consider only those that continuously export in the first five years since entry (right-hand-side panel). Subsequently, entry in new markets with either old or new products becomes the most common expansion strategy. These patterns suggest that firms branch out their exports sequentially, first expanding product scopes in their initial destinations, and then gradually expanding geographically into new destinations.

2.1.2 Entry Analysis

Naturally, selection, heterogeneity and other factors play a role in the facts described above. We now provide a more systematic analysis of how exporters expand across the various sub-extensive margins along their export tenure path.

To do this, we construct a sample that is appropriate for the analysis of firm expansion at the sub-extensive margins after the firm starts exporting. The sample excludes old exporters and firms with a single observation to focus on successful new exporters (i.e., those that export for more than one year). For each of these firms and their products, we square our dataset to consider all possible countries and years, including those without recorded exports. Specifically, if in year t a firm-product pair ip is observed in the original sample for the first time, we define an entry dummy for every country j in the sample where ip was *not* observed in t. We fill in observations in every year following t, until firm i actually enters j with product p (or until 2006, if it does not). Once/if the entry is recorded, that ijp triplet is dropped from the sample for the subsequent years.[10]

Using that sample, we create a full set of interactions between three indicator variables: whether the firm began exporting in the previous year; whether the product was exported in the firm's first spell; and whether the country was served in the firm's first spell.[11] We then estimate the following linear probability model:

$$\begin{aligned} Entry_{ijpt} = \gamma_0 + \gamma_Y FY_{i,t-1} + \gamma_{YM}\left(FY_{i,t-1} \times FM_{ij}\right) + \gamma_M FM_{ij} + \gamma_{YP}\left(FY_{i,t-1} \times FP_{ip}\right) + \gamma_P FP_{ip} \\ + \gamma_{MP}\left(FM_{ij} \times FP_{ip}\right) + \gamma_{YMP}\left(FY_{i,t-1} \times FM_{ij} \times FP_{ip}\right) + G_{jt} + \{FE\} + v_{ijpt}, \qquad (1) \end{aligned}$$

where $Entry_{ijpt}$ is a binary variable that takes value one if firm i enters destination j with product p in year t, and zero otherwise. $FY_{i,t-1}$ equals one if firm i is in the second (consecutive) year of its export history; FM_{ij} equals one if country j is the first-ever country served by firm i; FP_{ip} equals one if product p is the first-ever product exported by firm i; otherwise, they are zero. Standard errors are clustered at the firm level.

Naturally, many factors affect firms' entry decisions. To account for those factors, we add standard gravity equation covariates (G_{jt}) and a large set of fixed effects ($\{FE\}$) that include firm, year, destination, and product fixed effects. Firm fixed effects control for all systematic differences across firms that do not change over time and affect export entry. Year fixed effects control for global, as well as France-specific contractions and expansions. Destination fixed effects and gravity

[10]The construction of the sample is explained in detail in Section A.1 of the Online Appendix. We note that squaring the sample for all potential countries and years dramatically increases its size. For computational reasons, we then take a random draw of 30% of the initial sample; this still leaves us with roughly 250 million observations.

[11]This approach, based on indicators variables for "first" activities, builds on the empirical strategy of Albornoz et al. (2012) by introducing the product dimension, as well as all the corresponding interactions. We follow a similar approach in the analyses of sections 2.2.2 and 3.2.

variables subsume export market characteristics. Product fixed effects capture the general appeal of specific products.

Finally, we also include controls for firm size. Starting with the seminal work of Evans (1987), several researchers have found an inverse relationship between growth rates and both size and age at the firm level. To make sure we are not capturing size dependence, we add firm-specific TFP growth controls for the subset of firms for which balance sheet data is available.[12] As a robustness check, we also explicitly condition on total sales (domestic plus foreign) to control for firm size.[13]

It should be noted that our strategy for dealing with omitted variables cannot formally rule out the possibility of unobserved temporary firm shocks correlated across time, destinations and products driving the observed patterns. Thus, we cannot claim causal identification of age effects.

Table 2 shows the results from estimating equation (1).[14] Column 1 reports the results from a simple OLS estimate, while column 2 adds gravity controls and year and destination fixed effects. Columns 3 and 4 further include product and firm fixed effects, respectively.[15] Columns 5 and 6 examine the robustness of the results reported under columns 3 and 4 to firm-specific unobserved sources of TFP growth (in the sample of firms for which balance sheet data is available).

The main coefficients of interest are those that reflect entry activity right after firms' first year as exporters: γ_Y, γ_{YM} and γ_{YP}. Coefficient γ_Y captures whether new exporters are more likely than more experienced exporters to introduce a new product in a new destination. Coefficient γ_{YM} captures the additional probability that a young exporter adds a new product to its first market, relative to an old exporter, whereas γ_{YP} captures the additional probability that a young exporter enters a new country to sell its first product, relative to an old exporter.[16]

The estimates of γ_Y are statistically significant but tiny, indicating that entries corresponding to both a new product and a new destination are nearly as common for young and old exporters. The coefficients γ_{YM} and γ_{YP} are always positive and statistically significant. The estimated magnitude

[12]TFP is estimated at the firm level and follows Levinsohn and Petrin (2003). Online Appendix A provides further detail.

[13]See Table A.7 in the Online Appendix.

[14]For brevity, in the main tables we only report the estimates of the main coefficients of interest and of relevant sums of coefficients (at the bottom of the tables). Tables with the full results are in Online Appendix A.2.10.

[15]The results are similar when we include destination-year and product-year fixed effects, here and in the regressions on exit and intensive margin growth (sections 2.2.2 and 3.2, respectively). See Online Appendix A.2.8.

[16]Notice that the coefficient on the triple interaction, $FY_{i,t-1} \times FM_{ij} \times FP_{ip}$, is different from zero only in the special (and empirically rare) case where a firm starts exporting to multiple countries or products and explores other combinations of the same countries and products in its second year as exporter.

of γ_{YM}—between 2.1 and 3.5 percentage points—is rather large. The estimated magnitude of γ_{YP} is smaller, but is not small relative to the unconditional probability of entry of 0.33%.

Table 2: Entry regressions (30% sample)

	(1)	(2)	(3)	(4)	(5)	(6)
	Entry	Entry	Entry	Entry	Entry	Entry
γ_Y	0.0003***	0.001***	0.001***	-0.0005***	0.001***	-0.0003***
	(0.00004)	(0.00004)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
γ_{YM}	0.036***	0.035***	0.035***	0.035***	0.021***	0.021***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
γ_{YP}	0.002***	0.002***	0.002***	0.002***	0.003***	0.002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.009	0.012	0.013	0.016	0.010	0.013
Number of Observations	2.5e+08	2.4e+08	2.4e+08	2.4e+08	6.2e+07	6.2e+07
Coefficient Tests						
$\gamma_Y + \gamma_{YM}$	0.036***	0.036***	0.036***	0.035***	0.022***	0.021***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$\gamma_Y + \gamma_{YP}$	0.002***	0.003***	0.003***	0.002***	0.003***	0.002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$\gamma_{YM} - \gamma_{YP}$	0.034***	0.033***	0.033***	0.033***	0.018***	0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

Notes: The table reports the results of regressions of firm entry conditional on surviving on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (1). We only report estimates for the FY_{ijpt-1}, $FY_{ijpt-1} \times FP_{ip}$ and $FY_{ijpt-1} \times FM_{ij}$ coefficients. The full set of estimates is reported in Table A.25 in the Online Appendix A.2. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last three rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

To shed light on the prevalent patterns of entry, we contrast early vs. later entry and distinguish between the type of entry (i.e., with new products or in new destinations). First, we test whether an exporter is more likely to expand its product scope in its first market right after a successful first-ever spell ($\gamma_Y + \gamma_M + \gamma_{YM}$) than an old exporter ($\gamma_M$). That difference is given by $\gamma_Y + \gamma_{YM}$.

As displayed at the bottom of Table 2, this sum is significant and positive in all specifications, including those with firm fixed effects, when we compare the behavior of the same firm early and later in its export tenure. This shows that firms are more prone to introduce new products in their first markets right after an initial successful experience there than later.

Similarly, we test whether a young successful exporter is also more likely to take its first product to another market ($\gamma_Y + \gamma_P + \gamma_{YP}$) than an old exporter ($\gamma_P$). That difference, given by $\gamma_Y + \gamma_{YP}$, is again positive and significant in all specifications. Note, however, that the magnitude of this difference is considerably smaller than the previous one, suggesting that adding new products to the first destination is more likely for a young exporter (relative to an old one) than taking the first product to a new country. To check that possibility formally, we compute the second difference, $\gamma_{YM} - \gamma_{YP}$.[17] This sum explicitly compares expansion for young versus old exporters in products relative to markets. Since the sum is positive and significant, it confirms that firm early (relative to later) expansion abroad is more prevalent in products than in destinations.

Overall, the regression results confirm and make more precise the stylized facts discussed in section 2.1.1. We find that expansion at a sub-extensive margin is more likely right after a firm starts to export than later in the firm's exporting life cycle. The expansion takes several forms, but adding new products in the first destination and entering new export markets with the first product are considerably more likely than creating entirely new country-product pairs.[18]

2.2 Exit

The decision of firms to stop exporting and to drop products and countries contributes substantially to aggregate export dynamics (Table A.4, Online Appendix A.1.4). We now investigate in more detail the patterns of firm exit at the extensive and sub-extensive margins.

2.2.1 Firm Exit at the Extensive and Product-Destination Sub-extensive Margins

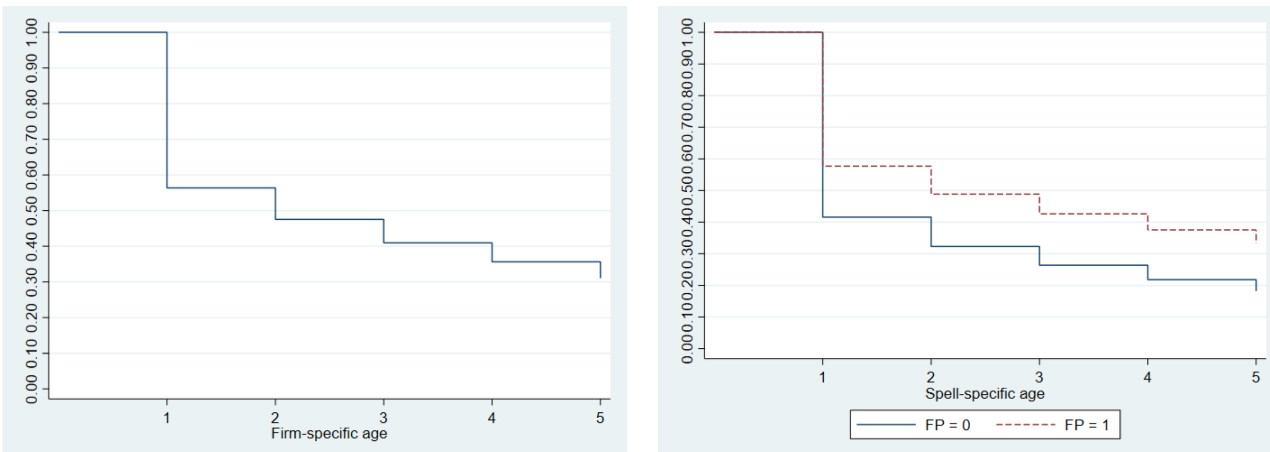
Figure 2 displays the complement to the conditional exit probabilities up to age $t = 5$, or Kaplan-Meier survival probability estimates. In the left panel, we define age and exit at the *firm* level. In

[17] Notice that the first difference is given by $\gamma_{YM} + \gamma_M - \gamma_{YP} - \gamma_P$, whereas the second difference is given by $\gamma_M - \gamma_P$. We obtain the difference-in-difference term $\gamma_{YM} - \gamma_{YP}$ by subtracting the latter from the former.

[18] In columns (5) and (6) of the Online Appendix Table A.7, we replicate columns (4) and (6) of Table 4 with total (domestic plus foreign) sales as an additional control. The estimates of the relevant coefficients remain very similar.

the right panel, we consider instead *firm-product-country* spell age and exit. We plot two curves representing survival rates by age for spells involving a firm's first product ($FP = 1$) and subsequent products ($FP = 0$). In both cases, age refers to the number of years after a first recorded export, under the assumption that firms classified as new exporters did not sell abroad before 1994.[19]

Figure 2: Survival functions by firm exporting age (left panel) and by firm-product-country spell age (right panel)



Notes: The figures show Kaplan-Meier survival probabilities up to age $t = 5$, defined as the product of the complement of observed exit frequencies at ages lower or equal to t. The left-hand side panel reports survival probabilities by new exporters' age. The right-hand side panel reports them by firm-product-country spell age, both for the first product of the firm ($FP = 1$) and for other products ($FP = 0$).

The figure's left panel shows high initial firm exit rates: 44% of firms abandon foreign markets after exporting for a single year. That figure falls sharply with firm age, to 16% after 5 years. Figure 2's right panel shows that export spells are also short-lived. However, spells involving firms' first exported product have substantially lower exit rates. This difference is greater at the beginning of spells (42% vs. 58%), but remains present thereafter. This suggests that exporters select their "safest" products when they begin selling abroad, and only later introduce riskier ones.

These facts reveal that many firms exit foreign markets soon after they start exporting, but if they survive initially, the odds of exiting drop markedly. Still, those that keep exporting often discontinue new product-destinations combinations soon after introducing them, although less so if they include the firm's first-ever exported product.

[19] See Online Appendices A.1.2 and A.2.7 for details and robustness checks on that assumption, respectively.

2.2.2 Exit Analysis

Because selection and heterogeneity may play an important role in the facts discussed above, we now examine more systematically the decision of firms to exit foreign markets and to discontinue product-country pairs. To do this, we estimate the following linear probability model:

$$Exit_{ijpt} = \beta_0 + \beta_Y FY_{ijp,t-1} + \beta_{YM}\left(FY_{ijp,t-1} \times FM_{ij}\right) + \beta_M FM_{ij} + \beta_{YP}\left(FY_{ijp,t-1} \times FP_{ip}\right) + \beta_P FP_{ip}$$
$$+ \beta_{MP}\left(FM_{ij} \times FP_{ip}\right) + \beta_{YMP}\left(FY_{ijp,t-1} \times FM_{ij} \times FP_{ip}\right) + G_{jt} + \{FE\} + w_{ijpt}, \qquad (2)$$

where $Exit_{ijpt}$ is a binary variable that takes value one if firm i stops exporting product p in market j in year t after doing so in year $t-1$, and zero otherwise. $FY_{ijp,t-1}$ is a binary variable that takes value one if firm i is in the second year of its jp spell. FM_{ij} and FP_{ip} are defined as in section 2.1.2. Just as we did there, we control here for possible confounders, including gravity covariates, different sets of country, product and year fixed effects, as well as changes in firm productivity for the subset of firms for which balance sheet data is available.

Table 3 reports the results. The six columns are organized exactly as in Table 2. In all but the firm fixed-effects specification without controlling for TFP growth (column 4), we find a positive and highly significant coefficient for the triple-difference coefficient. This result shows that there is a differentially higher first-year-first-market-first-product exit rate of about 6 percentage points (in the specifications with product fixed effects).[20] This can be compared with a 32.9% average exit probability for an ijp triplet across the whole sample.

Note that β_{YMP} is partly identified off between-firm comparisons involving single-year exporters, namely firms that export for just one year. The exception are the specifications with firm fixed effects, which do not identify the effects on exit from single-year firms. However, single-year firms are key for the analysis of exit among young exporters, as 44% of exporting firms are single-year (Figure 2). This leaves important information out of the analysis. Accordingly, we treat the coefficients in columns (3) and (5), which contain product fixed effects but not firm fixed effects,

[20] More precisely, the interpretation of the triple-coefficient coefficient is as follows. The first difference—early exit from the first market with the first product relative to late exit from the first market with the first product—is given by $(\beta_Y + \beta_{YM} + \beta_{YP} + \beta_{YMP})$. The second difference subtracts from this term the difference between early exit from a subsequent market with the first product relative to late exit from a subsequent market with the first product $(\beta_Y + \beta_{YP})$, yielding $(\beta_{YM} + \beta_{YMP})$. Finally, the third difference subtracts from this term the analogous double difference for subsequent products (β_{YM}), yielding the triple-difference coefficient, β_{YMP}.

Table 3: Exit regressions

	(1) Exit	(2) Exit	(3) Exit	(4) Exit	(5) Exit	(6) Exit
β_{YMP}	0.036***	0.034***	0.062***	-0.024***	0.064***	0.017***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.003)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.122	0.142	0.202	0.299	0.244	0.305
Number of Observations	2.1e+07	2.1e+07	2.1e+07	2.1e+07	9.0e+06	9.0e+06
Coefficient Tests						
$\beta_Y + \beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	0.166***	0.111***	0.147***	0.021***	0.156***	0.066***
	(0.004)	(0.005)	(0.005)	(0.004)	(0.009)	(0.002)
$\beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.157***	-0.179***	-0.124***	-0.194***	-0.143***	-0.188***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)
$\beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.163***	-0.176***	-0.120***	-0.202***	-0.136***	-0.180***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
$\beta_{YM} + \beta_M + \beta_{MP} + \beta_{YMP}$	0.005**	-0.003	0.034***	-0.023***	0.031***	0.008***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)

Notes: The table reports the results of regressions of firm exit on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (2). We only report estimates for the triple interaction ($FY_{ijpt-1} \times FM_{ij} \times FP_{ip}$) coefficient. The full set of estimates is reported in Table A.26 in Online Appendix A.2. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

as the most relevant estimates for the analysis of exit.[21]

To further establish how exit patterns vary in early stages of export experience, relative to later in firms' export tenure, we check whether exit rates are indeed higher at the beginning of the first-ever spell than in mature spells that include a subsequent product and a subsequent destination. This difference is captured by the sum of all seven coefficients: $\beta_Y + \beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$. We confirm that it is positive in all specifications. In those with product fixed effects, the difference is almost 16 percentage points.

Now, that comparison is probably too extreme, since we know from Figure 2 that exit out of an export spell is markedly higher between the first and the second years than later. To better understand differences between early exit at the firm level versus early exit at the spell level (in which case the firm may remain exporting other product-destination combinations), we focus on

[21] In columns (3) and (4) of the Online Appendix Table A.7, we replicate columns (3) and (5) of Table 3 with total (domestic plus foreign) sales as an additional control. The estimates of the relevant coefficients remain very similar.

comparisons between the exit behavior of firms right after they start a new spell. Specifically, we contrast exit at the beginning of the first-ever spell (which is similar to firm-level exit, with probability given by the sum of all seven coefficients) with exit at the beginning of a subsequent spell (i) with an additional product and an additional destination (β_Y); (ii) with an additional product in the firm's initial destination ($\beta_Y + \beta_{YM} + \beta_M$); (iii) in an additional destination with the firm's initial product ($\beta_Y + \beta_{YP} + \beta_P$). Both the first difference, given by $\beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$, and the second difference, given by $\beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$, are estimated to be negative and statistically significant. This shows that exit right after a firm starts to export is *less* likely than exit from a new spell when the firm is introducing a different product (be that in the first market or not), confirming that spells containing firms' first-ever exported products are particularly resilient.

On the other hand, the third difference, given by $\beta_{YM} + \beta_M + \beta_{MP} + \beta_{YMP}$, is estimated to be positive and significant. This shows that exit right after the first-ever spell is more likely than exit right after starting a subsequent spell with the first product but in an additional market, confirming that dynamics early and later in a firm's export tenure are very different.

Overall, the results show that exit rates are particularly high after firms' first export spell. This confirms that export dynamics depends on a *firm*'s exporting age and not just its experience in a given spell. However, there is also heterogeneity in the sense that exit from spells involving the first product is systematically less likely.

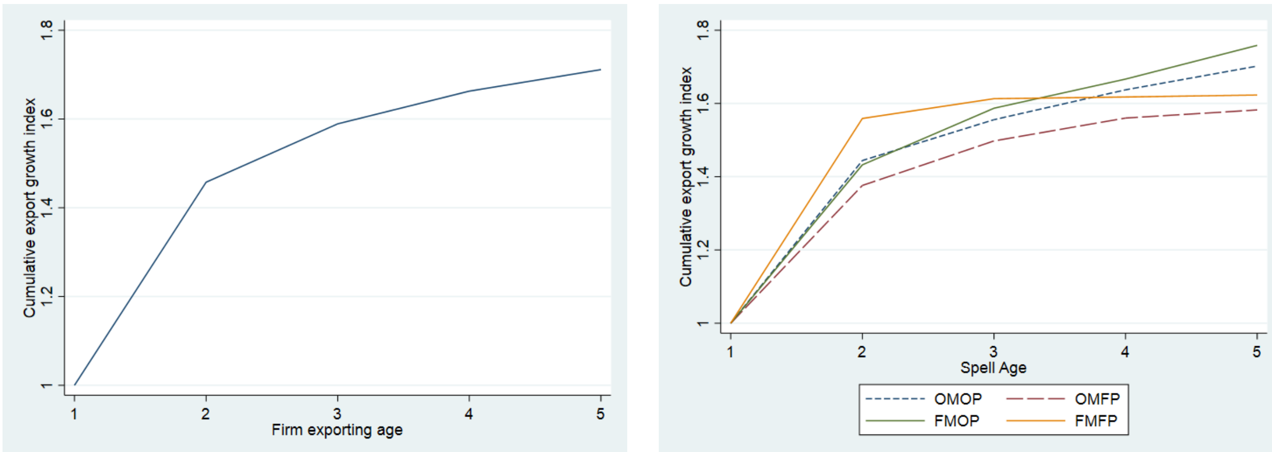
3 Export Experience and Intensive Margin Growth

Finally, we study now how firm export experience drives intensive margin growth.

3.1 Firm Expansion at the Intensive Margin

Figure 3 shows an index of cumulative export growth by exporting firm age (left panel) and spell age (right panel) for firms that export for five or more years. The index is set to one at age 1. It is then defined recursively at each age, by multiplying its value at the preceding age by the mean export growth rate at the current age. Both growth and age are defined at the firm level (left panel) or at the spell level (right panel). We distinguish spells depending on whether they include the firm's first product(s) and first market(s).

Figure 3: Index of cumulative mean export growth rates, by firm exporting age (left panel) and by firm-product-country export spell age (right panel)



Notes: The figures display an index of cumulative mean export growth by exporting firm age (left panel) and spell age (right panel), for firms that export for five or more years. In the right panel, we define products and markets as follows. FM corresponds to the first foreign market to which a firm exports. FP corresponds to the first product a firm exports. OM corresponds to markets other than a firm's first market. OP corresponds to products other than the firm's first product. We combine each product and each market definition to obtain the four categories in the figure.

The left panel of Figure 3 shows that firms that keep exporting tend to increase foreign sales over time. However, this growth is uneven: exporters undergo the highest growth rates at the beginning of their export tenure, with a marked slowdown afterwards. Now, this exceptional growth right after firms start to export is affected by the fact that export entry happens throughout the year. If foreign sales take place periodically over a calendar year, total sales in the first year will appear artificially low—and first-to-second year growth artificially high. The left panel of the figure should be interpreted with that caveat in mind.

The right panel of the figure examines instead cumulative export growth according to *spell* age, distinguishing between those that include or not the firm's first product and first market, analogously to Figure 1. Under the assumption that the calendar partial-year effect described above is on average similar for every type of spell, it permits a comparison across spell types free of that statistical effect. The figure shows that, after the second year, growth slows down for each type of spell. However, spells in the exporter's first market and with its first product (i.e., those directly linked to the firm's initial experience as an exporter) display substantially higher initial growth before converging to cumulative growth similar to other types of spells. In contrast, the spells with lowest initial growth involve subsequent products and subsequent markets.

These facts indicate that intensive margin export dynamics is also markedly affected by the extent of firms' experience abroad. On average, sales in product-destination spells that are not discontinued increase over time, especially right after they are introduced, but that initial growth is particularly high in firms' initial spells, i.e. right after they start exporting.

3.2 Intensive Margin Analysis

To verify whether those early growth patterns are robust to controlling for confounding factors and selection, we now investigate formally how foreign sales of successful exporters evolve.

We proceed analogously to our analysis of exit in section 2.2.2. Specifically, we estimate the following equation:

$$\Delta \log X_{ijpt} = \alpha_0 + \alpha_Y FY_{ijp,t-1} + \alpha_{YM}\left(FY_{ijp,t-1} \times FM_{ij}\right) + \alpha_M FM_{ij} + \alpha_{YP}\left(FY_{ijp,t-1} \times FP_{ip}\right) + \alpha_P FP_{ip} + \alpha_{MP}\left(FM_{ij} \times FP_{ip}\right) + \alpha_{YMP}\left(FY_{ijp,t-1} \times FM_{ij} \times FP_{ip}\right) + G_{jt} + \{FE\} + u_{ijpt}, \quad (3)$$

where $\Delta \log X_{ijpt}$ is the growth rate of the value of exports between t and $t-1$ by firm i of product p and market j. Observe that $\Delta \log X_{ijpt}$ is only defined for consecutive observations X_{ijpt} and X_{ijpt-1}. The other variables are defined exactly as in the exit regression (2). To focus on new exporters, we exclude all firms exporting in 1993.[22]

Table 4 reports the results. We find a consistently positive and significant coefficient for the triple-difference term, α_{YMP}. It shows that the additional first-year intensive margin growth in the first market is between 11 and 25 percent higher for the firm's first product than for subsequent products.[23] That is, there is differential growth early in the firm's first market for its first product, when the firm starts to export. Since we control for firm TFP growth and size, we find age dependence in export growth independent of firm size.[24]

[22] Results remain qualitatively unchanged if we include firms exporting in 1993 or if we treat firms exporting in 1994 and 1995 as old exporters (see Online Appendix A.2.7).

[23] More precisely, the first difference—early growth in the first market with the first product relative to late growth in the first market with the first product—is given by $(\alpha_Y + \alpha_{YM} + \alpha_{YP} + \alpha_{YMP})$. The second difference subtracts from this term the difference between early growth in a subsequent market with the first product relative to late growth in a subsequent market with the first product $(\alpha_Y + \alpha_{YP})$, yielding $(\alpha_{YM} + \alpha_{YMP})$. Finally, the third difference subtracts from this term the analogous double-difference for subsequent products (α_{YM}), yielding the triple-difference coefficient, α_{YMP}.

[24] Growth regressions with size controls are reported in columns (1) and (2) of Table A.7 in the Online Appendix.

Table 4: Export growth rate regressions

	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth	(6) Growth
α_{YMP}	0.183***	0.182***	0.182***	0.246***	0.110***	0.136***
	(0.020)	(0.021)	(0.021)	(0.022)	(0.028)	(0.030)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.015	0.015	0.019	0.065	0.019	0.057
Number of Observations	2.5e+06	2.4e+06	2.4e+06	2.4e+06	8.9e+05	8.9e+05
Coefficient Tests						
$\alpha_Y + \alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.443***	0.439***	0.446***	0.566***	0.388***	0.462***
	(0.011)	(0.011)	(0.012)	(0.014)	(0.017)	(0.021)
$\alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.125***	0.119***	0.120***	0.217***	0.074***	0.124***
	(0.018)	(0.018)	(0.018)	(0.016)	(0.018)	(0.021)
$\alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.129***	0.126***	0.122***	0.223***	0.068***	0.126***
	(0.014)	(0.014)	(0.014)	(0.016)	(0.022)	(0.026)
$\alpha_{YM} + \alpha_M + \alpha_{MP} + \alpha_{YMP}$	0.126***	0.121***	0.126***	0.213***	0.058***	0.102***
	(0.011)	(0.012)	(0.012)	(0.013)	(0.017)	(0.020)

Notes: The table reports the results of regressions of firm sales growth rates on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (population weighted distance to France, population, GDP, GDP per capita, contiguity with France, common official language, past colonial ties, GATT/WTO membership, Regional Trade Agreements with the EU, common legal origin, common currency and participation in cooperation agreements between the EU and African, Caribbean and Pacific countries), firm TFP growth and different sets of fixed effects as in specification (3). We only report estimates for the triple interaction ($FY_{ijpt-1} \times FP_{ip} \times FM_{ij}$) coefficient. The full set of estimates is reported in Table A.27 in Online Appendix A.2. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

To understand more broadly how intensive margin growth varies with firm export experience, we make additional comparisons. First, we contrast growth at the beginning of the first-ever spell with growth at a later stage in subsequent products and markets. The difference is given by the sum of all seven coefficients: $\alpha_Y + \alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$. As shown at the bottom of Table 4, this sum is positive and significant. Estimates of the difference range from 44 to 57 percentage points in the specifications with firm fixed effects.[25]

That comparison is, however, inflated by the partial-year effect discussed above, which is reflected in the coefficient of $FY_{ijp,t-1}$, α_Y.[26] We avoid that problem by contrasting first-year growth

[25] As with exit, identification in firm fixed estimation excludes firms with singletons. Those are firms with only two consecutive export spells. However, as Table 4 shows, results of growth regressions with and without firm fixed effects are qualitatively similar. This may be because firms with just one growth observation are not qualitatively different, or simply because they amount to only 26% of all firms in our growth sample (26628 out of 100352).

[26] Bernard et al. (2017) show that correcting for the overestimation of first-year sales growth rates amongst surviving

of the first-ever spell with first-year growth of spells that have either subsequent products or subsequent destinations—or both. Starting with the last case (first-year growth in spells containing neither the first product nor the first market), the difference is given by $\alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$. It is smaller, but remains large, between 12 and 22 percentage points.

Next, the difference between growth at the beginning of the first-ever spell and growth at the beginning of a subsequent spell in the first market, but with an additional product, is given by $\alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$. In turn, the difference between growth at the beginning of the first-ever spell and growth at the beginning of a subsequent spell with the first product, but in an additional destination, is given by $\alpha_{YM} + \alpha_M + \alpha_{MP} + \alpha_{YMP}$. Both sums are positive, statistically significant, and their magnitudes are sizeable, ranging between 10 and 22 percentage points depending on the specification. In each of these comparisons, the largest estimate is in specification (4), which includes firm fixed effects, where we compare the behavior of the same firm as it starts to export and as it introduces a new product-destination combination.

Overall, these results show that, for firms that keep exporting after their initial attempt, the earliest export experience is rather special. Specifically, the intensive margin growth after the first-ever experience abroad of a firm is systematically higher than its growth in all other combinations of years and product-destination spells.

4 Robustness and Discussion

4.1 Robustness Checks

The novel facts presented in sections 2-3 are robust to the inclusion of a variety of possible confounding factors and omitted variables, to heterogeneous effects, and to alternative definitions. The results from the robustness analysis are presented in different sections of the empirical Online Appendix A.2. We summarize them below.

First, Section A.2.1 reports results of growth regressions with a partial-year effect correction, as in Bernard et al. (2017). Estimates of the key parameters are slightly higher than without the

firms doubles the contribution of exporters' extensive (entry and exit) margins to total export growth. Nevertheless, we stress that our interest here is *not* in the coefficient on $FY_{ijp,t-1}$. Hence, this is not a central concern for our analysis. Still, as a robustness check, in Online Appendix A.2 we apply their correction explicitly. We show that while the coefficient on $FY_{ijp,t-1}$ is indeed affected, the results that matter for our analysis are essentially unchanged by the partial-year-effect correction.

correction, and display similar patterns across specifications. We also show that our results on entry are similar when we restrict our sample to entrants starting in the first half of the calendar year only. Second, we check that our results on age-dependent dynamics are not driven by firm size (Section A.2.2). To do so, we re-run all regressions with total firm sales as an additional control. Estimates are very similar to our baseline in the restricted sample (where we estimate firm TFP), validating our choice to capture size effects with TFP growth controls.

Third, we re-run all three types of regressions on subsamples of multinational firms[27] (Section A.2.3) and "simultaneous exporters" that sell multiple products to multiple countries from the start of their foreign experience (Section A.2.4). Coefficient estimates are usually smaller, but remain statistically significant and follow similar patterns. A fourth robustness check concerns potential spillovers from nearby firms. Section A.2.5 shows slightly lower, but comparable coefficients of interest when controlling for the number of exporting peers in the region, and for the intensity of their export growth. Fifth, one may be concerned that age dependence captures financial constraints that are binding in the early stages of export tenure. Section A.2.6 shows that the results are robust to controlling for industry-specific financial frictions, using a measure of asset tangibility proposed by Manova (2013).

Sixth, in Section A.2.7 we show that the results remain similar in a shorter panel with a more stringent definition of new exporters. Seventh, Section A.2.8 presents results of growth and exit regressions with country-year and product-year fixed effects to control for possible omitted supply and demand shocks.[28] Estimates of the main parameters are slightly lower in the growth regressions, but similar in exit regressions, and overall broadly consistent with our baseline findings. Finally, in Section A.2.9 we show the results from a sector-by-sector analysis.

4.2 Discussion

4.2.1 Summary of Findings

Hence, we find robust empirical evidence that exporting firms display (1) high initial failure rates, rapid (2) sub-extensive (product-destination) and (3) intensive margin expansions conditional on

[27] To identify French multinationals and foreign-owned French firms, we rely on the French statistical office (INSEE)'s LIFI survey of ownership links between corporations.

[28] Due to the sheer size of the entry dataset, computational constraints prevent us from estimating a similarly augmented model of entry.

surviving. Although such features are present for all types of new product-country export spells, a key distinguishing aspect is that each of them is particularly strong right after firms' first export spell. In addition, we find that (4) spells with exporters' first products are more resilient and, (5) after an initial success, new exporters are more likely to expand by introducing new products in their first export market than by entering new markets with their first product. Importantly, given existing evidence of size dependent dynamics, all of our results are robust to controlling for firm size and firm productivity growth.

4.2.2 Inconsistencies with the Canonical Model

Confronting this set of facts to existing theories of firm export dynamics and of multi-product exporters reveals, first, that our findings are at odds with what Alessandria et al. (2021) call the "canonical model of export dynamics," built upon Das et al. (2007). In that model, new exporters enter in response to positive productivity shocks and face sunk entry costs. Thus, controlling for productivity growth, young exporters should not be more likely to exit. If anything, sunk entry costs create an option value to remain an exporter, rendering new exporters less likely to exit right after entry (Albornoz et al., 2016). This prediction is even more likely to hold with persistent productivity shocks.[29] Similarly, controlling for size, young exporters would not be more likely to expand at either their extensive or intensive margins than old exporters, since in that family of models firms of the same size are expected to grow at a similar pace. Furthermore, a key aspect behind our findings (1)-(3) is that they are more prominent right after firms' first export experience than after they enter a new destination or introduce a new product abroad. To explain this form of age dependence going beyond size dependence, we must turn to other mechanisms.

The canonical model of export dynamics abstracts from products to focus on firms. But the literature on multi-product exporters has achieved considerable sophistication in explaining cross-sectional facts on multi-product exporters' size, product range and geographical scope.[30] Several of those models assume (and verify empirically) that firms have a "core" product, associated to lower

[29] On the basis of a model with sunk entry costs and persistent productivity shocks, Gumpert et al. (2020) partly match the (spell) age profile of exit rates out of exporting. However, they still underpredict first-year exit rates despite targeting them explicitly. While their general results provide support for size-dependence in export dynamics, the very low implied estimates of sunk entry costs (below .1% of annual sales) illustrate the difficulty in reconciling sunk cost models with early exit.

[30] See, among others, Eckel and Neary (2010); Bernard et al. (2011); Dhingra (2013); Qiu and Zhou (2013); Nocke and Yeaple (2014); Mayer et al. (2014, 2021); Eckel et al. (2016); Arkolakis et al. (2021).

marginal cost or higher demand. However, since most of the existing models are based on static theories, they are not designed to explain differential age dependence at the product margin, as our finding (4) requires. The few exceptions that are dynamic (e.g., Timoshenko, 2015b) restrict the analysis to a single destination, and therefore do not address the pattern of product-destination expansion, as our finding (5) describes.

4.2.3 Other Potential Mechanisms

Research on firm export dynamics has advanced a number of alternative mechanisms to explain age dependence that go beyond the canonical model. For some of them—learning from others, financial constraints—we show in the Online Appendix that our empirical findings remain valid when controlling for such factors. Here we consider other models that yield age dependence.

An important mechanism relates to customer-base accumulation with market penetration costs. Broadly speaking, this includes trade models where increasing market share or participation in new markets requires convex adjustment costs (Argente et al., 2021; Arkolakis, 2010, 2016; Fitzgerald et al., 2019; Piveteau, 2021). That class of models rationalizes why young exporters start small and face high exit rates, and why survivors grow faster in early years. But as Arkolakis (2016) makes clear, age dependence is typically linked to size dependence. Instead, as discussed above, our empirical findings are present with and without controls for firm size. Furthermore, theories based on such a mechanism typically model marketing costs as spell-specific. Thus, a firm would face similar expected dynamics in each market it operates (where "market" can be defined by destination, by product, or by destination-product pairs). Accordingly, these models are not designed to explain why firms grow faster at the intensive margin and by adding products and destinations at the beginning of their exporting life cycle, relative to when they start new spells later in their export tenure. One potentially interesting line of future research could extend the customer-base accumulation logic to a model where firms are active in multiple markets and sell multiple products, and where the expansion of a firm's customer base due to marketing expenditures in a market would spill over other markets, creating interdependences at the firm level. Viewed from the lens of that hypothetical model, our results imply that "global firm appeal" (on top of product-specific appeal) generally rises faster right after the first export spell, for the firms that keep exporting.

Another potential mechanism relates to search and matching frictions. Frictions to establish buyer/seller relationships may cause age dependence if, for instance, asymmetric information allows for the development of reputations (Aeberhardt et al., 2014; Araujo et al., 2016). Because of opportunistic behavior, there would be high early exit rates. In turn, in surviving relationships trust-building dynamics causes rapid expansion. Another important example is when search and matching frictions combine with uncertainty about demand. In such a setup, Eaton et al. (2021) explain why some buyer-supplier relationships end early, while others expand thanks to an upward revision of beliefs and an endogenous increase in search effort. As with customer base accumulation, however, explaining our findings would require the dynamics of buyer-seller relationships in different products and destinations to vary systematically along the firm exporting life cycle.

Models that explicitly take into account dynamic complementarities in export dynamics across different markets are, naturally, well suited to rationalize market interdependencies at the firm level. This includes, in particular, models with "extended gravity" forces. For instance, Alfaro Ureña et al. (2021) introduce sunk per-country entry costs that decrease with the number of destinations in an otherwise canonical model of export dynamics. These models are designed to explain the geographical expansion of successful new exporters. On the other hand, they have nothing to say about the sequential pattern of product scope expansion within markets. Analogously, Timoshenko (2015b) considers a model of multi-product firms that learn about demand in a single export destination, which explains early churning of products within destinations. On the other hand, by design that approach has nothing to say about firm expansion across countries. Instead, to rationalize our empirical findings one would need a dynamic framework with market interdependencies that allows firms to expand both in the product and the country dimensions. Moreover, it would need to generate different dynamics for firms' first spells as exporters, relative to their subsequent spells.

Finally, while adaptations are possible, these families of models do not explain the observed resilience of new exporters' first products. The same point applies to firms' decisions to prioritize expansion of product scope over entering new destinations early in their export tenure.

4.2.4 A Mechanism Based on Learning across Products and Countries

In Albornoz et al. (2012), we develop a learning model, where firms are forward-looking but uncertain about their profitability abroad, to rationalize related facts at the firm level across destinations, but without considering the product dimension. In Section B.1 of the Online Appendix, we present and discuss an extension of that model that incorporates product-specific uncertainty. We then formally derive from it all of our empirical findings. The main workings of the model are as follows.

Firms operate a "core-competency" flexible manufacturing technology (Eckel and Neary, 2010) and incur entry costs to export new products or serve new countries. Firm export profitability is ex ante uncertain, but is revealed to the firm once it starts to export. Furthermore, it is persistent over time and correlated across products and countries. Thus, if a firm finds out that it is highly profitable selling a given product in a given destination, it knows that it will also be profitable exporting other products to the first but also to other foreign destinations.

A consequence of this model is that, unless firms are very confident ex ante about their ability to profitably sell abroad, they will limit entry to a small number of product-country pairs, typically selling low volumes of their most profitable product in a single foreign market. This is why, for firms that keep exporting, first products display more resilience irrespective of firm size. Based on their performance in that first spell, exporters revise their initial beliefs, and that first revision will be sharper than subsequent belief updates in future spells. This implies higher failure rates, but also higher growth and entry rates upon surviving that first spell. Due to the correlation across countries and markets, this also explains the differential growth, entry and exit rates after the first spell relative to early years of later spells.[31] Finally, if adding a product entails a lower cost than entering a new destination, or if profitability is more correlated across products than across countries,[32] then new exporters will expand their product scopes before expanding geographically. Thus, this model suggests that the knowledge firms acquire as they start to export helps to explain how they expand their product scope and geographical presence.[33]

5 Conclusion

We uncover robust empirical evidence of age dependence in export dynamics. Exporting firms display high initial failure rates, but survivors expand rapidly along the intensive and sub-extensive

[31] This last feature distinguishes our model from models with market-specific learning, which explain within-spell dynamics but not why they are more pronounced in the first spell, e.g., Freund and Pierola (2010); Nguyen (2012); Cadot et al. (2013); Timoshenko (2015a); Cebreros (2016); Carrère and Strauss-Kahn (2017); Arkolakis et al. (2018); Li (2018); Berman et al. (2019); Steinberg (2021).

[32] We thank an anonymous referee for pointing this out.

[33] This partially addresses Alessandria et al. (2021, p.19)'s remark that "understanding how [...] firm-level organizational capital can be used across products and destinations is an unsettled issue."

product and country margins. These changes are significantly more prominent right after a firm's first export spell than later in the firm's export tenure. In addition, spells with first products are more resilient, and successful new exporters tend to expand their product scopes in their first destination before expanding geographically with their first products. Because these findings are robust to firm size and productivity growth controls, they do not sit well with the "canonical model of export dynamics." But they are consistent with a model of learning where export profitability is uncertain, persistent in time, and correlated across products and markets.

While previous work has focused on the study of export dynamics in either the country or the product dimension, our simple empirical strategy allows the analysis of both at the same time. However, it has important limitations. For example, it does not reveal or test for specific learning mechanisms, or allows us to explore counterfactuals. Extending the analysis to address the interdependence in firms' choices of what, when and where to export in a structural model would be desirable, but may require solving a potentially very hard optimization problem, as Alfaro Ureña et al. (2021) make clear. We look forward to further advances in this direction.

This matters beyond enhancing our knowledge of firm export dynamics. In particular, the interdependence in firms' export decisions has implications for understanding the consequences of trade policy and quantifying its effects. In our learning interpretation, entry in the first product-market reveals information about the value of future entry. This creates trade policy spillovers across products and destinations. Future work allowing for these spillovers in the evaluation of trade policies would be welcome.

References

Aeberhardt, R., I. Buono, and H. Fadinger (2014). Learning, Incomplete Contracts and Export Dynamics: Theory and Evidence from French Firms. *European Economic Review 68*(C), 219–249.

Albornoz, F., H. F. Calvo-Pardo, G. Corcos, and E. Ornelas (2012). Sequential Exporting. *Journal of International Economics 88*(1), 17–31.

Albornoz, F., S. Fanelli, and J. C. Hallak (2016). Survival in Export Markets. *Journal of International Economics 102*(C), 262–281.

Alessandria, G., C. Arkolakis, and K. J. Ruhl (2021). Firm Dynamics and Trade. *Annual Review of Economics 13*(1), 253–280.

Alessandria, G. A., R. C. Johnson, and K.-M. Yi (2021). Perspectives on Trade and Structural Transformation. NBER Working Paper 28720.

Alfaro Ureña, A., J. M. Castro-Vincenzi, S. Fanelli, and E. Morales (2021). Firm Export Dynamics in Interdependent Markets. Unpublished Manuscript.

Araujo, L., G. Mion, and E. Ornelas (2016). Institutions and Export Dynamics. *Journal of International Economics 98*(C), 2–20.

Argente, D., D. Fitzgerald, S. Moreira, and A. Priolo (2021). How do Firms Build Market Share? *SSRN 3831706*.

Argente, D., M. Lee, and S. Moreira (2022). How do Firms Grow? The Life Cycle of Products Matters. Technical report.

Arkolakis, C. (2010). Market Penetration Costs and the New Consumers Margin in International Trade. *Journal of Political Economy 118*(6), 1151 – 1199.

Arkolakis, C. (2016). A Unified Theory of Firm Selection and Growth. *The Quarterly Journal of Economics 131*(1), 89–155.

Arkolakis, C., S. Ganapati, and M.-A. Muendler (2021). The Extensive Margin of Exporting Products: A Firm-level Analysis. *American Economic Journal: Macroeconomics 13*(4), 182–245.

Arkolakis, C., T. Papageorgiou, and O. Timoshenko (2018). Firm Learning and Growth. *Review of Economic Dynamics 27*, 146–168.

Berlingieri, G., L. Marcolin, and E. Ornelas (2021). Service Offshoring and Export Experience. CEPR Discussion Paper 16215.

Berman, N., V. Rebeyrol, and V. Vicard (2019). Demand Learning and Firm Dynamics: Evidence from Exporters. *The Review of Economics and Statistics 101*(1), 91–106.

Bernard, A. B., E. A. Bøler, R. Massari, J.-D. Reyes, and D. Taglioni (2017). Exporter Dynamics and Partial-Year Effects. *American Economic Review 107*(10), 3211–28.

Bernard, A. B., J. B. Jensen, S. J. Redding, and P. K. Schott (2018). Global Firms. *Journal of Economic Literature 56*(2), 565–619.

Bernard, A. B., S. J. Redding, and P. K. Schott (2011). Multiproduct Firms and Trade Liberalization. *The Quarterly Journal of Economics 126*(3), 1271–1318.

Cadot, O., L. Iacovone, M. D. Pierola, and F. Rauch (2013). Success and Failure of African Exporters. *Journal of Development Economics 101*(C), 284–296.

Carrère, C. and V. Strauss-Kahn (2017). Export Survival and the Dynamics of Experience. *Review of World Economics (Weltwirtschaftliches Archiv) 153*(2), 271–300.

Cebreros, A. (2016). The Rewards of Self-Discovery: Learning and Firm Exporter Dynamics. Working Paper 2016-08, Banco de México.

Chen, C., T. Senga, C. Sun, and H. Zhang (2018). Uncertainty, Imperfect Information, and Expectation Formation over the Firm's Life Cycle. Discussion Papers 18010, RIETI.

Chen, C., C. Sun, and H. Zhang (2022). Learning and Information Transmission Within Multinational Corporations. *European Economic Review 143*, 104016.

Conconi, P., A. Sapir, and M. Zanardi (2016). The Internationalization Process of Firms: From Exports to FDI. *Journal of International Economics 99*, 16–30.

Das, S., M. J. Roberts, and J. R. Tybout (2007). Market Entry Costs, Producer Heterogeneity, and Export Dynamics. *Econometrica 75*(3), 837–873.

Defever, F., B. Heid, and M. Larch (2015). Spatial Exporters. *Journal of International Economics 95*(1), 145–156.

Dhingra, S. (2013). Trading Away Wide Brands for Cheap Brands. *American Economic Review 103*(6), 2554–84.

Eaton, J., M. Eslava, M. Kugler, and J. Tybout (2008). Export Dynamics in Colombia: Firm Level Evidence. In E. Helpman, D. Marin, and T. Verdier (Eds.), *The Organization of Firms in a Global Economy*, Chapter 8. Cambridge, MA: Harvard University Press.

Eckel, C., L. Iacovone, B. S. Javorcik, and J. P. Neary (2016). Testing the Core-competency Model of Multi-product Exporters. *Review of International Economics 24*(4), 699–716.

Eckel, C. and J. P. Neary (2010). Multi-product Firms and Flexible Manufacturing in the Global Economy. *The Review of Economic Studies 77*(1), 188–217.

Egger, P., M. Fahn, V. Merlo, and G. Wamser (2014). On the Genesis of Multinational Foreign Affiliate Networks. *European Economic Review 65*(C), 136–163.

Esteve-Pérez, S. (2021). Previous experience, experimentation and export survival: Evidence from firm-product-destination level data. *The World Economy 44*(9), 2638–2682.

Evans, D. (1987). The Relationship between Firm Growth, Size, and Age: Estimates for 100 Manufacturing Industries. *Journal of Industrial Economics 35*(4), 567–81.

Evenett, S. J. and A. J. Venables (2002). Firm Export Dynamics in Interdependent Markets. Unpublished Manuscript.

Fitzgerald, D., S. Haller, and Y. Yedid-Levi (2019). How Exporters Grow. NBER Working Paper 21935.

Freund, C. and M. D. Pierola (2010). Export Entrepreneurs: Evidence from Peru. Policy Research Working Paper Series 5407, The World Bank.

Gumpert, A., H. Li, A. Moxnes, N. Ramondo, and F. Tintelnot (2020). The life-cycle dynamics of exporters and multinational firms. *Journal of International Economics 126*(C).

Holloway, I. R. (2017). Learning via Sequential Market Entry: Evidence from International Releases of US Movies. *Journal of International Economics 104*, 104–121.

Iacovone, L. and B. S. Javorcik (2010). Multi-product exporters: Product churning, uncertainty and export discoveries. *The Economic Journal 120*(544), 481–499.

Lawless, M. and Z. Studnicka (2019). Old Firms and New Export Flows: Does Experience Increase Survival? Working Papers 19/19, School of Economics, University College Dublin.

Levinsohn, J. and A. Petrin (2003). Estimating Production Functions Using Inputs to Control for Unobservables. *The Review of Economic Studies 70*(2), 317–341.

Li, S. (2018). A Structural Model of Productivity, Uncertain Demand, and Export Dynamics. *Journal of International Economics 115*, 1–15.

Manova, K. (2013). Credit Constraints, Heterogeneous Firms, and International Trade. *Review of Economic Studies 80*(2), 711–744.

Mayer, T., M. J. Melitz, and G. I. P. Ottaviano (2014). Market Size, Competition, and the Product Mix of Exporters. *American Economic Review 104*(2), 495–536.

Mayer, T., M. J. Melitz, and G. I. P. Ottaviano (2021). Product Mix and Firm Productivity Responses to Trade Competition. *The Review of Economics and Statistics*, 1–18.

Morales, E., G. Sheu, and A. Zahler (2019). Extended Gravity. *Review of Economic Studies 86*(6), 2668–2712.

Nguyen, D. X. (2012). Demand uncertainty: Exporting delays and Exporting Failures. *Journal of International Economics 86*(2), 336–344.

Nocke, V. and S. Yeaple (2014). Globalization And Multiproduct Firms. *International Economic Review 55*, 993–1018.

Piveteau, P. (2021, November). An Empirical Dynamic Model of Trade with Consumer Accumulation. *American Economic Journal: Microeconomics 13*(4), 23–63.

Qiu, L. D. and W. Zhou (2013). Multiproduct Firms and Scope Adjustment in Globalization. *Journal of International Economics 91*(1), 142–153.

Ruhl, K. J. and J. L. Willis (2017). New Exporter Dynamics. *International Economic Review 58*, 703–726.

Sheveleva, Y. and K. Krishna (2017). Learning Versus Knowing: a Dynamic Model of Multiproduct Exporters. Unpublished Manuscript.

Steinberg, J. B. (2021). Export Market Penetration Dynamics.

Timoshenko, O. A. (2015a). Learning versus Sunk Costs Explanations of Export Persistence. *European Economic Review 79*, 113–128.

Timoshenko, O. A. (2015b). Product Switching in a Model of Learning. *Journal of International Economics 95*(2), 233–249.

Online Appendices [Not for Publication]

A Empirical Appendix

A.1 Data Sources and Descriptive Statistics

A.1.1 Data Sources

Our analysis is conducted on two main datasets. The *full dataset* consists of French Customs (DGDDI) data on all export transactions between 1993 and 2006 by firm, HS6 product, destination country, and year.[34] All values are in euros. To deal with revisions of the HS classification, we concord product categories using data from Beveren et al. (2012), who use a version of the Pierce and Schott (2012) algorithm. We match this dataset with standard gravity regression covariates from the CEPII Gravity dataset used in Head et al. (2010). Finally, we exclude countries with less than 5% of all French exports in order to reduce the size of our dataset. The resulting full dataset contains export values for 392,624 firms, 4212 HS6 products, 89 countries and 14 years.

The *restricted dataset* consists of the intersection between the full dataset and balance sheet data from the French tax authority (FICUS dataset). The FICUS dataset documents value-added, employment, capital stock, cost of materials as well as primary industry for all French firms taxed under the 2 main corporate tax regimes. The resulting dataset has 149,229 firms, 4209 HS6 products, 89 countries, and 14 years, representing 67.05% of total exports in the full dataset.

A.1.2 Definitions of Variables

Dependent Variable Our empirical investigation of export dynamics features three main dependent variables: export growth, exit and (conditional) entry. All three variables are measured at the firm-country-product-year ($ijpt$) level. Denote by x_{ijpt} the recorded sales of French firm i in country j of HS6 product , p in year t. $Growth_{ijpt}$ is the annual growth rate of firm-country-product exports, measured in FOB value, or:

$$Growth_{ijpt} = \ln(x_{ijpt}) - \ln(x_{ijpt-1}). \tag{4}$$

$Exit_{ijpt}$ is a binary variable that is defined when the firm-country-product has positive exports in year $t-1$. It takes value one when exports of that triplet in year t is nil, and takes value zero otherwise:

$$Exit_{ijpt} = \begin{cases} 1 & \text{if } x_{ijpt} = 0 \text{ and } x_{ijpt-1} > 0 \\ 0 & \text{if } x_{ijpt} > 0 \text{ and } x_{ijpt-1} > 0. \end{cases} \tag{5}$$

$Entry_{ijpt}$ is a binary variable that is defined for firm-country-product triplets with no exports in year $t-1$. It takes value one when the triplet has positive exports in year t and takes value 0 otherwise:[35]

$$Entry_{ijpt} = \begin{cases} 1 & \text{if } x_{ijpt} > 0 \text{ and } x_{ijpt-1} = 0 \\ 0 & \text{if } x_{ijpt} = 0 \text{ and } x_{ijpt-1} = 0. \end{cases} \tag{6}$$

Given our definition of non-entry, we must expand our dataset to *include firm-product-country-year observations that are never observed in the customs data.* More precisely, for all observed firm-product pairs, we span over all possible countries and years. By doing so, we allow for all the

[34] A detailed presentation of this dataset can be found in Bergounhon et al. (2018).

[35] Those definitions imply that some $Entry_{ijpt} = 1$ observations capture re-entry, while some $Exit_{ijpt} = 1$ observations capture temporary exit.

possible entry patterns a firm may consider for its products.[36] Finally, we exclude all post-entry observations in the entry analysis, in the sense that firm-product-country triplets with $Entry_{ijpt} = 1$ leave the sample from $t+1$ onward.

Measures of Export Experience We create four variables to capture age-dependence in export dynamics. FY_{ijpt} takes value one when firm i exports product p to market j in year t, but not in year $t-1$, and zero otherwise. That is, it records the first year in which a triplet ijp has recorded exports. In contrast, FY_{it} takes value one when firm i exports its first-ever product to its first-ever market in year t. That is, it records the year in which firm i has exporting age 1. FM_{ij} takes value one if j is the first country firm i exports to (this may apply to several countries), and zero otherwise. That is, it records the first market(s) served by firm i. Finally, FP_{ip} takes value one if p is the first product that firm i exports (this may apply to several products), and zero otherwise. That is, it records the first product(s) exported by firm i. Interactions of these variables allow us to separate the effects of general and (product-country) spell export experience on export dynamics. Put another way, we can disentangle dependence to spell and firm age in export dynamics.

To define 'first year,' we choose not to exploit information in 1993, the first year of our dataset, while defining new exporters as firms that did not export in 1993, and until they first appear in the dataset. We show that left-censoring does not affect our estimates in Online Appendix A.2.7.

Other covariates Almost all variables representing firm characteristics are taken directly from FICUS and converted into euros. The exception is Total Factor Productivity (TFP), which we estimate at the firm-year level using the Levinsohn-Petrin method (Levinsohn and Petrin, 2003). In each NACE 1-digit industry (outside the distribution sector), we estimate TFP as the residual of a regression of firm output on capital and labor stocks, using intermediates to control for serially correlated technological shocks unobserved by the econometrician. We then compute TFP growth at the firm-year level. This covariate is added to all estimated models in order to filter supply shocks out of export dynamics.

Finally, covariates from the CEPII's Gravity database include four continuous variables: population-weighted distance to France ($distw$), population (pop_d), GDP (gdp_d) and GDP per capita ($gdpcap_d$); and nine binary variables: contiguity with France ($contig$), common official language ($comlang\_off$), past colonial ties at any time ($colony$) or after 1945 ($col45$), GATT/WTO membership ($gatt_d$), Regional Trade Agreement with the EU (rta), common legal origin ($comleg$), common currency ($comcur$) and participation in cooperation agreements between the EU and African, Caribbean and Pacific countries (acp). We refer to Head et al. (2010) and references therein for further details.

A.1.3 Descriptive Statistics

Table A.1 reports some descriptive statistics when data in the full and restricted datasets are aggregated at the *firm-year* level. There are moderate but non-negligible differences between firms in both samples: firms in the restricted sample are larger, more productive, have higher export volumes, more products, and more destinations. For this reason, we report results for both datasets throughout the paper rather than the restricted sample only.

We occasionally rely on subsamples of these two main datasets. As explained in Section A.1, computational reasons force us to run entry regressions on a *random sample of 30% of all firms*.[37]

[36] Implicitly, we assume that the relevant set of products a firm considers for exports is the one it eventually exports. This is the best we can do in the absence of data on domestic sales by product.

[37] To analyze the timing of entry we must construct artificial pre-entry observations for each firm-product present in the data. Keeping all firms would result in an entry dataset with over 2bn observations which cannot be handled

Table A.1: Summary Statistics by Firm-Year

	Full Dataset			Restricted Dataset		
Characteristic	Mean	Median	N	Mean	Median	N
Sales †	17.3	1.78	1,465,158	20.9	2.08	592,041
Number of employees	67.01	9	1,465,158	99.16	16	592,041
Capital Stock †	10.3	.11	1,465,158	17.8	.20	592,041
Value-Added per Worker ‡	59.22	44.54	1,465,158	57.60	43.25	592,041
Exports	2,384,173	31709	1,465,158	3,956,396	58,036	592,041
Number of Exported Products	5.40	2	1,465,158	6.22	2	592,041
Number of Destination Countries	4.55	2	1,465,158	6.16	2	592,041
Exporting Age (years)	4.79	4	1,465,158	5.40	5	592,041

Notes: All monetary values in euros unless otherwise indicated. †: million euros; ‡ thousands of euros; N refers to the number of observations (firm-years).

The resulting sample has 6,814,109 firm-country-product-year observations, with 228,513 firms, 88 countries, 4211 concorded HS6 products, and 14 years.

Aggregating further, we can characterize aggregate French export growth over our sample period. French exports of goods grew from 175.7bn euros in 1993 to 390.8bn euros in 2006. This is summarized in Figure A.1.

This growth was very uneven across product categories, as shown by Table A.2. Throughout our sample, the main export product categories were Machinery and Mechanical Appliances, Vehicles, and Chemicals. The highest growth rates were experienced in the Arms and Ammunition, Mineral Products and Works of Art Sections. In contrast, exports of agricultural products, textiles and some raw materials experienced the lowest growth rates.

The geographical breakdown of French exports of goods also changed during the sample period. Table A.3 shows the ten main export destinations in 1993 and 2006 and their respective shares of total French exports. Unsurprisingly, neighboring European countries and large economies such as the US, Japan, and China feature prominently. French exports became more dispersed during the sample period, with a fall in the export shares of Germany and the UK and a rise in the shares of Spain, Switzerland, China, and Poland.

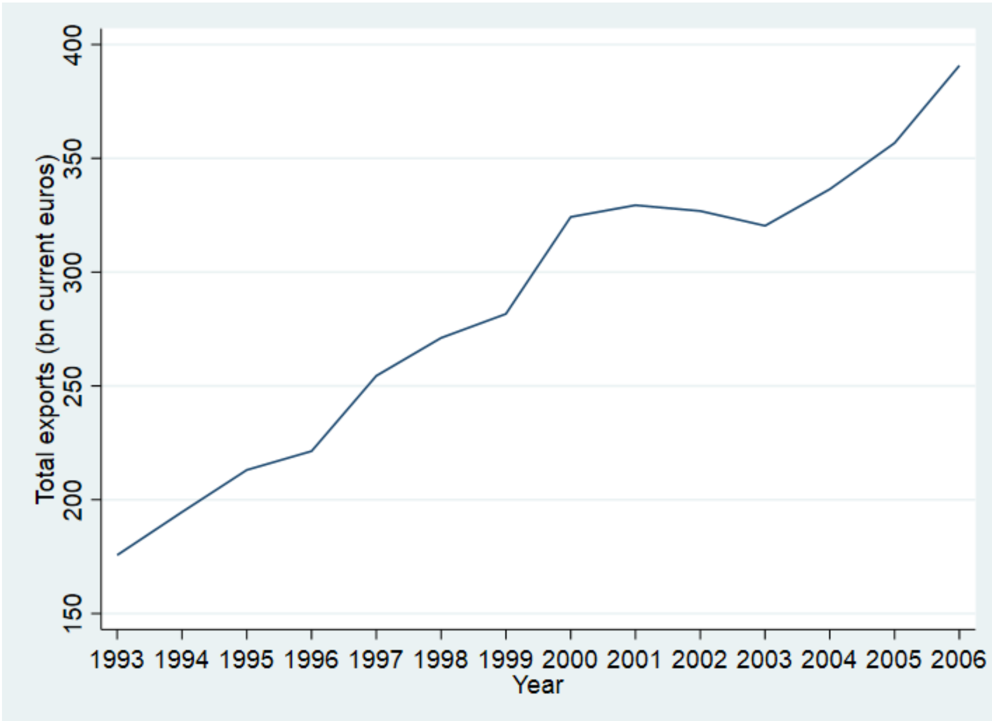
A.1.4 Margins Decomposition

We decompose the long difference in aggregate French exports, as in Bernard et al. (2009) but including new sub-extensive margins: adding new products to current export destinations and reaching new countries with products already exported elsewhere. To capture experience, we define 'new' exporters as firms that did not export in 1994, but export in 2006. A country is 'new' for firms that did not serve that country in 1994. A product is 'new' for firms that did not export that product in 1994. Products are defined at the HS 6-digit level.

Specifically, denote by x_{jt}^{f} the total value of exports from country f to country j in time t, and by x_{ijt}^{f} the total value of exports from country f to country j in time t by firm i. Upper case letters denote 'logs' of lower case equivalent values, e.g., $X_{ijt} \equiv \ln x_{ijt}$, while a 'upper bar' denotes 'average', ex. firm average sales in destination j at time t is $\overline{x}_{ijt}^{f}=\frac{1}{N_{Ej}^{f}}\sum_{i\in E} x_{ijt}^{f}.N_{Ej}^{f}\equiv |i\in E|$ denotes the cardinality of the set $\{i \in E\}, i.e.$ the number of firms i in set E.

by our statistical package. Growth and exit regressions run on a random sample with the exact same group of firms yield similar estimates as those reported in the main text and are available upon request.

Figure A.1: Total French exports, 1993-2006



Following Eaton et al. (2008), we define the exports growth rate as:

$$\frac{\Delta x^f_{jt}}{\frac{1}{2}(x^f_{ijt} + x^f_{ijt-1})}$$

which makes results less sensitive to small values ('0s' in flows) and a +g% followed by a -g% returns the level to the same level, as opposed to what would happen if dividing by the value of exports in $t-1$. We can then decompose the change in the value of exports (numerator) into the change in exports of continuers 'C' (those firms exporting in both t and $t-1$) and that of entrants, 'e' (firms exporting in t but not in $t-1$, including 'single year' exporters 's', which are firms exporting either in t or in $t-1$, but not in both) and exiters, 'd' (firms exporting in $t-1$ but not in t), where the set 'E' denotes the union of subsets $E = \{e\} \cup \{f\} \cup \{s\}$:

$$\begin{aligned}
\Delta x^f_{jt} &= \sum_{i\in E} \Delta x^f_{ijt} + \sum_{i\in C} \Delta x^f_{ijt} \\
&= \sum_{i\in e} \Delta x^f_{ijt} + \sum_{i\in d} \Delta x^f_{ijt} + \sum_{i\in C} \Delta x^f_{ijt} \\
&= \sum_{i\in e} (x^f_{ijt} - \overline{x}^f_{ijt-1} + \overline{x}^f_{ijt-1}) + \sum_{i\in d} (-x^f_{ijt-1} + \overline{x}^f_{ijt-1} - \overline{x}^f_{ijt-1}) + \sum_{i\in C} \Delta x^f_{ijt} \\
&= N^f_{ej}\overline{x}^f_{ijt-1} + \sum_{i\in e} (x^f_{ijt} - \overline{x}^f_{ijt-1}) - N^f_{dj}\overline{x}^f_{ijt-1} - \sum_{i\in d} (x^f_{ijt-1} - \overline{x}^f_{ijt-1}) + \sum_{i\in C} \Delta x^f_{ijt}
\end{aligned}$$

where the third equality follows from (i) noting that for firms in the set of entrants, $\{i \in e\}, \Delta x^f_{ijt} = x^f_{ijt} - 0$ while for firms in the set of exiters, $\{i \in d\}, \Delta x^f_{ijt} = 0 - x^f_{ijt-1}$; and from (ii) adding and

Table A.2: French exports of goods by HS Section, current EUR bn.

HS Sector	1993 Exports	2006 Exports	Growth rate (%)
LIVE ANIMALS; ANIMAL PRODUCTS	7.16	10.2	+42.0
VEGETABLE PRODUCTS	7.35	9.51	+29.3
ANIMAL OR VEGETABLE FATS AND OIL ...	.38	.85	+122.2
FOODSTUFFS, BEVERAGES AND TOBACCO	9.92	21.8	+120.2
MINERAL PRODUCTS	3.99	17.43	+337.2
CHEMICALS	17.91	56.04	+213.0
PLASTICS AND ARTICLES THEREOF...	7.97	21.11	+164.8
RAW HIDES AND SKINS, LEATHER...	1.23	3.55	+188.7
WOOD AND ARTICLES OF WOOD...	.99	2.52	+154.2
PULP OF WOOD...	3.855	8.365	+117.0
TEXTILES AND TEXTILE ARTICLES	7.13	12.81	+79.64
FOOTWEAR, HEADGEAR, UMBRELLAS...	.75	1.51	+101.9
ARTICLES OF STONE, PLASTER, CEMENT...	2.87	4.78	+66.62
NATURAL OR CULTURED PEARLS...	.95	2.42	+153.7
BASE METALS AND ARTICLES...	11.61	33.30	+186.9
MACHINERY AND MECHANICAL APPLIANCES	34.98	85.38	+144.1
VEHICLES, AIRCRAFT, VESSELS...	26.33	78.01	+196.3
OPTICAL, PHOTOGRAPHIC INSTRUMENTS...	4.55	13.16	+189.0
ARMS AND AMMUNITION; PARTS...	.06	.32	+459.1
MISCELLANEOUS MANUFACTURED ARTICLES	2.48	5.67	+128.4
WORKS OF ART, COLLECTORS' PIECES	.23	0.92	+308.0

subtracting the average exports per firm in $t-1$, $\overline{x}^f_{ijt-1}$, within the subsets of 'entrants', N^f_{ej} , and 'exiters', N^f_{dj} . Then, the growth rate in exports can be decomposed into the relative contribution

Table A.3: Exports to France's Top 10 Destinations (current billion euros) and Share of Total Exports in 1993 and 2006

	1993			2006		
	Country	Exports	Share (%)	Country	Exports	Share (%)
1.	Germany	31.2	20.4	Germany	61.6	15.8
2.	United Kingdom	16.9	11.1	Spain	38.1	9.77
3.	Italy	16.8	11.0	Italy	35.2	9.03
4.	United States	12.7	8.32	United Kingdom	32.9	8.45
5.	Spain	12.0	7.84	Belgium	28.8	7.40
6.	Netherlands	8.66	5.67	United States	26.3	6.76
7.	Japan	3.52	2.31	Netherlands	16.0	4.10
8.	Portugal	2.79	1.83	Switzerland	10.4	2.68
9.	Sweden	1.83	1.20	China	8.09	2.07
10.	Algeria	1.81	1.19	Poland	6.99	1.79

of continuers, entrants and exiters as follows:

$$\frac{\Delta x_{ijt}}{\frac{1}{2}(x_{ijt}+X_{ijt-1})} = \frac{\sum\limits_{i\in C}\Delta x^f_{ijt}}{\frac{1}{2}(x_{ijt}+x_{ijt-1})} + \frac{\sum\limits_{i\in e}\Delta x^f_{ijt}}{\frac{1}{2}(x_{ijt}+x_{ijt-1})} + \frac{\sum\limits_{i\in d}\Delta x^f_{ijt}}{\frac{1}{2}(x_{ijt}+x_{ijt-1})}$$

$$= \underbrace{\underbrace{\frac{\sum\limits_{i\in C}\frac{1}{2}(\overline{x}^f_{ijt}+\overline{x}^f_{ijt-1})}{\frac{1}{2}(x_{ijt}+x_{ijt-1})}}_{\text{Share of continuers' exports}} \underbrace{\frac{\sum\limits_{i\in C}\Delta x^f_{ijt}}{\sum\limits_{i\in C}\frac{1}{2}(\overline{x}_{ijt}+\overline{x}_{ijt-1})}}_{\text{Growth in continuers' sales}}}_{\text{Contribution to growth of continuers}} +$$

$$+ \underbrace{\underbrace{\frac{N^f_{ej}\overline{x}^f_{ijt-1}}{\frac{1}{2}(x_{ijt}+x_{ijt-1})}}_{\text{Increase in the number of exporters}} + \underbrace{\frac{\sum\limits_{i\in e}(x^f_{ijt}-\overline{x}^f_{ijt-1})}{\frac{1}{2}(x_{ijt}+x_{ijt-1})}}_{\text{Difference between entrants' sales and those of the average firm in } t-1}}_{\text{Contribution to growth of entrants (includes single year exporters in } t)}$$

$$- \underbrace{\underbrace{\frac{N^f_{dj}\overline{x}^f_{ijt-1}}{\frac{1}{2}(x_{ijt}+x_{ijt-1})}}_{\text{Drop in the number of exporters}} - \underbrace{\frac{\sum\limits_{i\in d}(x^f_{ijt-1}-\overline{x}^f_{ijt-1})}{\frac{1}{2}(x_{ijt}+x_{ijt-1})}}_{\text{Drop in sales from exiters}}}_{\text{Contribution to growth of exiters (includes single year exporters in } t-1)}$$

Then, following Bernard et al. (2009), we can further decompose the growth rate in the (log) value of exports of continuer firms into the product 'p' extensive and intensive margins, as:

$$\sum_{i\in C}\Delta x^f_{ijt} = \underbrace{\sum_{p\in A}x^f_{ijpt}}_{\text{New products Added}} - \underbrace{\sum_{p\in D}x^f_{ijpt}}_{\text{Old products Dropped}} + \underbrace{\sum_{p\in G}\Delta x^f_{ijpt}}_{\text{Existing products Growing}} + \underbrace{\sum_{p\in S}\Delta x^f_{ijpt}}_{\text{Existing products Shrinking}}$$

which can be inserted into the first additive term above, and each weighted by the share of continuers' exports in total export flows.

The extensive margin of product-country adding encompasses four non-mutually exclusive activities: adding and entirely new product and country (FMFP), adding a new country for an existing product (FMOP), adding a new product for an existing country (OMFP) and adding an existing product into an existing country (OMOP):

$$\sum_{p \in A} x^f_{ijpt} = \sum_{jp \in FMFP} x^f_{ijpt} + \sum_{jp \in FMOP} x^f_{ijpt} + \sum_{jp \in OMFP} x^f_{ijpt} + \sum_{jp \in OMOP} x_{ijpt}$$

which corresponds to the further decomposition of the extensive margin of product-country adding reported in Table 1 in the main text. We could similarly decompose the extensive margin of product-country dropping, $\sum_{p \in D} x^f_{ijpt-1}$.

Table A.4 displays the contribution of net changes along each margin, in percentage terms, as well as the contribution of gross changes. Similar to what has been found for other countries (e.g., Eaton et al., 2008; Bernard et al., 2009), the intensive margin accounts for 26.5 percent of the variation in overall French exports across destinations. The pure extensive margin, given by the net entry of exporters, explains most of export growth (54.2 percent). The remaining 19.4 percent is explained by the sub-extensive, product-country margin. While that share may appear modest, the net effect hides much greater gross contributions of entry (57.6%) and exit (38.2%) of product-country pairs. Hence, firms' internationalization paths at the extensive and sub-extensive margins are the main driver of France's export growth.

Table A.4: Margin Decomposition of 1994-2006 Export Growth

Margin	**Share of total**
Exporter births	+77.16%
Exporter deaths	-23.01%
Net entry	*+54.15%*
New Product-Countries	+57.62%
out of which	
New p, New c	+9.87%
Old p, New c	+29.62%
New p, Old c	+6.45%
Old p, Old c (swap)	+11.68%
Retired Product-Countries	*-38.20%*
Net Product-Country Margin	*+19.42%*
Growing Product-Countries	+42.84%
Shrinking Product-Countries	-16.41%
Net Intensive Margin	*+26.43 %*

Notes: The table reports the net and gross contribution of extensive, product-country sub-extensive and intensive margin changes to the average growth of French exports between 1994 and 2006.

The table further decomposes the product-country sub-extensive margin into four mutually exclusive activities: adding an entirely new product in a new destination country ('new p, new c'); adding a new country for an already exported product ('old p, new c'); adding a new product to an existing export destination country ('new p, old c'); and adding an old product into an old export destination country ('old p, old c'). This decomposition reveals two main facts. First, over half of the product-country sub-extensive gross margin is explained by firms that reach new destinations with old products ('old p, new c'). Second, expanding product scope in a previously entered country matters quantitatively as well: adding (new or old) products into countries where firms already export explains almost one third of the gross product-country margin.

A.2 Robustness Checks and Additional Tables

A.2.1 Robustness: Partial-Year Effect Correction

A potential limitation of our growth regressions stems from our use of calendar year data. Some exporters might enter a market late in the (calendar) year relative to later shipments to the same market. Growth rates between the second (complete) calendar year and the first ('partial') calendar year would then be artificially high. Bernard et al. (2017) and Berthou and Vicard (2015) show that age patterns in growth are less pronounced once the precise timing of new exporters' entry is taken into account.[38]

As explained in Section 3, this partial-year effect should be mostly absorbed by the FY_{ijpt-1} variable in equation (3). This variable captures any specific feature of growth rates right after entry in country-product jp. If exporters start new spells systematically later in the year than subsequent shipments in the same spell, FY_{ijpt-1} will absorb spurious beginning-of-spell growth.[39]

Nonetheless, we check the robustness of our results to a correction proposed by Bernard et al. (2017). In our dataset, exports are defined at the firm-product-country-year level. We first compute the average annual growth rate of exports among continuers with more than four years of consecutive exports, from which we infer a monthly export growth rate, $r-1$. As our data also report exports by month, we can inflate export values in the first year of each spell by the additional values for the missing months, assuming uniform growth at rate $r-1$. More precisely, suppose firm i starts exporting value X^{obs}_{ijp} to jp in its first calendar year. Denote by m the earliest month of that calendar year in which exports are recorded. We replace X^{obs}_{ijp} with a counterfactual annual export corresponding to a full year $X^{true}_{ijp,BBMRT}(m)$, defined as:

$$X^{true}_{ijp,BBMRT}(m) = \frac{1-r^{12}}{1-r^{13-m}} X^{obs}_{ijp}.$$

Table A.5 displays the results of the estimations with the corrected exports data. Its structure follows Table 4. Column 1 reports the results from a simple OLS estimate of equation (3), while column 2 adds gravity controls and year and destination fixed effects. Columns 3 and 4 further include product and firm fixed effects, respectively. Finally, columns 5 and 6 add controls for firm-specific unobserved sources of TFP growth, for the sample of firms for which balance sheet data is available.

Results are qualitatively similar to the baseline in all specifications, in that coefficients for α_{YMP} are positive and highly significant. One difference comes from the first coefficient test reported in Table A.5. Some specifications yield a negative estimate of α_Y implying that early growth rates in

[38]The literature has raised concerns about statistical artefacts in age-dependent export dynamics in the case of growth. One might think that entry at the product-country level may exhibit the same patterns. As a simple check, we run the same conditional entry regressions on a subset of firms that enter early in (i.e., the first semester of) the calendar year. Results are qualitatively similar. We report them in Table O.A.4. in the Online Appendix.

[39]This is different from Berthou and Vicard (2015), who work with export growth rates at the firm-year level. The use of that control variable is one reason why we do not exploit monthly French Customs data, as they do. Another reason comes from the need to work on a calendar year basis to match customs data with annual balance sheet data, unlike Berthou and Vicard (2015).

first-ever spells are lower than growth rates in subsequent years of subsequent spells. However, this result vanishes when introducing firm fixed effects or controls for idiosyncratic TFP growth. This suggests that our baseline estimates of α_Y did capture some calendar year effects, but that growth rates still exhibit age dependence when firm heterogeneity is controlled for.

One might be concerned that a similar argument applies to entry patterns. While no equivalent correction has been proposed in the literature, we run a simple check by excluding firms who start late in the calendar year. More precisely, we restrict our conditional entry sample to firms whose first entry occurred in the first half of the year (January to June). In that way we exclude artificial sequential exporters.

Table A.6 reports the results. The Table is built along the same lines as Table 2. As can be seen estimates of γ_{YM} and γ_{YP} are very similar to the baseline, suggesting the estimated age dependence in entry does not stem from a statistical artefact.

Table A.5: Growth Regressions with Bernard et al. (2017) Partial Year Effect Correction

	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth	(6) Growth
α_{YMP}	0.234***	0.235***	0.240***	0.354***	0.227***	0.298***
	(0.029)	(0.030)	(0.030)	(0.032)	(0.029)	(0.031)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.003	0.004	0.009	0.062	0.010	0.057
Number of Observations	2.1e+06	2.1e+06	2.1e+06	2.1e+06	1.6e+06	1.6e+06
Coefficient Tests						
$\alpha_Y + \alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	-0.093***	-0.079***	-0.068***	0.139***	-0.010***	0.047**
	(0.015)	(0.016)	(0.017)	(0.021)	(0.018)	(0.022)
$\alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.167***	0.165***	0.163***	0.316***	0.165***	0.268***
	(0.027)	(0.027)	(0.026)	(0.023)	(0.019)	(0.022)
$\alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.198***	0.193***	0.183***	0.345***	0.187***	0.306***
	(0.019)	(0.019)	(0.019)	(0.021)	(0.021)	(0.025)
$\alpha_{YM} + \alpha_M + \alpha_{MP} + \alpha_{YMP}$	0.097***	0.088***	0.096***	0.224***	0.087***	0.160***
	(0.015)	(0.015)	(0.015)	(0.017)	(0.018)	(0.021)

Notes: The table reports the results of regressions of firm sales growth rates on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (detailed in Table 4 notes), firm TFP growth and different sets of fixed effects as in specification (3) after applying Bernard et al. (2017) partial-year effect correction. We only report estimates for the triple interaction ($FY_{ijpt-1} \times FP_{ip} \times FM_{ij}$) coefficient, for comparison with Table 4. The full set of estimates is available from the authors upon request. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

A.2.2 Robustness: Firm Size Controls

Another robustness check consists in controlling for firm size when measuring age-dependence in export dynamics.

This robustness check is inspired by models of export dynamics such as Arkolakis (2016), which exhibit size dependence in growth rates. We thus introduce total firm sales (domestic plus foreign) as an additional control in the restricted sample of firms for which balance-sheet data is available (FICUS).

Table A.7 reports the results of growth, exit and entry regressions in our preferred specifications with these firm size controls. Columns 1 and 2 report estimates of growth regressions where we add size controls to the specifications in Columns (4) and (6) of Table 4, respectively. Columns 3 and 4 report estimates of exit regressions with product fixed effects, which add size controls to the specification in Columns 3 and 5 of Table 3, respectively. Finally, Columns 5 and 6 report estimates of entry regressions with firm fixed effects, which add size controls to the specification in Columns 4 and 6 in Table 2.

Comparing Table A.7 to the corresponding columns of tables 2, 3 and 4, a general pattern emerges. Estimates of differential growth, entry or exit activity among young exporters are highest in the full sample with firm size controls. They are somewhat lower in the restricted sample when we introduce total sales as a firm size control.They are again lower, though still economically significant, when we control for TFP growth (whether or not we have total sales controls). We conclude that while size dependence does play a role in young exporters' dynamics, our estimates of age effects are robust. Furthermore, the robustness check reveals that the regressions with TFP growth controls reported in the main text provide conservative estimates.

A.2.3 Robustness: Multinational Companies

Most firm-level export datasets show that exports are concentrated among a small group of large, often multinational firms, e.g. Bernard et al. (2018).[40] Since these firms are often multi-product and may benefit from additional experience of foreign trade at parent or affiliate level, we want to check that our novel empirical facts are not the result of a composition effect averaging two very different sets of new exporters.[41] To check this, we examine growth, entry, and exit patterns in the subsample of firms with non-French parent or affiliates (henceforth Multinational Companies, or MNCs).

For a subset of our sample we observe if a French firm is foreign-owned, which we code as $FO = 1$, or owns foreign affiliates itself, which we code as $Parent = 1$. Another binary variable, MNC, takes value one if either $FO = 1$ or $Parent = 1$. These variables are defined at the firm-year level, allowing regressions with firm fixed effects. We then include and interact the three binary variables with our coefficients of interest in growth, exit and entry regressions.

In Tables A.8, A.9 and A.10, we report results from estimations with gravity controls, year and country fixed effects, and controls for TFP growth in every specification. Furthermore, we add either product or firm fixed effects in addition to those other controls. For each of these two specifications, we show results (i) simply adding a MNC dummy to the regression; (ii) adding and interacting the MNC dummy with *each* of our (seven) main variables and their interactions; (iii) adding and interacting both the FO and the $Parent$ dummies with each of our main variables and its interactions.[42]

In the growth regressions (Table A.8), we do not find any systematic difference in the growth

[40] Using rich data on Chilean firms, Blum et al. (2020) show that this also applies to new exporters, and that the bulk of export growth among new exporters comes from a relatively small group of firms. Moreover, these firms often belong to multinational companies. Freund and Pierola (2020) provide a similar message, stressing the disproportional contributions for export growth of the top five exporters in 32 developing countries, which they also find to be often linked with foreign capital.

[41] Note, however, that Chen et al. (2018) find robust evidence of substantial sales' forecast errors decreasing with firm age parent exporting experience among Japanese multinationals.

[42] To save space, Tables A.8, A.9 and A.10 only report interactions between MNC dummies and the main coefficient of interest, e.g. $\alpha_{YMP} \times MNC$ in the case of growth regressions.

rates of multinational and non-multinational exporters, as the coefficient of the MNC, FO and $Parent$ indicators are almost always not significant. More importantly, when we interact the $MNC/FO - Parent$ dummies with our (seven) main variables, the triple interaction coefficient α_{YMP} falls slightly in magnitude relative to the baseline specification, but remains statistically significant at the 1% level. Furthermore, the quadruple interaction term does not show a robust pattern except for displaying a small magnitude and for not being statistically significant in any specification.

The exit regressions (Table A.9) show that multinationals do not display systematically different exit patterns, since the estimates of the coefficients on the indicators MFN, FO and $Parent$ are almost always not significant. More importantly, when we interact the indicators with our (seven) main variables, the triple interaction coefficient β_{YMP} hardly changes relative to the baseline specification. Estimates with product fixed effects in Column 5 suggest that foreign-owned firms have a differential 3.7 extra percentage point probability to exit in the first year of their first spell relative to later in its exporting cycle. This compares with a 7.4 percentage point differential for non-multinationals. Still, in qualitative terms, the pattern is the same.

Finally, Table A.10 reveals some quantitative differences between the entry patterns of affiliates of foreign-owned companies (although not of parents) and non-multinationals. Nevertheless, their qualitative patterns are similar. The coefficients on the indicators are positive and sometimes statistically significant, but are always tiny. More importantly, when we interact the $MNC/FO - Parent$ dummies with our (seven) main variables, our main coefficients of interest, γ_Y, γ_{YM} and γ_{YP}, hardly change. The interaction with the first of them is near zero and not statistically significant. The coefficient on the interaction of MNC with γ_{YM} is negative and significant. It appears that this comes entirely from foreign-owned firms. The magnitude, however, remains about 40 percent of the estimated coefficient on γ_{YM} alone. This implies that foreign-owned firms are also more likely to add products to their first market immediately after entry, but that the additional probability is not as high as with other firms. In contrast, the coefficient on the interaction of MNC with γ_{YP} is positive and significant. Again, this comes entirely from foreign-owned firms rather than from French parents. The magnitude of the coefficient is almost twice as large as the estimated coefficient on γ_{YP} alone. This implies that foreign-owned firms are even more likely to enter a new market with their first product immediately after entry than other firms.

Overall, then, both French affiliates of foreign MNCs and French parents exhibit export dynamics that are qualitatively similar to non-MNCs. The former are slightly less likely to exit early and more likely to expand early in the country dimension than in the product dimension, relative to other firms. These results are consistent with the evidence from Chen et al. (2018) on the importance of imperfect information and learning even among multinational firms, showing that similar product-level dynamics within multinational firms are present.

An interesting parallel can be drawn with Gumpert et al. (2020). These authors structurally estimate a dynamic model of multinational sales and exports, using (in part) similar French data. Their model, featuring sunk costs of investing and exporting and persistent idiosyncratic TFP shocks, can account for age-dependence in exit rates. Their estimation procedure targets early exit rates as well as average exit rates of both non-MNC exporters and MNCs. Interestingly, however, their model underestimates the early exit rates of non-MNC exporters despite targeting that moment, as the model meets the non-negativity constraint on sunk costs.[43] This echoes the difficulty in targeting early exit rates and other life-cycle dynamics of exporters in Ruhl and Willis (2017). Our results suggest that learning mechanisms apply to both MNC and non-MNC exporters and can complement sunk cost models to explain age-dependence in exports.

[43] Their model also predicts MNC entry rates fairly well, but overpredicts young exporters' sales.

A.2.4 Robustness: Simultaneous Exporters

The predominant entry strategy among French exporters consists in starting small. Table A.11 gives a snapshot of number of products and destination countries of age-1 exporters. It can be seen that out of 324,004 new exporters, roughly 70 percent serve just a single country with a single product. In contrast, 13 percent of entrants sell multiple products in multiple destinations. These "simultaneous exporters" account for over 75 percent of exports by age-1 exporters, and still 64% of age-5 exports.

We thus perform our three empirical exercises on the subset of firms exporting multiple products to multiple countries at age 1 (last row of Table A.11. Table A.12 reveals that the same export dynamics patterns broadly hold among these simultaneous exporters. The first two columns display the results of growth regressions with firm fixed effects in the main estimation sample and in the sample with TFP growth controls. Estimates of α_{YMP} remain positive and significant. The somewhat lower magnitudes (84% and 62% of the corresponding baseline estimates, respectively) suggest that early learning plays a lesser but still important role in explaining age dependence in export growth among those firms.

Columns 3 and 4 show the results of exit regressions with product fixed effects in both samples. Without TFP growth controls, the estimate of β_{YMP} is close to zero and is not statistically significant. However, when we control for TFP growth (in the restricted sample), the coefficient becomes positive and significant, although it is about a third of the magnitude of the baseline specification.

Finally, columns 5 and 6 report the results entry regressions with firm fixed effects in both samples. Some magnitudes are smaller and other larger than in the baseline specifications, but qualitatively the results remain similar to the main specification.

Taken together, these results suggest that our proposed mechanism applies to both "simultaneous" and sequential (non-simultaneous) exporters in terms of subsequent entry and of intensive margin growth. Exit patterns of new simultaneous exporters also show some age dependence, but less than new sequential exporters.

A.2.5 Robustness: Export spillovers

We now examine whether early growth, exit and entry behavior may be influenced by the behavior of nearby exporters. Such local spillovers may come from firms inferring some of their export profitability from neighboring firms, or firms hiring personnel with experience among exporters in the same local labor market (Fernandes and Tang, 2014). Alternatively, there may be competition effects working in the other direction. For example, as Ciliberto and Jäkel (2021) show for large Danish exporters, competition between them significantly reduces entry in a foreign market. Whatever the prevailing force, it may be an omitted variable in our analysis.

To verify this possibility, we follow Fernandes and Tang (2014) and construct measures of (lagged) neighboring firms' growth and of the number of such neighboring firms. We treat each of France's then 22 *régions* as our geographical unit. We then compute the log of the number of continuing exporters to the same product-country jp from the same *région* r between $t-2$ and $t-1$. The signal variable is defined as the unweighted average growth rate of continuing exporters to the same product-country jp from the same *région* r between $t-2$ and $t-1$. Finally, we interact both variables.

These three new independent variables are added to the baseline growth, exit and entry regressions as additional controls. Estimation relies on the restricted sample, for which information on location by region is available. Results are reported in Table A.13. Reassuringly, the coefficients of interest in each regression are very similar to those obtained without controlling for the possibility of export spillovers (see columns 5 and 6 in Tables 4, 3 and 2).

A.2.6 Robustness: Financial Frictions

We now add controls for credit constraints to our baseline specification. The idea is that credit constraints may explain the gradual growth and expansion of successful but credit-dependent new exporters. Following Manova (2013), we use a measure of Asset Tangibility (AT) at the industry level to proxy for the lack of financial frictions. This variable records the share of net property, plant, and equipment in total book-value assets, averaged over 1986–1995 for the median firm in each industry. The measure is available at the 3-digit ISIC industry level in the manufacturing sector. We use concordance tables to convert that measure into our NACE sectors. As a result, our models are estimated on the sub-sample of manufacturing firms present in the restricted sample for which balance sheet data is available.

Results are shown in Tables A.14-A.16. All three tables have the same structure. Columns (1) and (2) report the results of the product fixed effects and firm fixed effects regressions with the AT measure as an additional independent variable. Columns (3) and (4) report the results of a similar regression on the sub-sample of the least constrained manufacturing industries (i.e. those with above-median AT).

Results are very consistent with our baseline estimates: coefficients on the key coefficients are highly significant and display the expected signs throughout, albeit with slightly lower magnitudes. For instance, the .121 and .118 coefficients in the growth regressions are to be compared with .110 and .136 in the baseline specification. Estimates have roughly the same magnitude in the regressions on the sub-sample of 'unconstrained' manufacturing industries.

A.2.7 Robustness: Different Definition of Old Exporters

In the main text, old exporters refer to firms exporting in the first year of our sample (1993). All others are treated as new exporters, even though we do not observe exports prior to 1993. To check that results are not driven by this definition, we now treat firms exporting at least once in 1993, 1994 *or* 1995 as old exporters. Results are shown in Tables A.17, A.18 and A.19, which are designed to parallel the three tables of the main specification.

Results are very similar to the baseline results. In the growth and entry regressions, the coefficients of interest have the same sign and significance, as well as very similar magnitude. In the exit regressions, signs and significance are also unchanged in five of the six columns. As explained before, the insignificant estimate for the triple-difference coefficient in column 6 of Table A.18 is not inconsistent with our theory: firm fixed effects estimation excludes a large number of firms with a single observation, which should account for the bulk of early exit.

A.2.8 Robustness: Additional Fixed Effects

We now run growth and exit regressions with additional fixed effects.[44] We include country-year and product-year fixed effects to control for potential omitted market-specific time-varying shocks that may affect exporter growth and survival. These may include various shocks to demand and supply conditions as well as trade costs, in particular exchange rate movements and trade policy changes.

Results are shown in Tables A.20 and A.21. Both have the same structure. Columns 1-3 apply to the full sample, while columns 4-5 report results for the restricted sample of firms for which we

[44] Adding a large number of fixed effects is computationally too challenging in entry regressions, due to the sheer size of the dataset (250m observations even in the 30% random sub-sample).

have balance sheet data. Column 1 in both tables reports the same estimates as column 1 in the baseline tables for ease of comparison. Column 2 reports estimates of a regression with country-year fixed effects, which absorb traditional gravity variables. Column 3 reports estimates of a regression with product-year fixed effects, where country and year dummies are also present. Columns 4 and 5 show estimates of the same regressions as columns 2 and 3, but for the restricted sample.

Overall, results are quantitatively and qualitatively similar to the baseline. In Table A.20, estimates in column 2 are very similar to their counterparts in column 2 of the baseline tables, suggesting our country dummies, year dummies and gravity variables already cover for most relevant omitted country-year variables. Similarly, estimates in columns 3 and 5 suggest that the results in columns 3 and 5 of the baseline table are robust to the inclusion of product-year dummies, even if the coefficients of interest are slightly lower.

In Table A.21, results are also broadly similar to the baseline estimates. The regression with country-year dummies (column 2) shows a positive and significant estimate of the main coefficient of interest, with a magnitude almost twice as high as in the baseline. Results in columns 3 and 5 with product-year dummies are remarkably similar to their counterparts of columns 3 and 5 in the baseline table.

A.2.9 Robustness: Sector-By-Sector Regressions

We run separate HS1 sector-by-sector regressions to examine whether the empirical regularities we have uncovered apply to all or just a few product categories. Key estimates are reported in Tables A.22-A.23. In all regressions, we include gravity controls, TFP controls, country and year fixed effects. Furthermore, we add firm fixed effects in the growth and entry regressions and product fixed effects in the exit regressions.

Broadly speaking, our findings for the "average product" extend to the vast majority of product categories. Only in the Arms and Ammunition product category, a clear outlier, we do not find any evidence of early age-dependence dynamics. Entry and exit results seem to apply to a wider set of products than growth results. This could be due to the small sample size in some product categories, which is a more relevant problem in the growth regressions.

Table A.6: Entry regressions (30% sample, January-June starters only)

	(1) Entry	(2) Entry	(3) Entry	(4) Entry	(5) Entry	(6) Entry
γ_Y	0.00032***	0.00052***	0.00051***	-0.00072***	0.00034***	-0.00054***
	(0.00006)	(0.00006)	(0.00007)	(0.00008)	(0.00010)	(0.00010)
γ_{YM}	0.02997***	0.02983***	0.02978***	0.02961***	0.01855***	0.01858***
	(0.00125)	(0.00127)	(0.00127)	(0.00125)	(0.00109)	(0.00109)
γ_{YP}	0.00183***	0.00183***	0.00183***	0.00181***	0.00232***	0.00217***
	(0.00009)	(0.00009)	(0.00009)	(0.00010)	(0.00014)	(0.00014)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.00968	0.01242	0.01350	0.01597	0.01042	0.01245
Number of Observations	1.0e+08	9.7e+07	9.7e+07	9.7e+07	4.0e+07	4.0e+07
Coefficient Tests						
$\gamma_Y + \gamma_{YM}$	0.03028***	0.03035***	0.03029***	0.02888***	0.01889***	0.01803***
	(0.00126)	(0.00127)	(0.00128)	(0.00125)	(0.00111)	(0.00110)
$\gamma_Y + \gamma_{YP}$	0.00215***	0.00235***	0.00234***	0.00109***	0.00266***	0.00163***
	(0.00008)	(0.00008)	(0.00009)	(0.00009)	(0.00014)	(0.00014)
$\gamma_{YM} - \gamma_{YP}$	0.02814***	0.02800***	0.02795***	0.02779***	0.01623***	0.01641***
	(0.00127)	(0.00128)	(0.00128)	(0.00126)	(0.00113)	(0.00113)

Notes: The table reports the results of regressions of firm entry conditional on surviving on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (7). We only report estimates for the FY_{ijpt-1}, $FY_{ijpt-1} \times FP_{ip}$ and $FY_{ijpt-1} \times FM_{ij}$ coefficients. The estimation sample is restricted to firms whose first entry occurred between the months of January and June. Columns 1-4 report results for all of these firms, while Columns 5-6 report results for the subset of firms for which balance-sheet data is available (FICUS). The last three rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.7: Regressions with Firm Size Controls

	(1) Growth	(2) Growth	(3) Exit	(4) Exit	(5) Entry	(6) Entry
α_{YMP}	0.209***	0.137**				
	(0.030)	(0.031)				
β_{YMP}			0.039	0.063***		
			(0.006)	(0.006)		
γ_{Y}					-0.0005***	-0.0004***
					(0.0001)	(0.0001)
γ_{YM}					0.023***	0.021***
					(0.001)	(0.001)
γ_{YP}					0.003***	0.002***
					(0.0001)	(0.0001)
Firm size controls	yes	yes	yes	yes	yes	yes
Gravity controls	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes
Product FE	no	no	yes	yes	no	no
Firm FE	yes	yes	no	no	yes	yes
TFP Growth control	no	yes	no	yes	no	yes
R-squared	0.062	0.059	0.234	0.242	0.014	0.013
Number of Observations	9.5e+05	8.7e+05	1.0e+07	8.9e+06	6.4e+07	5.6e+07

Notes: The table reports the results of regressions of firm sales growth rates on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s). We control for total current firm sales as well as gravity variables (the full list is available in Table 4 notes), firm TFP growth and different sets of fixed effects as in specification (3). We only report coefficient estimates for the triple interaction ($FY_{ijpt-1} \times FP_{ip} \times FM_{ij}$). All columns report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.8: Growth Regressions with MNC Controls

	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth	(6) Growth
α_{YMP}	0.109***	0.136***	0.098***	0.133***	0.098***	0.133***
	(0.029)	(0.031)	(0.032)	(0.036)	(0.032)	(0.036)
MNC	0.035**	0.021	0.024	0.007		
	(0.018)	(0.021)	(0.025)	(0.029)		
$\alpha_{YMP} \times MNC$			0.032	0.002		
			(0.066)	(0.066)		
$\alpha_{YMP} \times FO$					0.044	0.022
					(0.065)	(0.063)
$\alpha_{YMP} \times Parent$					0.003	-0.034
					(0.213)	(0.200)
FO					0.026	0.011
					(0.021)	(0.032)
Parent					-0.033	-0.017
					(0.070)	(0.053)
Gravity controls	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes
Product FE	yes	no	yes	no	yes	no
Firm FE	no	yes	no	yes	no	yes
TFP Growth Control	yes	yes	yes	yes	yes	yes
R-squared	0.020	0.059	0.020	0.059	0.020	0.059
Number of Observations	8.7e+05	8.7e+05	8.7e+05	8.7e+05	8.7e+05	8.7e+05
Coefficient Tests						
$\alpha_Y + \alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.386***	0.463***	0.366***	0.447***	0.366***	0.448***
	(0.017)	(0.022)	(0.018)	(0.025)	(0.018)	(0.025)
$\alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.067***	0.122***	0.050***	0.104***	0.050***	0.105***
	(0.018)	(0.021)	(0.018)	(0.025)	(0.018)	(0.025)
$\alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.068***	0.125***	0.053**	0.111***	0.053**	0.112***
	(0.023)	(0.027)	(0.024)	(0.031)	(0.024)	(0.031)
$\alpha_{YM} + \alpha_M + \alpha_{MP} + \alpha_{YMP}$	0.053***	0.101***	0.043**	0.091***	0.044**	0.092***
	(0.017)	(0.020)	(0.017)	(0.023)	(0.017)	(0.023)

Notes: The table reports the results of regressions of firm sales growth rates on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), and all interacted with indicators for being part of a multinational (MNC) either foreign-owned (FO) or owning a foreign affiliate ($Parent$), in addition to controls for gravity variables (the full list is available in Table 4 notes), firm TFP growth and different sets of fixed effects as in specification (3). We only report coefficient estimates for the triple interaction ($FY_{ijpt-1} \times FP_{ip} \times FM_{ij}$), its interaction with our indicators of being part of a multinational, and multinational status indicators. Columns 1-2 report results without quadruple interactions for firm multinational status, while columns 3-4 include them. Columns 5-6 separate results under columns 3-4 for foreign-owned versus owning a foreign affiliate. All columns report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.9: Exit Regressions with MNC Controls

	(1) Exit	(2) Exit	(3) Exit	(4) Exit	(5) Exit	(6) Exit
β_{YMP}	0.064***	0.017***	0.074***	0.014***	0.074***	0.014***
	(0.007)	(0.003)	(0.008)	(0.003)	(0.008)	(0.003)
MNC	-0.010*	-0.003	-0.006	0.004		
	(0.006)	(0.005)	(0.013)	(0.007)		
$\beta_{YMP} \times MNC$			-0.040***	0.012*		
			(0.011)	(0.007)		
$\beta_{YMP} \times FO$					-0.037***	0.016**
					(0.011)	(0.008)
$\beta_{YMP} \times Parent$					-0.021	-0.024
					(0.020)	(0.019)
FO					0.003	0.008
					(0.013)	(0.007)
Parent					-0.002	-0.009
					(0.019)	(0.016)
Gravity controls	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes
Product FE	yes	no	yes	no	yes	no
Firm FE	no	yes	no	yes	no	yes
TFP Growth Control	yes	yes	yes	yes	yes	yes
R-squared	0.242	0.306	0.242	0.306	0.242	0.306
Number of Observations	8.9e+06	8.9e+06	8.9e+06	8.9e+06	8.9e+06	8.9e+06
Coefficient Tests						
$\beta_Y + \beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	0.157***	0.064***	0.164***	0.058***	0.164***	0.058***
	(0.009)	(0.002)	(0.011)	(0.003)	(0.011)	(0.003)
$\beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.141***	-0.189***	-0.136***	-0.192***	-0.136***	-0.192***
	(0.004)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)
$\beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.136***	-0.180***	-0.126***	-0.182***	-0.126***	-0.182***
	(0.003)	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)
$\beta_{YM} + \beta_M + \beta_{MP} + \beta_{YMP}$	0.032***	0.008***	0.035***	0.00003	0.035***	0.00003
	(0.003)	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)

Notes: The table reports the results of regressions of firm entry conditional on surviving on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), and all interacted with indicators for being part of a multinational (MNC) either foreign-owned (FO) or owning a foreign affiliate ($Parent$), in addition to controls for gravity variables (the full list is available in Table 4 notes), firm TFP growth and different sets of fixed effects as in specification (2). We only report coefficient estimates for the triple interaction ($FY_{ijpt-1} \times FP_{ip} \times FM_{ij}$), its interaction with our indicators of being part of a multinational, and multinational status indicators. Columns 1-2 report results without quadruple interactions for firm multinational status, while columns 3-4 include them. Columns 5-6 separate results under columns 3-4 for foreign-owned versus owning a foreign affiliate. All columns report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.10: Entry Regressions with MNC Controls

	(1) Entry	(2) Entry	(3) Entry	(4) Entry	(5) Entry	(6) Entry
γ_Y	0.00058***	-0.00036***	0.00056***	-0.00032***	0.00056***	-0.00032***
	(0.00008)	(0.00009)	(0.00009)	(0.00009)	(0.00009)	(0.00009)
γ_{YM}	0.02119***	0.02112***	0.02520***	0.02513***	0.02520***	0.02512***
	(0.00111)	(0.00114)	(0.00151)	(0.00158)	(0.00151)	(0.00158)
γ_{YP}	0.00263***	0.00257***	0.00232***	0.00220***	0.00232***	0.00220***
	(0.00013)	(0.00014)	(0.00013)	(0.00013)	(0.00013)	(0.00013)
$\gamma_Y \times MNC$			0.00012	-0.00039		
			(0.00022)	(0.00025)		
$\gamma_{YM} \times MNC$			-0.01536***	-0.01536***		
			(0.00210)	(0.00210)		
$\gamma_{YP} \times MNC$			0.00329***	0.00375***		
			(0.00073)	(0.00076)		
$\gamma_Y \times Parent$					-0.00103	0.00019
					(0.00073)	(0.00083)
$\gamma_{YM} \times Parent$					-0.00361	-0.00355
					(0.00455)	(0.00438)
$\gamma_{YP} \times Parent$					0.00110	-0.00002
					(0.00224)	(0.00241)
$\gamma_Y \times FO$					0.00021	-0.00043
					(0.00022)	(0.00027)
$\gamma_{YM} \times FO$					-0.01509***	-0.01509***
					(0.00214)	(0.00213)
$\gamma_{YP} \times FO$					0.00320***	0.00376***
					(0.00076)	(0.00080)
MNC	0.00039*	0.00015	0.00052**	0.00021		
	(0.00023)	(0.00031)	(0.00023)	(0.00033)		
Parent					0.00138***	0.00040
					(0.00042)	(0.00070)
FO					-0.00018	-0.00010
					(0.00025)	(0.00031)
Gravity controls	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes
Product FE	yes	no	yes	no	yes	no
Firm FE	no	yes	no	yes	no	yes
TFP Growth Control	yes	yes	yes	yes	yes	yes
R-squared	0.01030	0.01278	0.01059	0.01305	0.01060	0.01306
Number of Observations	6.1e+07	6.1e+07	6.1e+07	6.1e+07	6.1e+07	6.1e+07
Coefficient Tests						
$\gamma_Y + \gamma_{YM}$	0.02177***	0.02076***	0.02575***	0.02481***	0.02576***	0.02481***
	(0.00111)	(0.00114)	(0.00150)	(0.00158)	(0.00150)	(0.00158)
$\gamma_Y + \gamma_{YP}$	0.00321***	0.00220***	0.00288***	0.00188***	0.00288***	0.00188***
	(0.00014)	(0.00014)	(0.00012)	(0.00012)	(0.00012)	(0.00012)
$\gamma_{YM} - \gamma_{YP}$	0.01856***	0.01856***	0.02288***	0.02293***	0.02288***	0.02293***
	(0.00113)	(0.00116)	(0.00152)	(0.00160)	(0.00152)	(0.00160)

Notes: The table reports the results of regressions of firm entry conditional on surviving on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), and all interacted with indicators for being part of a multinational (MNC) either foreign-owned (FO) or owning a foreign affiliate ($Parent$), in addition to controls for gravity variables (the full list is available in Table 4 notes), firm TFP growth and different sets of fixed effects as in specification (1). We only report coefficient estimates for the FY_{ijpt-1}, $FY_{ijpt-1} \times FP_{ip}$ and $FY_{ijpt-1} \times FM_{ij}$, their interaction with our indicators of being part of a multinational, and multinational status indicators. Columns 1-2 report results without quadruple interactions for firm multinational status, while columns 3-4 include them. Columns 5-6 separate results under columns 3-4 for foreign-owned versus owning a foreign affiliate. All columns report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.11: Number of products and countries at exporting age 1, all new exporters

Age-1 Entry Strategy	# Firms	Freq. (%)	Age-1 Exp. Share (%)	Age-5 Exp. Share (%)
1 product, 1 country	226,220	69.82	10.93	19.12
1 product, many countries	12,595	3.89	5.04	5.92
1 country, many products	43,545	13.44	7.38	10.57
Many countries and products	41,644	12.85	76.64	64.39
Total	324,004	100	100	100

Table A.12: Growth, exit and entry regressions results for simultaneous exporters

	(1) Growth	(2) Growth	(3) Exit	(4) Exit	(5) Entry	(6) Entry
α_{YMP}	0.206***	0.084**				
	(0.036)	(0.036)				
β_{YMP}			-0.004	0.022***		
			(0.005)	(0.007)		
γ_{Y}					-0.001***	-0.001***
					(0.0001)	(0.0001)
γ_{YM}					0.021***	0.012***
					(0.001)	(0.001)
γ_{YP}					0.003***	0.005***
					(0.0001)	(0.0003)
Gravity controls	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes
Product FE	no	no	no	no	yes	yes
Firm FE	yes	yes	yes	yes	no	no
TFP Growth control	no	yes	no	yes	no	yes
R-squared	0.050	0.042	0.206	0.251	0.015	0.013
Number of Observations	1.6e+06	6.5e+05	3.5e+06	1.3e+06	1.0e+08	2.7e+07

Notes: The table reports the results of regressions of firm growth, exit and entry on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), in addition to controls for gravity variables (the full list is available in Table 4 notes), firm TFP growth and different sets of fixed effects as in specifications (3) under columns 1-2, (2) under columns 3-4, and (1) under columns 5-6. We only report coefficient estimates corresponding to columns 4 and 6 in Tables 4 and 2 and 3 and 5 in 3. All columns report results for the restricted sample of firms exporting multiple products to multiple countries at exporting age 1, in the last row of Table A.11. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.13: Local Export Spillovers

	(1) Growth	(2) Growth	(3) Exit	(4) Exit	(5) Entry	(6) Entry
α_{YMP}	0.113***	0.134***				
	(0.034)	(0.036)				
β_{YMP}			0.065***	0.017***		
			(0.007)	(0.004)		
γ_{Y}					0.002***	-0.001***
					(0.0003)	(0.0002)
γ_{YM}					0.036***	0.034***
					(0.002)	(0.002)
γ_{YP}					0.007***	0.007***
					(0.0004)	(0.0003)
log(# neighbors)	-0.011***	0.010***	-0.005***	-0.020***	0.001***	0.001***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.0001)	(0.0001)
signal	-0.243***	-0.250***	-0.004***	-0.002***	-0.0002***	-0.0002***
	(0.007)	(0.007)	(0.0004)	(0.0004)	(0.00004)	(0.00004)
log(# neighbors) × signal	0.029***	0.027***	-0.001***	-0.002***	0.0004***	0.0004***
	(0.005)	(0.005)	(0.0004)	(0.0004)	(0.00005)	(0.00005)
Gravity controls	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	yes	yes	yes	yes
Product FE	yes	no	yes	no	yes	no
Firm FE	no	yes	no	yes	no	yes
R-squared	0.037	0.078	0.185	0.271	0.014	0.054
Number of Observations	7.3e+05	7.3e+05	5.8e+06	5.8e+06	2.2e+07	2.2e+07

Notes: The table reports the results of regressions of firm growth, exit and entry on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), controlling for measures of local export spillovers, measured by the number (*log(#neighbors)*) and growth rate (*signal*) of neighbouring firms, in addition to controls for gravity variables (the full list is available in Table 4 notes) and different sets of fixed effects as in specifications (3) under columns 1-2, (2) under columns 3-4, and (1) under columns 5-6. We only report the corresponding coefficient estimates as reported in Tables 4, 3 and 2 under columns 4 and 6 for growth and entry, and 3 and 5 for exit. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.14: Growth Regressions: Financial Frictions

	(1) Growth	(2) Growth	(3) Growth	(4) Growth
α_{YMP}	0.121***	0.118***	0.113***	0.125***
	(0.031)	(0.031)	(0.032)	(0.034)
Asset Tangibility	0.116***	0.111***	0.101**	-0.032
	(0.040)	(0.041)	(0.046)	(0.143)
Gravity controls	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes
Product FE	yes	no	yes	no
Firm FE	no	yes	no	yes
TFP Growth Control	yes	yes	yes	yes
Industries	all	all	unconstrained	unconstrained
R-squared	0.013	0.014	0.021	0.050
Number of Observations	7.7e+05	7.6e+05	7.6e+05	7.6e+05
Coefficient Tests				
$\alpha_Y + \alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.406***	0.405***	0.407***	0.462***
	(0.018)	(0.018)	(0.019)	(0.023)
$\alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.087***	0.083***	0.076***	0.118***
	(0.019)	(0.019)	(0.020)	(0.023)
$\alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.090***	0.086***	0.073***	0.114***
	(0.025)	(0.025)	(0.026)	(0.030)
$\alpha_{YM} + \alpha_M + \alpha_{MP} + \alpha_{YMP}$	0.068***	0.062***	0.066***	0.097***
	(0.019)	(0.019)	(0.019)	(0.021)

Notes: The table reports the results of regressions of firm sales growth rates on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), firm assets tangibility, together with controls for gravity variables (detailed in Table 4 notes), firm TFP growth and different sets of fixed effects as in specification (3). We only report estimates for the triple interaction ($FY_{ijpt-1} \times FP_{ip} \times FM_{ij}$) coefficient, for comparison with Table 4. The full set of estimates is available from the authors upon request. Columns 1-2 report results for firms in all industries, while Columns 3-4 report results for the restricted sample of firms operating in financially unconstrained industries. All columns report results for firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.15: Exit Regressions: Financial Frictions

	(1) Exit	(2) Exit	(3) Exit	(4) Exit
β_{YMP}	0.050***	0.044***	0.047***	0.019***
	(0.007)	(0.007)	(0.007)	(0.003)
Asset Tangibility	-0.037***	-0.030**	-0.018	-0.005
	(0.013)	(0.013)	(0.013)	(0.040)
Gravity controls	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes
Product FE	yes	no	yes	no
Firm FE	no	yes	no	yes
TFP Growth Control	yes	yes	yes	yes
Industries	all	all	unconstrained	unconstrained
R-squared	0.161	0.175	0.236	0.287
Number of Observations	8.2e+06	8.0e+06	8.0e+06	8.0e+06
Coefficient Tests				
$\beta_Y + \beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	0.164***	0.151***	0.140***	0.066***
	(0.009)	(0.009)	(0.009)	(0.003)
$\beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.189***	-0.183***	-0.161***	-0.194***
	(0.004)	(0.004)	(0.004)	(0.002)
$\beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.153***	-0.164***	-0.157***	-0.184***
	(0.003)	(0.003)	(0.003)	(0.002)
$\beta_{YM} + \beta_M + \beta_{MP} + \beta_{YMP}$	-0.023***	-0.009**	0.011***	0.007***
	(0.003)	(0.003)	(0.003)	(0.002)

Notes: The table reports the results of regressions of firm exit on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), firm assets tangibility, together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (2). We only report estimates for the triple interaction ($FY_{ijpt-1} \times FM_{ij} \times FP_{ip}$) coefficient, for comparison with Table 3.The full set of estimates is available from the authors upon request. Columns 1-2 report results for firms in all industries, while Columns 3-4 report results for the restricted sample of firms operating in financially unconstrained industries. All columns report results for firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.16: Entry Regressions: Financial Frictions

	(1) Entry	(2) Entry	(3) Entry	(4) Entry
γ_Y	0.00048***	-0.00045***	0.00043***	-0.00034**
	(0.00009)	(0.00010)	(0.00014)	(0.00014)
γ_{YM}	0.01663***	0.01652***	0.01644***	0.01644***
	(0.00101)	(0.00102)	(0.00147)	(0.00144)
γ_{YP}	0.00293***	0.00282***	0.00327***	0.00323***
	(0.00016)	(0.00017)	(0.00025)	(0.00027)
Asset Tangibility	-0.00039	-0.00116	0.00314***	-0.00169
	(0.00045)	(0.00140)	(0.00098)	(0.00629)
Gravity controls	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Country FE	yes	yes	yes	yes
Product FE	yes	no	yes	no
Firm FE	no	yes	no	yes
TFP Growth Control	yes	yes	yes	yes
Industries	all	all	unconstrained	unconstrained
R-squared	0.01022	0.01252	0.01184	0.01302
Number of Observations	5.0e+07	5.0e+07	1.5e+07	1.5e+07
Coefficient Tests				
$\gamma_Y + \gamma_{YM}$	0.01711***	0.01607***	0.01687***	0.01611***
	(0.00101)	(0.00103)	(0.00149)	(0.00147)
$\gamma_Y + \gamma_{YP}$	0.00340***	0.00237***	0.00370***	0.00289***
	(0.00017)	(0.00017)	(0.00028)	(0.00029)
$\gamma_{YM} - \gamma_{YP}$	0.01371***	0.01370***	0.01317***	0.01321***
	(0.00103)	(0.00105)	(0.00154)	(0.00152)

Notes: The table reports the results of regressions of firm entry conditional on surviving on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), firm assets tangibility, together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (1). We only report estimates for the FY_{ijpt-1}, $FY_{ijpt-1} \times FP_{ip}$ and $FY_{ijpt-1} \times FM_{ij}$ coefficients, for comparison with Table 2. The full set of estimates is available from the authors upon request. Columns 1-2 report results for firms in all industries, while Columns 3-4 report results for the restricted sample of firms operating in financially unconstrained industries. All columns report results for firms for which balance-sheet data is available (FICUS). The last three rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.17: Growth: New Definition of Old Exporters

	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth	(6) Growth
α_{YMP}	0.188***	0.187***	0.181***	0.243***	0.132***	0.152***
	(0.028)	(0.029)	(0.030)	(0.032)	(0.035)	(0.038)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.016	0.017	0.022	0.073	0.023	0.062
Number of Observations	1.7e+06	1.6e+06	1.6e+06	1.6e+06	5.7e+05	5.7e+05
Coefficient Tests						
$\alpha_Y + \alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.450***	0.450***	0.458***	0.578***	0.406***	0.462***
	(0.015)	(0.015)	(0.016)	(0.019)	(0.020)	(0.027)
$\alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.119***	0.116***	0.113***	0.217***	0.082***	0.128***
	(0.026)	(0.026)	(0.026)	(0.022)	(0.021)	(0.025)
$\alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.136***	0.133***	0.124***	0.222***	0.086***	0.134***
	(0.017)	(0.017)	(0.017)	(0.019)	(0.026)	(0.032)
$\alpha_{YM} + \alpha_M + \alpha_{MP} + \alpha_{YMP}$	0.126***	0.123***	0.125***	0.217***	0.061***	0.106***
	(0.014)	(0.014)	(0.015)	(0.016)	(0.021)	(0.023)

Notes: The table reports the results of regressions of firm sales growth rates on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (detailed in Table 4 notes), firm TFP growth and different sets of fixed effects as in specification (3) considering as old exporters firms exporting in 1993, 1994 and 1995. We only report estimates for the triple interaction ($FY_{ijpt-1} \times FP_{ip} \times FM_{ij}$) coefficient, for comparison with Table 4. The full set of estimates is available from the authors upon request. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.18: Exit: New Definition of Old Exporters

	(1) Exit	(2) Exit	(3) Exit	(4) Exit	(5) Exit	(6) Exit
β_{YMP}	0.033***	0.061***	0.075***	-0.056***	0.106***	0.006
	(0.007)	(0.007)	(0.007)	(0.004)	(0.009)	(0.006)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.022	0.054	0.127	0.239	0.145	0.215
Number of Observations	2.1e+07	2.1e+07	2.1e+07	2.1e+07	9.1e+06	9.1e+06
Coefficient Tests						
$\beta_Y + \beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	0.178***	0.173***	0.164***	-0.064***	0.202***	0.021***
	(0.005)	(0.004)	(0.005)	(0.004)	(0.007)	(0.005)
$\beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.055***	-0.068***	-0.062***	-0.207***	-0.042***	-0.158***
	(0.006)	(0.006)	(0.006)	(0.003)	(0.008)	(0.004)
$\beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.068***	-0.080***	-0.063***	-0.217***	-0.053***	-0.182***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.006)	(0.004)
$\beta_{YM} + \beta_M + \beta_{MP} + \beta_{YMP}$	0.073***	0.069***	0.043***	-0.070***	0.088***	0.005
	(0.004)	(0.004)	(0.004)	(0.002)	(0.007)	(0.004)

Notes: The table reports the results of regressions of firm exit on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (2) considering as old exporters firms exporting in 1993, 1994 and 1995. We only report estimates for the triple interaction ($FY_{ijpt-1} \times FM_{ij} \times FP_{ip}$) coefficient, for comparison with Table 3.The full set of estimates is available from the authors upon request. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.19: Entry (30% Sample): New Definition of Old Exporters

	(1) Entry	(2) Entry	(3) Entry	(4) Entry	(5) Entry	(6) Entry
γ_Y	0.00066***	0.00081***	0.00093***	-0.00065***	0.00083***	-0.00027**
	(0.00005)	(0.00005)	(0.00007)	(0.00007)	(0.00013)	(0.00013)
γ_{YM}	0.03767***	0.03713***	0.03694***	0.03671***	0.02220***	0.02223***
	(0.00128)	(0.00129)	(0.00129)	(0.00129)	(0.00122)	(0.00123)
γ_{YP}	0.00243***	0.00243***	0.00236***	0.00242***	0.00234***	0.00231***
	(0.00008)	(0.00008)	(0.00008)	(0.00008)	(0.00017)	(0.00018)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.01099	0.01414	0.01526	0.01850	0.01218	0.01507
Number of Observations	1.4e+08	1.3e+08	1.3e+08	1.3e+08	3.3e+07	3.3e+07
Coefficient Tests						
$\gamma_Y + \gamma_{YM}$	0.03833***	0.03794***	0.03786***	0.03606***	0.02302***	0.02196***
	(0.00129)	(0.00129)	(0.00130)	(0.00130)	(0.00122)	(0.00122)
$\gamma_Y + \gamma_{YP}$	0.00309***	0.00323***	0.00329***	0.00177***	0.00317***	0.00205***
	(0.00007)	(0.00007)	(0.00008)	(0.00008)	(0.00017)	(0.00017)
$\gamma_{YM} - \gamma_{YP}$	0.03524***	0.03470***	0.03457***	0.03428***	0.01986***	0.01992***
	(0.00130)	(0.00130)	(0.00131)	(0.00130)	(0.00125)	(0.00126)

Notes: The table reports the results of regressions of firm entry conditional on surviving on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (1) considering as old exporters firms exporting in 1993, 1994 and 1995. We only report estimates for the FY_{ijpt-1}, $FY_{ijpt-1} \times FP_{ip}$ and $FY_{ijpt-1} \times FM_{ij}$ coefficients, for comparison with Table 2. The full set of estimates is available from the authors upon request. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last three rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.20: Growth Regressions With Additional Fixed Effects

	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth
α_{YMP}	0.183***	0.189***	0.175***	0.118***	0.102***
	(0.020)	(0.020)	(0.020)	(0.027)	(0.024)
Gravity controls	no	no	yes	no	yes
Country-Year FE	no	yes	no	yes	no
Country FE	no	no	yes	no	yes
Product-Year FE	no	no	yes	no	yes
TFP Growth Control	no	no	no	yes	yes
R-squared	0.015	0.017	0.044	0.015	0.070
Number of Observations	2.5e+06	2.5e+06	2.4e+06	9.1e+05	8.9e+05
Coefficient Tests					
$\alpha_Y + \alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.443***	0.452***	0.439***	0.390***	0.374***
	(0.011)	(0.012)	(0.012)	(0.017)	(0.015)
$\alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.125***	0.121***	0.116***	0.087***	0.067***
	(0.018)	(0.018)	(0.017)	(0.018)	(0.015)
$\alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.129***	0.139***	0.119***	0.086***	0.064***
	(0.014)	(0.014)	(0.014)	(0.022)	(0.019)
$\alpha_{YM} + \alpha_M + \alpha_{MP} + \alpha_{YMP}$	0.126***	0.115***	0.119***	0.063***	0.046***
	(0.011)	(0.012)	(0.011)	(0.017)	(0.015)

Notes: The table reports the results of regressions of firm sales growth rates on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (detailed in Table 4 notes), firm TFP growth and different sets of fixed effects as in specification (3). We only report estimates for the triple interaction ($FY_{ijpt-1} \times FP_{ip} \times FM_{ij}$) coefficient, for comparison with Table 4. The full set of estimates is available from the authors upon request. Columns 1-3 report results for the full sample of firms, while Columns 4-5 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.21: Exit Regressions With Additional Fixed Effects

	(1) Exit	(2) Exit	(3) Exit	(4) Exit	(5) Exit
β_{YMP}	0.036***	0.067***	0.061***	0.073***	0.063***
	(0.003)	(0.003)	(0.003)	(0.007)	(0.006)
Gravity controls	no	no	yes	no	yes
Country-Year FE	no	yes	no	yes	no
Country FE	no	no	yes	no	yes
Product-Year FE	no	no	yes	no	yes
TFP Growth Control	no	no	no	yes	yes
R-squared	0.122	0.200	0.212	0.238	0.257
Number of Observations	2.1e+07	2.1e+07	2.1e+07	9.3e+06	9.1e+06
Coefficient Tests					
$\beta_Y + \beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	0.166***	0.156***	0.146***	0.166***	0.155***
	(0.004)	(0.005)	(0.005)	(0.009)	(0.009)
$\beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.157***	-0.133***	-0.126***	-0.148***	-0.146***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
$\beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.163***	-0.126***	-0.122***	-0.140***	-0.137***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
$\beta_{YM} + \beta_M + \beta_{MP} + \beta_{YMP}$	0.005**	0.035***	0.034***	0.036***	0.029***
	(0.002)	(0.003)	(0.003)	(0.004)	(0.003)

Notes: The table reports the results of regressions of firm exit on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (2). We only report estimates for the triple interaction ($FY_{ijpt-1} \times FM_{ij} \times FP_{ip}$) coefficient, for comparison with Table 3.The full set of estimates is available from the authors upon request. Columns 1-3 report results for the full sample of firms, while Columns 4-5 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.22: Growth Regressions, HS1 Sector-By-Sector

Sector	1	2	3	4	5	6	7	8	9	10	11
α_{YMP}	0.334***	-0.040	0.206	0.182**	0.033	0.122**	0.135	-0.432**	0.229	0.237**	-0.041
	(0.089)	(0.124)	(0.244)	(0.075)	(0.212)	(0.062)	(0.090)	(0.173)	(0.155)	(0.096)	(0.083)
R-squared	0.113	0.135	0.163	0.112	0.184	0.098	0.104	0.091	0.159	0.113	0.051
Number of Observations	8.8e+04	3.1e+04	6624.000	6.9e+04	7042.000	1.0e+05	5.3e+04	1.4e+04	1.2e+04	4.0e+04	1.6e+05

Sector	12	13	14	15	16	17	18	19	20	21
α_{YMP}	-0.427	0.287**	0.146	0.287***	0.201***	0.227*	0.315***	1.439	0.222**	0.678*
	(0.273)	(0.120)	(0.194)	(0.074)	(0.065)	(0.133)	(0.108)	(1.215)	(0.095)	(0.372)
R-squared	0.103	0.117	0.109	0.096	0.083	0.132	0.086	0.229	0.103	0.198
Number of Observations	6381.000	1.8e+04	1.0e+04	6.7e+04	1.0e+05	2.4e+04	3.4e+04	509.000	4.0e+04	2216.000

Notes: The table reports the results of regressions of firm sales growth rates on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (detailed in Table 4 notes), firm TFP growth and different sets of fixed effects as in specification (4). We only report estimates for the triple interaction ($FY_{ijpt-1} \times FP_{ip} \times FM_{ij}$) coefficient, for comparison with Table 4. The full set of estimates is available from the authors upon request. All columns report results for firms for which balance-sheet data is available (FICUS). Each column displays the results of a regression with firm fixed effects as well as country and year dummies. Section refers to sections of the HS product classification, i.e., 1 Live Animals; Animal Products; 2 Vegetable Products; 3 Animal Or Vegetable Fats And Oils; 4 Foodstuffs, Beverages And Tobacco; 5 Mineral Products; 6 Products Of The Chemical Or Allied Industries; 7 Plastics And Articles Thereof; Rubber And Articles Thereof; 8 Raw Hides And Skins, Leather, Furskins And Articles Thereof...; 9 Wood And Articles Of Wood...; 10 Pulp Of Wood Or Of Other Fibrous Cellulosic Material...; 11 Textiles And Textile Articles; 12 Footwear, Headgear, Umbrellas...; 13 Articles Of Stone, Plaster, Cement...; 14 Natural Or Cultured Pearls, Precious Or Semi-Precious Stones, Precious Metals...; 15 Base Metals And Articles Of Base Metal 16 Machinery And Mechanical Appliances; Electrical Equipment...; 17 Vehicles, Aircraft, Vessels And Associated Transport Equipment; 18 Optical, Photographic, Cinematographic, Measuring Instruments...; 19 Arms And Ammunition; Parts And Accessories Thereof; 20 Miscellaneous Manufactured Articles; 21 Works Of Art, Collectors' Pieces And Antiques. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.23: Exit Regressions, HS1 Sector By Sector

Sector	1	2	3	4	5	6	7	8	9	10	11
β_{YMP}	0.073***	0.038***	0.067***	0.062***	0.104***	0.044***	0.048***	0.018	0.034*	0.088***	0.026***
	(0.010)	(0.010)	(0.024)	(0.009)	(0.022)	(0.007)	(0.008)	(0.018)	(0.018)	(0.013)	(0.006)
R-squared	0.195	0.243	0.257	0.229	0.249	0.211	0.235	0.224	0.258	0.242	0.213
Number of Observations	6.8e+05	3.1e+05	7.0e+04	6.4e+05	7.0e+04	9.9e+05	5.0e+05	1.4e+05	8.5e+04	3.6e+05	1.8e+06

Sector	12	13	14	15	16	17	18	19	20	21
β_{YMP}	0.028	0.082***	0.013	0.061***	0.101***	0.140***	0.059***	0.024	0.083***	0.055
	(0.022)	(0.014)	(0.025)	(0.009)	(0.025)	(0.014)	(0.014)	(0.072)	(0.010)	(0.037)
R-squared	0.238	0.277	0.215	0.282	0.290	0.328	0.261	0.270	0.252	0.263
Number of Observations	7.9e+04	1.8e+05	6.3e+04	7.4e+05	1.4e+06	2.0e+05	4.1e+05	4854.000	3.6e+05	1.9e+04

Notes: The table reports the results of regressions of firm exit on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (5). We only report estimates for the triple interaction ($FY_{ijpt-1} \times FM_{ij} \times FP_{ip}$) coefficient, for comparison with Table 5. The full set of estimates is available from the authors upon request. All columns report results for firms for which balance-sheet data is available (FICUS). Each column displays the results of a regression with product fixed effects as well as country and year dummies. Section refers to sections of the HS product classification, i.e., 1 Live Animals; Animal Products; 2 Vegetable Products; 3 Animal Or Vegetable Fats And Oils; 4 Foodstuffs, Beverages And Tobacco; 5 Mineral Products; 6 Products Of The Chemical Or Allied Industries; 7 Plastics And Articles Thereof; Rubber And Articles Thereof; 8 Raw Hides And Skins, Leather, Furskins And Articles Thereof...; 9 Wood And Articles Of Wood...; 10 Pulp Of Wood Or Of Other Fibrous Cellulosic Material...; 11 Textiles And Textile Articles; 12 Footwear, Headgear, Umbrellas...; 13 Articles Of Stone, Plaster, Cement...; 14 Natural Or Cultured Pearls, Precious Or Semi-Precious Stones, Precious Metals...; 15 Base Metals And Articles Of Base Metal 16 Machinery And Mechanical Appliances; Electrical Equipment...; 17 Vehicles, Aircraft, Vessels And Associated Transport Equipment; 18 Optical, Photographic, Cinematographic, Measuring Instruments...; 19 Arms And Ammunition; Parts And Accessories Thereof; 20 Miscellaneous Manufactured Articles; 21 Works Of Art, Collectors' Pieces And Antiques. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.24: Entry Regressions, HS1 Sector By Sector

γ_Y	-0.00023	-0.00022	-0.00079	-0.00071***	-0.00054	-0.00006	-0.00070***	-0.00093	-0.00070**	-0.00022	-0.00083***
	(0.00022)	(0.00025)	(0.00052)	(0.00022)	(0.00051)	(0.00028)	(0.00024)	(0.00087)	(0.00032)	(0.00025)	(0.00020)
γ_{YM}	0.04085***	0.01843***	0.01640***	0.01873***	0.01508***	0.01908***	0.01433***	0.01459***	0.03333***	0.02653***	0.02398***
	(0.00270)	(0.00251)	(0.00429)	(0.00215)	(0.00354)	(0.00157)	(0.00176)	(0.00541)	(0.00541)	(0.00244)	(0.00219)
γ_{YP}	0.00426***	0.00181***	0.00346***	0.00312***	0.00303***	0.00316***	0.00326***	0.00435***	0.00261***	0.00292***	0.00276***
	(0.00045)	(0.00041)	(0.00115)	(0.00038)	(0.00113)	(0.00052)	(0.00050)	(0.00138)	(0.00049)	(0.00040)	(0.00037)
Section	1	2	3	4	5	6	7	8	9	10	11
R-squared	0.02944	0.01794	0.02592	0.02038	0.02180	0.01862	0.01550	0.02825	0.02132	0.01803	0.01664
Number of Observations	4.2e+06	2.5e+06	4.9e+05	3.8e+06	5.6e+05	5.1e+06	3.4e+06	7.8e+05	9.0e+05	2.7e+06	1.1e+07

γ_Y	-0.00072	-0.00019	-0.00178***	-0.00033**	-0.00063***	0.00037	-0.00085***	0.00319	-0.00047*	0.00016
	(0.00065)	(0.00033)	(0.00066)	(0.00015)	(0.00013)	(0.00026)	(0.00026)	(0.00369)	(0.00026)	(0.00070)
γ_{YM}	0.01216**	0.02476***	0.02226***	0.01903***	0.01903***	0.03757***	0.01359***	0.01048	0.02674***	0.03876***
	(0.00528)	(0.00354)	(0.00680)	(0.00168)	(0.00153)	(0.00426)	(0.00186)	(0.01268)	(0.00296)	(0.00971)
γ_{YP}	0.00671***	0.00224***	0.00536***	0.00224***	0.00239***	0.00107**	0.00361***	0.00588	0.00244***	0.00183
	(0.00162)	(0.00050)	(0.00152)	(0.00033)	(0.00033)	(0.00043)	(0.00074)	(0.01170)	(0.00041)	(0.00118)
Section	12	13	14	15	16	17	18	19	20	21
R-squared	0.01836	0.02059	0.02635	0.01413	0.01288	0.02030	0.01844	0.02943	0.01978	0.03371
Number of Observations	4.2e+05	1.5e+06	3.6e+05	6.6e+06	1.1e+07	1.8e+06	2.6e+06	2.7e+04	2.7e+06	2.3e+05

Notes: The table reports the results of regressions of firm entry conditional on surviving on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (6). We only report estimates for the FY_{ijpt-1}, $FY_{ijpt-1} \times FP_{ip}$ and $FY_{ijpt-1} \times FM_{ij}$ coefficients, for comparison with Table 6. The full set of estimates is available from the authors upon request. All columns report results for firms for which balance-sheet data is available (FICUS). Each column displays the results of a regression with firm fixed effects as well as country and year dummies. Section refers to sections of the HS product classification, i.e., 1 Live Animals; Animal Products; 2 Vegetable Products; 3 Animal Or Vegetable Fats And Oils; 4 Foodstuffs, Beverages And Tobacco; 5 Mineral Products; 6 Products Of The Chemical Or Allied Industries; 7 Plastics And Articles Thereof; Rubber And Articles Thereof; 8 Raw Hides And Skins, Leather, Furskins And Articles Thereof...; 9 Wood And Articles Of Wood...; 10 Pulp Of Wood Or Of Other Fibrous Cellulosic Material...; 11 Textiles And Textile Articles; 12 Footwear, Headgear, Umbrellas...; 13 Articles Of Stone, Plaster, Cement...; 14 Natural Or Cultured Pearls, Precious Or Semi-Precious Stones, Precious Metals...; 15 Base Metals And Articles Of Base Metal 16 Machinery And Mechanical Appliances; Electrical Equipment...; 17 Vehicles, Aircraft, Vessels And Associated Transport Equipment; 18 Optical, Photographic, Cinematographic, Measuring Instruments...; 19 Arms And Ammunition; Parts And Accessories Thereof; 20 Miscellaneous Manufactured Articles; 21 Works Of Art, Collectors' Pieces And Antiques. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

A.2.10 Complete Tables for Growth, Exit and Entry Regressions

Tables A.25, A.26 and A.27 report the full set of estimates of our main entry, exit and growth regressions.

B Theoretical Appendix

B.1 A model of sequentially exporting products across countries

We propose a theoretical framework that relies on firm-level learning about its export profitability as the firm starts to sell abroad. In particular, we consider an extension of the framework developed in Albornoz et al. (2012) that incorporates the product dimension, in addition to the country dimension. To contextualize more precisely our contribution, we first summarize the main assumptions, the mechanics and the main results of that model.

Albornoz et al. (2012)'s model is based on the following three assumptions: (1) firms need to incur a sunk cost to start serving a foreign market; (2) firms are uncertain about their profitability as exporters; (3) the firm-level profitability is positively correlated over time and across markets and is (mostly) resolved as the firm starts to export. Assumption (1) has been adopted in numerous trade models. Assumption (2) is, by now, also relatively uncontroversial. The main departure from the standard approach was assumption (3). The profitability correlation could come from either supply or demand components, creating interdependence in firms' entry strategies even if destination markets are segmented.

Under those assumptions, Albornoz et al. (2012) show that some firms may start exporting either seeking immediate profits or gathering information about their own profitabilities, which may guide future profits. This generates sequentiality in the exporting process. Intuitively, a firm that is uncertain (and not particularly optimistic) of how good it is as an exporter will first pay the sunk cost to enter a single foreign destination. Once it finds out about its profitability, it has three options. Exit, if it discovers that it cannot make positive variable profits as an exporter. Remain in its initial market, if it finds out that it can do better than break even, given the entry cost in the first market is already sunk. Remain in its initial market while also expanding to other destinations, if the firm finds out that it can make larger profits through exporting—in which case it would make sense to incur the sunk costs to enter additional destinations.

We extend this framework by introducing the product dimension. That is, we decompose firm exports in the product-market dimension to investigate whether the same mechanism of "profitability discovery" extends to the product dimension. The extension is conceptually simple. In terms of its key assumptions, now they become: (1a) firms need to incur a sunk cost to start serving a foreign market; (1b) firms need to incur a product-specific sunk cost to start selling that product abroad; (2) firms are uncertain about their profitability as exporters; (3') the firm-level uncertainty is positively correlated over time, across markets and across products, and is (mostly) resolved as the firm starts to export; (4) firms operate a flexible manufacturing technology, i.e., have 'core-competence' in the production of a particular variety. Hence, relative to the original model, assumption (1) is enhanced by the introduction of a sunk cost for product development—which is standard in the multi-product firm literature—and assumptions (3') and (4) are necessary to incorporate the product dimension to the initial assumption (3).

Despite its conceptual simplicity, this extension is relatively lengthy to develop, given all the discrete choices a firm has to consider due to the multiple product-market combinations that a firm can choose in each period. To limit this multidimensionality, we restrict the model to two products and two markets. We describe below the main ingredients of the model, leaving the details of the

Table A.25: Entry regressions (30% sample)

	(1) Entry	(2) Entry	(3) Entry	(4) Entry	(5) Entry	(6) Entry
γ_Y	0.00033***	0.00055***	0.00067***	-0.00048***	0.00057***	-0.00033***
	(0.00004)	(0.00004)	(0.00006)	(0.00006)	(0.00008)	(0.00008)
γ_{YM}	0.03568***	0.03544***	0.03539***	0.03509***	0.02103***	0.02096***
	(0.00117)	(0.00119)	(0.00120)	(0.00123)	(0.00111)	(0.00114)
γ_M	0.02165***	0.01908***	0.01855***	0.01892***	0.01353***	0.01397***
	(0.00066)	(0.00059)	(0.00056)	(0.00043)	(0.00061)	(0.00051)
γ_{YP}	0.00216***	0.00215***	0.00209***	0.00212***	0.00257***	0.00248***
	(0.00006)	(0.00006)	(0.00006)	(0.00007)	(0.00013)	(0.00014)
γ_P	0.00072***	0.00074***	0.00051***	0.00204***	0.00134***	0.00266***
	(0.00003)	(0.00003)	(0.00004)	(0.00004)	(0.00006)	(0.00008)
γ_{MP}	0.00502***	0.00470***	0.00458***	0.00429***	0.00403***	0.00392***
	(0.00090)	(0.00088)	(0.00085)	(0.00076)	(0.00127)	(0.00121)
γ_{YMP}	-0.02984***	-0.02966***	-0.02962***	-0.03008***	0.00508***	0.00449***
	(0.00139)	(0.00138)	(0.00138)	(0.00137)	(0.00185)	(0.00164)
TFP growth					0.00001	-0.00001
					(0.00001)	(0.00001)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.00934	0.01219	0.01313	0.01581	0.01022	0.01270
Number of Observations	2.5e+08	2.4e+08	2.4e+08	2.4e+08	6.2e+07	6.2e+07
Coefficient Tests						
$\gamma_Y + \gamma_{YM}$	0.03601***	0.03599***	0.03605***	0.03460***	0.02160***	0.02063***
	(0.00118)	(0.00120)	(0.00119)	(0.00122)	(0.00111)	(0.00115)
$\gamma_Y + \gamma_{YP}$	0.00249***	0.00270***	0.00275***	0.00164***	0.00314***	0.00215***
	(0.00006)	(0.00006)	(0.00007)	(0.00006)	(0.00014)	(0.00014)
$\gamma_{YM} - \gamma_{YP}$	0.03352***	0.03329***	0.03330***	0.03296***	0.01846***	0.01849***
	(0.00118)	(0.00120)	(0.00120)	(0.00123)	(0.00114)	(0.00117)

Notes: The table reports the results of regressions of firm entry conditional on surviving on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (1). The full set of estimates as reported in Table 2 is reported. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last three rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.26: Exit regressions

	(1) Exit	(2) Exit	(3) Exit	(4) Exit	(5) Exit	(6) Exit
β_Y	0.324***	0.290***	0.271***	0.216***	0.299***	0.254***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.006)	(0.002)
β_{YM}	-0.006**	-0.005*	0.004	0.027***	-0.006	0.019***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.006)	(0.003)
β_M	0.012***	0.002	-0.008*	-0.020***	-0.002	-0.027***
	(0.004)	(0.004)	(0.004)	(0.002)	(0.008)	(0.002)
β_{YP}	-0.093***	-0.086***	-0.075***	-0.047***	-0.078***	-0.049***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.006)	(0.002)
β_P	-0.069***	-0.090***	-0.083***	-0.124***	-0.096***	-0.147***
	(0.003)	(0.004)	(0.004)	(0.001)	(0.008)	(0.002)
β_{MP}	-0.037***	-0.033***	-0.024***	-0.006***	-0.026***	-0.001
	(0.004)	(0.004)	(0.004)	(0.002)	(0.007)	(0.002)
β_{YMP}	0.036***	0.034***	0.062***	-0.024***	0.064***	0.017***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.003)
TFP growth					-0.0004***	-0.001***
					(0.0002)	(0.0002)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
TFP Growth Control	no	no	no	no	yes	yes
R-squared	0.122	0.142	0.202	0.299	0.244	0.305
Number of Observations	2.1e+07	2.1e+07	2.1e+07	2.1e+07	9.0e+06	9.0e+06
Coefficient Tests						
$\beta_Y + \beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	0.166***	0.111***	0.147***	0.021***	0.156***	0.066***
	(0.004)	(0.005)	(0.005)	(0.004)	(0.009)	(0.002)
$\beta_{YM} + \beta_M + \beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.157***	-0.179***	-0.124***	-0.194***	-0.143***	-0.188***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)
$\beta_{YP} + \beta_P + \beta_{MP} + \beta_{YMP}$	-0.163***	-0.176***	-0.120***	-0.202***	-0.136***	-0.180***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
$\beta_{YM} + \beta_M + \beta_{MP} + \beta_{YMP}$	0.005**	-0.003	0.034***	-0.023***	0.031***	0.008***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)

Notes: The table reports the results of regressions of firm exit on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (see Table 4 notes for the full list), firm TFP growth and different sets of fixed effects as in specification (2). The full set of estimates in Table 3 is reported. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

Table A.27: Export growth regressions

	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth	(6) Growth
α_Y	0.318***	0.319***	0.327***	0.349***	0.314***	0.337***
	(0.016)	(0.016)	(0.017)	(0.017)	(0.011)	(0.011)
α_{YM}	-0.018	-0.015	-0.013	-0.016	-0.008	-0.010
	(0.017)	(0.017)	(0.017)	(0.018)	(0.020)	(0.020)
α_M	0.015*	0.008	0.010	0.010	0.014	0.009
	(0.008)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)
α_{YP}	-0.030*	-0.031*	-0.031*	-0.042**	-0.017	-0.028*
	(0.016)	(0.016)	(0.017)	(0.018)	(0.014)	(0.015)
α_P	0.029***	0.029***	0.024***	0.046***	0.033***	0.051***
	(0.007)	(0.007)	(0.007)	(0.010)	(0.009)	(0.010)
α_{MP}	-0.054***	-0.054***	-0.053***	-0.027***	-0.058***	-0.033***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.012)	(0.011)
α_{YMP}	0.183***	0.182***	0.182***	0.246***	0.110***	0.136***
	(0.020)	(0.021)	(0.021)	(0.022)	(0.028)	(0.030)
TFP growth					0.007***	0.008***
					(0.002)	(0.003)
Gravity controls	no	yes	yes	yes	yes	yes
Year FE	no	yes	yes	yes	yes	yes
Country FE	no	yes	yes	yes	yes	yes
Product FE	no	no	yes	no	yes	no
Firm FE	no	no	no	yes	no	yes
R-squared	0.015	0.015	0.019	0.065	0.019	0.057
Number of Observations	2.5e+06	2.4e+06	2.4e+06	2.4e+06	8.9e+05	8.9e+05
Coefficient Tests						
$\alpha_Y + \alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.443***	0.439***	0.446***	0.566***	0.388***	0.462***
	(0.011)	(0.011)	(0.012)	(0.014)	(0.017)	(0.021)
$\alpha_{YM} + \alpha_M + \alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.125***	0.119***	0.120***	0.217***	0.074***	0.124***
	(0.018)	(0.018)	(0.018)	(0.016)	(0.018)	(0.021)
$\alpha_{YP} + \alpha_P + \alpha_{MP} + \alpha_{YMP}$	0.129***	0.126***	0.122***	0.223***	0.068***	0.126***
	(0.014)	(0.014)	(0.014)	(0.016)	(0.022)	(0.026)
$\alpha_{YM} + \alpha_M + \alpha_{MP} + \alpha_{YMP}$	0.126***	0.121***	0.126***	0.213***	0.058***	0.102***
	(0.011)	(0.012)	(0.012)	(0.013)	(0.017)	(0.020)

Notes: The table reports the results of regressions of firm sales growth rates on our indicators for first year of an export spell (FY_{ijpt-1}), first exported product (FP_{ip}) and first export destination (FM_{ij}), separately and for three double and one triple interaction(s), together with controls for gravity variables (population weighted distance to France, population, GDP, GDP per capita, contiguity with France, common official language, past colonial ties, GATT/WTO membership, Regional Trade Agreements with the EU, common legal origin, common currency and participation in cooperation agreements between the EU and African, Caribbean and Pacific countries), firm TFP growth and different sets of fixed effects as in specification (3). The full set of estimates as reported in Table 4 is reported. Columns 1-4 report results for the full sample of firms, while Columns 5-6 report results for the restricted sample of firms for which balance-sheet data is available (FICUS). The last four rows report estimates and standard errors of sums of linear combinations of coefficients in the column's corresponding econometric specifications. Standard errors clustered at the firm level are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged CEPII Gravity-French tax authority (FICUS)-French Customs data, 1993-2006.

analysis to the OA section B.3, below.

B.2 Basic structure

A risk-neutral producer has the option of serving two segmented foreign markets, A and B, with either one or two differentiated products, a and b. The producer enjoys monopoly power on each of the four submarkets. Countries A and B are symmetric except for the unit trade costs that the firm must pay to export there, denoted by τ^A and τ^B, $\tau^A \leq \tau^B$. For simplicity, those unit trade costs are assumed to be equal for both products. To sell in each foreign market, the firm also needs to incur a one-time fixed cost per destination, $F > 0$. This corresponds to the costs of establishing distribution channels, designing a marketing strategy, becoming familiar with the institutional and policy characteristics of the country, etc. Specifically in the context of our model, this is the sunk cost of selling the first product in a foreign market.

Product a has a lower unit production cost than product b: producing b costs $c > 0$ per unit, while we normalize the unit cost of producing a to zero. Exporters must also pay an ex ante unknown export unit cost, $c_v^j, v = a, b$. In addition, firms incur a one-time fixed cost f to introduce an additional product, which is smaller than the sunk cost to enter a foreign destination, i.e., $0 < f < F$. Moreover, we assume that $c > 2(F^{1/2} - f^{1/2})$.[45]

The producer faces the following demand for each product $v = a, b$ in each market $j = A, B$:

$$q_v^j(p_v^j) = d_v^j - p_v^j, \tag{A.B.1}$$

where q_v^j denotes the output sold in destination j for product v, p_v^j denotes its corresponding price, and d_v^j is an ex ante unknown parameter. We therefore allow for uncertainty in both demand and supply parameters.

Let

$$\mu_v^j \equiv d_v^j - c_v^j$$

be a random variable with a continuous cumulative distribution function $G(\cdot)$ on the support $[\underline{\mu}, \overline{\mu}]$. We refer to μ_v^j as the firm's "export profitability" of product v in market j. $\overline{\mu}$ obtains when the highest possible demand intercept ($\overline{d}$) and the lowest possible export unit cost ($\underline{c}$) are realized; $\underline{\mu}$ obtains under the opposite extreme scenario ($d_v^j = \underline{d}$ and $c_v^j = \overline{c}$). The analysis becomes interesting when trade costs are such that, upon the resolution of the uncertainty, it may become optimal to export both, only one, or none of the products to both, only one, or none of the destinations. Accordingly, we assume $\underline{\mu} < \tau^A$—so that exporting may not be worthwhile even if $F = 0$—and $2F^{1/2} + \tau^B + c < \overline{\mu}$. This last condition implies that exporting only the non-core product to the more costly market can be profitable. To ensure that equilibrium prices are always strictly positive, we need that $E\mu < 2d_v^j + \tau^j$ for all d_v^j and τ^j, so we assume throughout the paper that $2\underline{d} + \tau^A > E\mu$.

As discussed above, our key assumption is that export profitability is correlated over time and across products and markets. This correlation could come from either supply or demand components of uncertainty in parameter μ_v^j. To make the analysis as clear and simple as possible,

[45] Our modelling of variable costs is consistent with 'core-competency' theories of multiproduct exporters, e.g., Eckel and Neary (2010), as well as empirical evidence that firms mostly export their core products, e.g., Arkolakis et al. (2018). Our assumption on fixed costs is consistent with recent work by Bernard et al. (2011), Arkolakis et al. (2021), Timoshenko (2015) and Eckel et al. (2016), who assume that non-core products are obtained from adapting a core product. The restriction $0 < f < F$ captures the idea that adapting/introducing a second product in a country where the firm already exports costs less than setting up the firm to export to a new market. As explained in OA section B.3, condition $c > 2(F^{1/2} - f^{1/2})$ implies that the costs associated with exporting non-core products are large enough so that some firms choose to enter foreign markets with their core products only, in line with empirical evidence.

we focus on a limiting case where the draws of μ_v^j are perfectly correlated across markets and products: $\mu_v^A = \mu_v^B = \mu$. To simplify notation we henceforth denote by μ the profitability of product a in a market, noting that the corresponding value for product b equals $\mu - c$. Observe that our assumptions imply a hierarchy of products within firms in terms of profitability, motivated by the empirical evidence presented in (i) Table 1, according to which most new exporters start selling one product into one destination, and in (ii) Figure 2, whereby first products have a higher survival rate.

Although we keep this simple structure throughout the theoretical analysis, where the uncertainty is solely at the firm level, broader interpretations are possible without altering the mechanics of the model or its main conclusions (although at the cost of a longer taxonomy). In particular, one could also allow for firm-product and firm-market uncertainty. In that case, $\mu_v^j = \mu + \mu_v + \mu^j$, so that by exporting a firm learns about its general profitability as an exporter but also about the appeal of each of its products in foreign markets and about how well it can perform in each foreign market. Such an approach would imply that the firm learns additional information about its potential to make profits through exporting every time it sells a new product abroad and every time it enters a new foreign market. In the empirical analysis, we allow for these possibilities so that we can disentangle firm-level learning from learning at those other dimensions.

To determine optimal entry decisions, we evaluate all profits from an *ex ante* perspective, i.e., at their $t = 0$ expected value. We assume that firms do not discount future payoffs, but this has no bearing on our qualitative results. We denote by e_{vt}^j the firm's decision to enter market $j = A, B$ with product $v = a, b$ at time $t = 1, 2$. Thus, $e_{vt}^j = 1$ if the firm enters market j (i.e., pays the sunk cost) with product v at time t, $e_{vt}^j = 0$ otherwise. Output q_{vt}^j can be strictly positive only if either $e_{vt}^j = 1$ or $e_{vt-1}^j = 1$.

The timing is as follows:

$t = 1$: At period 1, the firm decides whether to enter each market and, if so, with which product. If the firm decides to enter market j, it pays the per-destination fixed entry cost F and chooses the quantity of product v to sell there in that period, q_{v1}^j. If the firm decides to export both products, it pays the additional sunk cost f. At the end of period 1, export profits in destination j for product v are realized. If the firm has entered and produced $q_{v1}^j \geq \varepsilon$, where $\varepsilon > 0$ is arbitrarily small, it infers μ from its profits.

$t = 2$: At period 2, if the firm has entered market j with product v at $t = 1$, it decides whether to keep selling that product in that market. If so, it chooses how much to sell, q_{v2}^j. If the firm has not entered destination j with product v at $t = 1$, it decides whether to do so. If the firm enters market j, it pays F and chooses q_{v2}^j. If the firm decides to sell both products, it pays the additional fixed cost f. At the end of period 2, export profits are realized.

As in Jovanovic (1982), firms must engage in production to infer their profitability. In our model, this involves producing a strictly positive quantity for at least one of the four product-country pairs and paying the corresponding one-time fixed entry costs.[46] We now proceed to solve the model.

[46] In reality, entry may also be importer-driven. While our model focuses on exporter-driven entry, a first export experience that follows an unsolicited order by an importer could also resolve uncertainty and lead to active expansion of scope and/or across foreign markets.

B.3 Solving the Model

B.3.1 Firm's export decision

There are six undominated entry strategies. First, the firm may not enter at all. Second, the firm may enter both markets A and B simultaneously at $t = 1$ with both products a and b (which we denote by Aab Bab for short, or "Simultaneous product-market entry" $(e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 1)$). Third, the firm may enter market A with both products and market B with product a at $t = 1$, deciding at $t = 2$ whether to expand its scope to product b in market B (Aab Ba, or "Partially sequential product-market entry" $(e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 0)$). Fourth, the firm may enter markets A and B at $t = 1$ with product a, deciding at $t = 2$ whether to expand product scope in either or both markets (Aa Ba, or "Sequential product entry" $(e^A_{a1} = 1, e^A_{b1} = 0; e^B_{a1} = 1, e^B_{b1} = 0)$). Fifth, the firm may enter only market A at $t = 1$ with both products, deciding at $t = 2$ whether to enter market B and, if so, whether to enter it with product a or both (Aab, or "Sequential market entry" $(e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 0, e^B_{b1} = 0)$). Sixth and last, the firm may enter only market A at $t = 1$ with product a, deciding at $t = 2$ whether to expand its product scope in A and/or to enter market B with either product a or both (Aa, or "Sequential product-market entry" $(e^A_{a1} = 1, e^A_{b1} = 0; e^B_{a1} = 0, e^B_{b1} = 0)$).

The other possibilities, of entering both markets only at $t = 2$, of entering market B before market A, and of entering with product b rather than with product a, need not be considered. The last two are respectively dominated by (i) entering with product a before product b, since $\mu_b = \mu_a - c < \mu_a$ ('core-competency') and $f > 0$, and by (ii) entering market A before market B, since $\tau^A \leq \tau^B$. The first possibility is dominated by simultaneous entry at $t = 1$, since by postponing entry the producer is faced with the same problem as in $t = 1$, but is left with a shorter horizon to recoup fixed entry costs ('sell to learn').

We solve for the firm's decision variables $\{e^j_{v1},\ e^j_{v2},\ q^j_{v1},\ q^j_{v2}\}$ for product $v = \{a, b\}$ using backward induction. We denote optimal quantities in period t under simultaneous entry by $\widehat{q}^j_{vt}$, and under (any) sequential (market or product) entry by $\widetilde{q}^j_{vt}$.

B.3.2 Period $t = 2$

(i) *No entry.* The firm does not export, earning zero profits.

(ii) *Aab Bab, or Simultaneous product-market entry* $(e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 1)$. When the firm exports to both destinations at $t = 1$, at $t = 2$ it will have inferred its export profitability μ and will choose its export volumes by solving

$$\max_{q^j_{v2} \geq 0} \left\{ (\mu_v - \tau^j - q^j_{v2}) q^j_{v2} \right\},\ j = A, B;\ v = a, b.$$

This yields

$$\widehat{q}^j_{v2}(\tau^j) = \mathbf{1}_{\{\mu_v > \tau^j\}} \left(\frac{\mu_v - \tau^j}{2} \right), \tag{A.B.2}$$

where $\mathbf{1}_{\{.\}}$ represents the indicator function, here denoting whether $\mu_v > \tau^j$. Second-period output is zero for low μ_v. Profits at $t = 2$, expressed in $t = 0$ expected terms, can then be written as

$$V_v(\tau^j) \equiv \mathbb{E}\left[\max_{q^j_{v2} \geq 0} (\mu_v - \tau^j - q^j_{v2}) q^j_{v2} \right] = \mathbb{E}\left[\mathbf{1}_{\{\mu_v > \tau^j\}} \left(\frac{\mu_v - \tau^j}{2} \right)^2 \right]$$
$$= \int_{\tau^j}^{\overline{\mu}} \left(\frac{\mu_v - \tau^j}{2} \right)^2 dG(\mu_v),\ j = A, B;\ v = a, b.$$

$V_v(\tau^j)$ is the value of continuing to export product v to market j after product v's profitability in foreign market j has been revealed. If the firm cannot deliver positive profits in a market, it either drops a product or exits altogether. Otherwise, the firm tunes up its product output choice to that market.

(iii) *Aab Ba, or Partially sequential product-market entry* ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 0$). When the firm exports product a to both destinations and product b to destination A in $t = 1$, at $t = 2$ it will have inferred its export profitability μ. Thus, q^j_{v2} is again given by (A.B.2): $\widetilde{q}^j_{v2}(\tau^j) = \widehat{q}^j_{v2}(\tau^j) = \mathbf{1}_{\{\mu_v > \tau^j\}} \left(\frac{\mu_v - \tau^j}{2}\right)$, generating second-period profit $V_v(\tau^j)$, for $(v, j) = \{(a, A), (a, B), (b, A)\}$.

The firm chooses to sell product b in market B at $t = 2$ if the operational profit is larger than the fixed cost f to introduce it, given that the cost to enter market B has already been sunk. This will be the case when the firm realizes that it is profitable to do so:

$$\left(\frac{\mu_b - \tau^B}{2}\right)^2 \geq f. \tag{A.B.3}$$

Hence, the firm's decision to expand its product scope in market B at $t = 2$ is

$$e^B_{b2}(\tau^B) = 1 \Leftrightarrow \mu_b \geq 2f^{1/2} + \tau^B \Leftrightarrow \mu \geq 2f^{\frac{1}{2}} + \tau^B + c. \tag{A.B.4}$$

Thus, defining $f^B_2(\tau^B)$ as the f that solves (A.B.3) with equality, the firm introduces product b in market B at $t = 2$ if $f \leq f^B_2(\tau^B)$. It is straightforward to see that $f^B_2(\tau^B)$ is strictly decreasing in τ^B.

If the firm introduces product b in market B, it will choose q^B_{b2} much like it chooses q^A_{b2}, adjusted for market B's specific trade cost, τ^B. However, conditional on $e^B_{b2} = 1$, we know that $\mu_b \geq 2f^{1/2} + \tau^B > \tau^B$. Therefore, the firm sets $\widetilde{q}^B_{b2}(\tau^B) = \left(\frac{\mu_b - \tau^B}{2}\right)$.

Expressed in $t = 0$ expected terms, the firm's profit from (possibly) sequentially expanding its product scope (to product b in market B at $t = 2$) corresponds to

$$\begin{aligned} W_b(\tau^B; f) &\equiv \mathbb{E}\left[\max\left\{\max_{q^B_{b2} \geq 0}(\mu_b - \tau^B - q^B_{b2})q^B_{b2} - f, 0\right\}\right] = \mathbb{E}\left[\mathbf{1}_{\{\mu_b > 2f^{1/2} + \tau^B\}}\left\{\left(\frac{\mu_b - \tau^B}{2}\right)^2 - f\right\}\right] \\ &= \left\{V_b(\tau^B) - \int_{c+\tau^B}^{2f^{1/2}+c+\tau^B}\left(\frac{\mu - c - \tau^B}{2}\right)^2 dG(\mu)\right\} - f\left[1 - G(2f^{1/2} + c + \tau^B)\right]. \end{aligned} \tag{A.B.5}$$

Function $W_b(\tau^B; f)$ represents the value of sequentially exporting product b to market B after learning its product profitability. The expression in curly brackets in the last line represents the (ex ante) expected gross profit from entering market B at $t = 2$ with product b, expressed in terms of the profitability of product a, i.e., μThe other term represents the product fixed cost from introducing product b in market B times the probability that entry with that product-country pair is profitable.

Thus, the return from first entering destination A with product b includes the value of waiting to subsequently become an informed exporter of product b to destination B, avoiding the costs from directly "testing" that product-market. In the presence of uncertainty and the irreversible product cost f, the possibility of delaying entry into market B corresponds to a real option. If profits were not correlated across destinations, there would not be any gain from delaying entry into B with product b and $W_b(\tau^B; f)$ would collapse to the unconditional expectation of profits for product b in market B, as in $t = 1$. The difference between those two values, which is the value of the real option, would then be zero. While we focus on the case of perfect correlation, it should be clear that as long as the correlation is positive, the value of the option remains strictly positive.

(iv) *Aa Ba, or Sequential product entry* ($e^A_{a1} = 1, e^A_{b1} = 0; e^B_{a1} = 1, e^B_{b1} = 0$). When the firm exports product a to both destinations in $t = 1$, at $t = 2$ it will have inferred its export profitability μ. Thus, q^j_{a2} is again given by (A.B.2): $\widetilde{q}^j_{a2}(\tau^j) = \widehat{q}^j_{a2}(\tau^j) = \mathbf{1}_{\{\mu_a > \tau^j\}} \left(\frac{\mu_a - \tau^j}{2}\right)$, generating second-period profit $V_a(\tau^j)$.

The firm then considers whether to expand its product scope in market A and/or B. Since profitability is perfectly correlated across markets, but the trade cost of A is smaller than that of B, $\tau^A \leq \tau^B$, a necessary condition to expand the firm's product scope is:

$$\left(\frac{\mu_b - \tau^A}{2}\right)^2 \geq f. \tag{A.B.6}$$

Hence, the firm's decision to expand its product scope in market A at $t = 2$ is

$$e^A_{b2}(\tau^A) = 1 \Leftrightarrow \mu_b \geq 2f^{1/2} + \tau^A \Leftrightarrow \mu \geq 2f^{1/2} + \tau^A + c. \tag{A.B.7}$$

Thus, defining $f^A_2(\tau^A)$ as the f that solves (A.B.6) with equality, the firm introduces product b in market A at $t = 2$ if $f \leq f^A_2(\tau^A)$. It is straightforward to see that $f^A_2(\tau^A)$ is strictly decreasing in τ^A.

If the firm introduces product b in market A, it will choose q^A_{b2} much like it chooses q^A_{a2}, adjusted for product b's additional production cost, c. However, conditional on $e^A_{b2} = 1$, we know that $\mu_b \geq 2f^{1/2} + \tau^A > \tau^A$. Therefore, the firm sets $\widetilde{q}^A_{b2}(\tau^A) = \left(\frac{\mu_b - \tau^A}{2}\right)$. An analogous analysis applies to $e^B_{b2}(\tau^B)$ and $\widetilde{q}^B_{b2}(\tau^B)$.

Expressed in $t = 0$ expected terms, the firm's profit from (possibly) sequentially expanding its product scope in markets A an B at $t = 2$ corresponds, respectively, to $W_b(\tau^A; f)$ and $W_b(\tau^B; f)$. Therefore, expressed in $t = 0$ expected terms, the firm's profit from (possibly) expanding the product scope at $t = 2$ corresponds to:

$$W(\tau^A, \tau^B; f) = W_b(\tau^A; f) + W_b(\tau^B; f).$$

(v) *Aab, or Sequential market entry* ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 0, e^B_{b1} = 0$). When the firm exports products $v = a, b$ to country A in $t = 1$, at $t = 2$ it will have inferred its export profitability μ. Thus, q^A_{v2} is again given by (A.B.2): $\widetilde{q}^A_{v2}(\tau^A) = \widehat{q}^A_{v2}(\tau^A) = \mathbf{1}_{\{\mu_v > \tau^A\}} \left(\frac{\mu_v - \tau^A}{2}\right)$, generating second-period profit $V_v(\tau^A), v = a, b$.

A firm can subsequently enter the second market with either only product a or both products. Entry with product a is profitable if the following condition holds:

$$\left(\frac{\mu - \tau^B}{2}\right)^2 \geq F.$$

This defines the following threshold for profitable entry with product a:

$$\mu \geq 2F^{1/2} + \tau^B. \tag{A.B.8}$$

In turn, profitable entry with products a and b in market B requires

$$\left(\frac{\mu - \tau^B}{2}\right)^2 + \left(\frac{\mu - \tau^B - c}{2}\right)^2 - f \geq F.$$

Moreover, entry in market B with products a and b is preferable to entry with only product a if

$$\left(\frac{\mu-\tau^B}{2}\right)^2 - F + \left(\frac{\mu-\tau^B-c}{2}\right)^2 - f \geq \left(\frac{\mu-\tau^B}{2}\right)^2 - F,$$

or equivalently, if

$$\mu \geq 2f^{1/2} + \tau^B + c. \tag{A.B.9}$$

We assume that the right-hand-side of (A.B.8) is smaller than the right-hand-side of (A.B.9). This is equivalent to assuming that the extra costs of the non-core product are high relative to the market fixed entry cost:

$$c > 2(F^{1/2} - f^{1/2}), \tag{A.B.10}$$

Under (A.B.10), it is optimal for the firm to enter market B at $t = 2$ with only product a if

$$2F^{1/2} + \tau^B \leq \mu < 2f^{1/2} + \tau^B + c. \tag{A.B.11}$$

and enter with both products a and b if, instead, condition (A.B.9) holds. That is, for relatively small μ, the firm does not enter market B; for relatively large μ, the firm enters market B with products a and b; for intermediate levels of μ, the firm enters market B with only product a. We assume that condition (A.B.10) holds to reduce the strategy space and to avoid an even longer taxonomy, as we do not need to consider the situation where entering market B with two products dominates entering market B with a single product. This also conforms with the empirical regularity that firms often enter subsequent markets with only their core products.

Defining $F_2^B(\tau^B)$ as the F that solves (A.B.8) with equality, the firm enters market B at $t = 2$ with only product a if $F \leq F_2^B(\tau^B)$. It is straightforward to see that $F_2^B(\tau^B)$ is strictly decreasing in τ^B. When (A.B.11) does not hold, the firm will find it worth to enter market B at $t = 2$ with both products a and b if condition (A.B.9) is met. In that case, defining $f_2^B(\tau^B)$ as the f that solves (A.B.9) with equality, the firm enters market B at $t = 2$ with products a and b if $f \leq f_2^B(\tau^B)$, which is strictly decreasing in τ^B. Hence, if the firm enters market B, it will choose q_{v2}^B much like it chooses q_{v2}^A, adjusted for market B's specific trade cost, τ^B. However, conditional on $e_{a2}^B = 1$, we know that $\mu > 2F^{1/2} + \tau^B > \tau^B$. Similarly, conditional on $e_{b2}^B = 1$, we know that $\mu_b > 2f^{1/2} + \tau^B > \tau^B$. Therefore, the firm sets $\widetilde{q}_{v2}^B(\tau^B) = \frac{\mu_v - \tau^B}{2}$ for $v = a, b$.

Expressed in $t = 0$ expected terms, the firm's profit from (possibly) entering market B at $t = 2$ corresponds to

$$W(\tau^B; F, f) = W_a(\tau^B; F) + W_b(\tau^B; f),$$

where $W_a(\tau^B; F)$ is defined analogously to $W_b(\tau^B; f)$ in (A.B.5). Function $W(\tau^B; F, f)$ represents the value of exporting to market B after learning its profitability in foreign markets by entering market A first. The first term, $W_a(\tau^B; F)$, represents the (ex ante) expected gross profit from entering market B at $t = 2$ with product a, net of the fixed cost from entering B times the probability that entry with product a in that market is profitable. The second term, $W_b(\tau^B; f)$, captures the (ex ante) expected net profit from entering market B at $t = 2$ expanding the firm's scope to the product b.

(vi) *Aa, or Sequential product-market entry* ($e_{a1}^A = 1, e_{b1}^A = 0; e_{a1}^B = 0, e_{b1}^B = 0$). When the firm exports product a to country A in $t = 1$, at $t = 2$ it will have inferred its export profitability μ. Thus, q_{a2}^A is again given by (A.B.2): $\widetilde{q}_{a2}^A(\tau^A) = \widehat{q}_{a2}^A(\tau^A) = \mathbf{1}_{\{\mu > \tau^A\}} \left(\frac{\mu - \tau^A}{2}\right)$, generating second-period profit $V_a(\tau^A)$.

At $t = 2$, the firm then chooses whether to introduce product b in market A and whether to enter market B with product a, b or both. The former corresponds to the option to expand product scope in a market, and was defined under case (ii), now applied to market A instead, $W_b(\tau^A; f)$. The latter corresponds to the option of sequential market entry, examined under case (v), $W(\tau^B; F, f) = W_a(\tau^B; F) + W_b(\tau^B; f)$. Therefore, expressed in $t = 0$ expected terms, the firm's profit from (possibly) introducing product b in market A or entering market B with product a and/or b at $t = 2$ corresponds to

$$W(\tau^A, \tau^B; F, f) = W_b(\tau^A; f) + W_a(\tau^B; F) + W_b(\tau^B; f).$$

Function $W(\tau^A, \tau^B; F, f)$ represents the value of the option of sequentially exporting product b to market A as well as the value of the options to sequentially enter market B with either one or both products, after learning product a's profitability by entering market A first.

B.3.3 Period $t = 1$

(i) *No entry.* The firm does not export, earning zero profit.

(ii) *Aab Bab or Simultaneous product-market entry* ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 1$). A firm exporting to both destinations at $t = 1$ chooses q^A_{v1} and q^B_{v1} to maximize gross profits:

$$\Psi^{(\text{ii})}(q^A_{a1}, q^A_{b1}, q^B_{a1}, q^B_{b1}; \tau^A, \tau^B) \equiv \sum_{j=A,B} \sum_{v=a,b} \int_{\underline{\mu}}^{\overline{\mu}} (\mu - c\mathbf{1}_{\{v=b\}} - \tau^j - q^j_{v1}) q^j_{v1} dG(\mu) + \\ + \mathbf{1}_{\{q^A_{a1}>0\}} \left[\sum_{j=A,B} \sum_{v=a,b} V_v(\tau^j) \right], \quad \text{(A.B.12)}$$

where superscript (ii) stands for "Simultaneous product-market entry." The first term corresponds to the firm's period 1 per-destination $j = A, B$ operational profits for products $v = a, b$, expressed in terms of the profitability of product a. The second term denotes how much the firm expects to earn in period 2, depending on whether the firm sold a positive amount of any product in any possible destination in period 1, uncovering its export profitability (recall that for simplicity we set the rate of time discount to zero). Since exporting to one market reveals information about the firm's export profitability in both markets and products, it is enough to have exported a positive amount of a product v in period 1 to either destination, suggesting that a $\max\left\{\mathbf{1}_{\{q^A_{a1}>0\}}, \mathbf{1}_{\{q^A_{b1}>0\}}, \mathbf{1}_{\{q^B_{a1}>0\}}, \mathbf{1}_{\{q^B_{b1}>0\}}\right\}$ term would be more appropriate, as in Albornoz et al. (2012). But because product a ('core') is sufficiently more profitable ($c > 2(F^{1/2} - f^{1/2}) > 0$) and entering destination A is less expensive ($\tau^A \leq \tau^B$), the firm will always optimally sell it there, and we can safely set $\max\left\{\mathbf{1}_{\{q^A_{a1}>0\}}, \mathbf{1}_{\{q^A_{b1}>0\}}, \mathbf{1}_{\{q^B_{a1}>0\}}, \mathbf{1}_{\{q^B_{b1}>0\}}\right\} = \mathbf{1}_{\{q^A_{a1}>0\}}$, here and below.

Maximization of (A.B.12) yields outputs

$$\widehat{q}^A_{v1}(\tau^A) = \mathbf{1}_{\{E\mu>\tau^A+c\mathbf{1}_{\{v=b\}}\}} \left(\frac{E\mu - c\mathbf{1}_{\{v=b\}} - \tau^A}{2} \right) + \mathbf{1}_{\{v=a\}} \mathbf{1}_{\{E\mu\leq\tau^A+c\mathbf{1}_{\{v=b\}}\}} \varepsilon, \quad \text{(A.B.13)}$$

$$\widehat{q}^B_{v1}(\tau^B) = \mathbf{1}_{\{E\mu>\tau^B+c\mathbf{1}_{\{v=b\}}\}} \left(\frac{E\mu - c\mathbf{1}_{\{v=b\}} - \tau^B}{2} \right), \quad \text{(A.B.14)}$$

where $\varepsilon > 0$ is an arbitrarily small number. To understand these expressions, notice that there are five possibilities that depend on parameter values. If $E\mu > \tau^B + c$, $q^j_{v1} = \frac{E\mu - c\mathbf{1}_{\{v=b\}} - \tau^j}{2}$ for $j = A, B$ and $v = a, b$ is clearly optimal. If $\tau^B + c \geq E\mu > \tau^B$, $q^j_{a1} = \frac{E\mu - \tau^j}{2}$ for $j = A, B$ and $q^A_{b1} = \frac{E\mu - c - \tau^A}{2}$, $q^B_{b1} = 0$ are the best choices. Depending on $c \gtreqless \tau^B - \tau^A$ we have two [mutually exclusive] possibilities: (1) if $c \leq \tau^B - \tau^A$ then $\tau^B \geq E\mu > \tau^A + c$ and $q^A_{v1} = \frac{E\mu - c\mathbf{1}_{\{v=b\}} - \tau^A}{2}$, $q^B_{v1} = 0$ for $v = a, b$ is the best choice. (2) If $c > \tau^B - \tau^A$ then $\tau^A + c \geq E\mu > \tau^B$ and $q^j_{a1} = \frac{E\mu - \tau^j}{2}$, $q^j_{b1} = 0$ for $j = A, B$ is the best choice.[47] When $\tau^A + c \geq E\mu > \tau^A$, setting $q^A_{a1} = \frac{E\mu - \tau^A}{2}$, $q^A_{b1} = 0$ and $q^B_{v1} = 0$ for $v = a, b$ is optimal. Finally, if $E\mu \leq \tau^A$, setting $q^A_{v1} = q^B_{v1} = 0$ for $v = a, b$ may appear optimal. However, inspection of (A.B.12) makes clear that a small but strictly positive $q^A_{a1} = \varepsilon > 0$ dominates that option, since $\lim_{\varepsilon \to 0} \Psi^{(\text{ii})}(\varepsilon, 0, 0, 0; \tau^A, \tau^B) = \sum_{j=A,B} \sum_{v=a,b} V_v(\tau^j) > 0$. Clearly, setting $q^A_{v1} = q^B_{v1} = 0$ for $v = a, b$ forgoes the benefit from uncovering a valuable signal of the firm's export profitability.

Define[48]

$$\Psi_v(\tau^j) \equiv \mathbf{1}_{\{E\mu > \tau^j + c\mathbf{1}_{\{v=b\}}\}} \left(\frac{E\mu - c\mathbf{1}_{\{v=b\}} - \tau^j}{2} \right)^2 + V_v(\tau^j).$$

Evaluating (A.B.12) at the optimal output choices (A.B.13), (A.B.14) and (A.B.2), we obtain the firm's expected gross profit from simultaneous product-market entry:

$$\Psi^{(\text{ii})}(\tau^A, \tau^B) \equiv \lim_{\varepsilon \to 0^+} \Psi^{(\text{ii})}(\widehat{q}^A_{a1}(\tau^A), \widehat{q}^A_{b1}(\tau^A), \widehat{q}^B_{a1}(\tau^B), \widehat{q}^B_{b1}(\tau^B); \tau^A, \tau^B) = \sum_{j=A,B} \sum_{v=a,b} \Psi_v(\tau^j). \tag{A.B.15}$$

(iii) *Aab Ba or Partially sequential product-market entry:* $(e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 0)$. At $t = 1$, a firm that enters market A with both products and market B with only product a chooses q^A_{a1}, q^A_{b1} and q^B_{a1} to maximize

$$\begin{aligned}\Psi^{(\text{iii})}(q^A_{a1}, q^A_{b1}, q^B_{a1}, 0; \tau^A, \tau^B) \equiv & \sum_{v=a,b} \int_{\underline{\mu}}^{\overline{\mu}} (\mu - c\mathbf{1}_{\{v=b\}} - \tau^A - q^A_{v1}) q^A_{v1} dG(\mu) + \\ & + \int_{\underline{\mu}}^{\overline{\mu}} (\mu - \tau^B - q^B_{a1}) q^B_{a1} dG(\mu) + \\ & + \mathbf{1}_{\{q^A_{a1} > 0\}} \left[\sum_{v=a,b} V_v(\tau^A) + V_a(\tau^B) + W_b(\tau^B; f) \right],\end{aligned} \tag{A.B.16}$$

where superscript (iii) stands for entry with strategy (iii). The first two terms correspond to the firm's period 1 per-destination $j = A, B$ operational profits for products $v = a, b$ -expressed in terms of the profitability of product a. The third term denotes how much the firm expects to earn

[47] To allow for simultaneous product entry into one destination, we assume that the per unit cost to expand the product scope is smaller than the difference in per unit trade costs, i.e., that the unit cost difference between both products c is not bigger than the difference in tariffs across destinations, $c \leq \tau^B - \tau^A$. In the opposite case, $c > \tau^B - \tau^A$, the exporter does not consider entry into destination A with products a and b at $t = 1$.

[48] Notice that it is possible for a firm that expects $E\mu > \tau^A$ to uncover a realization of its profitability $\mu < \tau^A$, 'discovering' that selling to destination A is not profitable, i.e., $\widehat{q}^A_{a1} = \frac{E\mu - \tau^A}{2} > 0$ is ex-ante optimal because expected gross profits, $\underset{q^A_{a1}}{max} E[(\mu - \tau^A - q^A_{a1}) q^A_{a1}]$, are positive, $(\frac{E\mu - \tau^A}{2})^2 > 0$; yet, ex-post realized gross profits are negative, $(\mu - \tau^A - \frac{E\mu - \tau^A}{2})(\frac{E\mu - \tau^A}{2}) < 0$. This is a consequence of the condition according to which the firm cannot uncover its profitability without actually engaging into producing and selling to a destination.

in period 2, depending on having sold a positive amount in period 1. A strictly positive quantity $q_{a1}^A > 0$ allows the firm to make a more informed entry decision in market B with product b at $t = 2$, according to (A.B.4). Clearly, the solution to this program is $\widetilde{q}_{v1}^A(\tau^A) = \widehat{q}_{v1}^A(\tau^A)$ for $v = a, b$, as in (A.B.13), and $\widetilde{q}_{a1}^B(\tau^B) = \widehat{q}_{a1}^B(\tau^B)$ as in (A.B.14). Evaluating (A.B.16) at these optimal output choices, we obtain the firm's expected profit from "Partially sequential product-market entry":

$$\begin{aligned}\Psi^{(\text{iii})}(\tau^A, \tau^B) &\equiv \lim_{\varepsilon \to 0^+} \Psi^{(\text{iii})}(\widetilde{q}_{a1}^A(\tau^A), \widetilde{q}_{b1}^A(\tau^A), \widetilde{q}_{a1}^B(\tau^B), 0; \tau^A, \tau^B) \\ &= \sum_{v=a,b} \Psi_v(\tau^A) + \Psi_a(\tau^A) + W_b(\tau^B; f). \end{aligned} \quad \text{(A.B.17)}$$

(iv) *Aa Ba or Sequential product entry*$(e_{a1}^A = 1, e_{b1}^A = 0; e_{a1}^B = 1, e_{b1}^B = 0)$. At $t = 1$, a firm that simultaneously enters both markets with product a chooses q_{a1}^A and q_{a1}^B to maximize

$$\begin{aligned}\Psi^{(\text{iv})}(q_{a1}^A, 0, q_{a1}^B, 0; \tau^A, \tau^B) \equiv \sum_{j=A,B} \int_{\underline{\mu}}^{\overline{\mu}} (\mu - \tau^j - q_{a1}^j) q_{a1}^j dG(\mu) + \\ + \mathbf{1}_{\{q_{a1}^A > 0\}} \sum_{j=A,B} [V_a(\tau^j) + W_b(\tau^j; f)], \end{aligned} \quad \text{(A.B.18)}$$

where (iv) stands for the "Sequential product entry" strategy. The first term corresponds to the firm's period 1 per-destination $j = A, B$ operational profits for products a, and the second denotes how much the firm expects to earn in period 2 from sequentially expanding the product scope to either or both markets, conditional on having sold a positive amount in period 1, i.e., $q_{a1}^A > 0$. A strictly positive quantity of product a in both markets allows the firm to make a more informed entry decision with product b at $t = 2$, according to (A.B.7). The solution to this program is $\widetilde{q}_{a1}^j(\tau^j) = \widehat{q}_{a1}^j(\tau^j)$ for $j = A, B$, as in (A.B.13) and (A.B.14). Evaluating (A.B.18) at these optimal output choices, we obtain the firm's expected profit from "Sequential product entry":

$$\Psi^{(\text{iv})}(\tau^A, \tau^B) \equiv \lim_{\varepsilon \to 0^+} \Psi^{(\text{iv})}(\widetilde{q}_{a1}^A(\tau^A), 0, \widetilde{q}_{a1}^B(\tau^B), 0; \tau^A, \tau^B) = \sum_{j=A,B} [\Psi_a(\tau^j) + W_b(\tau^j; f)]. \quad \text{(A.B.19)}$$

(v) *Aab or Sequential market entry* $(e_{a1}^A = 1, e_{b1}^A = 1; e_{a1}^B = 0, e_{b1}^B = 0)$. At $t = 1$, a firm that enters market A with both products a and b, chooses q_{a1}^A and q_{b1}^A to maximize

$$\begin{aligned}\Psi^{(\text{v})}(q_{a1}^A, q_{b1}^A, 0, 0; \tau^A, \tau^B) \equiv \sum_{v=a,b} \int_{\underline{\mu}}^{\overline{\mu}} (\mu - c\mathbf{1}_{\{v=b\}} - \tau^A - q_{v1}^A) q_{v1}^A dG(\mu) + \\ + \mathbf{1}_{\{q_{a1}^A > 0\}} \left[\sum_{v=a,b} V_v(\tau^A) + W_a(\tau^B; F) + W_b(\tau^B; f) \right], \end{aligned} \quad \text{(A.B.20)}$$

where superscript (v) stands for "Sequential market entry" strategy (v). The first term corresponds to the firm's period 1 per-product $v = a, b$ operational profits in market A. The second term denotes how much the firm expects to earn in period 2 from sequentially entering market B with either or both products, depending on having sold a positive amount in period 1, i.e., $q_{a1}^A > 0$. A strictly positive quantity of either product in market A allows the firm to make a more informed entry decision with either or both products at $t = 2$, according to (B.3.2). The solution to this program is $\widetilde{q}^A_{v1}(\tau^A) = \widehat{q}^A_{v1}(\tau^A)$ for $v = a, b$, as in (A.B.13). Evaluating (A.B.20) at these optimal output choices, we obtain the firm's expected profit from "Sequential market entry":

$$\Psi^{(\mathrm{v})}(\tau^A, \tau^B) \equiv \lim_{\varepsilon \to 0^+} \Psi^{(\mathrm{v})}(\widetilde{q}^A_{a1}(\tau^A), \widetilde{q}^A_{b1}(\tau^A), 0, 0; \tau^A, \tau^B)$$

$$= \sum_{v=a,b} \Psi_v(\tau^A) + W_a(\tau^B; F) + W_b(\tau^B; f). \tag{A.B.21}$$

(vi) *Aa or Sequential product-market entry* ($e^A_{a1} = 1, e^A_{b1} = 0; e^B_{a1} = 0, e^B_{b1} = 0$). At $t = 1$, a firm that enters market A with product a chooses q^A_{a1} to maximize

$$\Psi^{(\mathrm{vi})}(q^A_{a1}, 0, 0, 0; \tau^A, \tau^B) \equiv \int_{\underline{\mu}}^{\overline{\mu}} (\mu - \tau^A - q^A_{a1}) q^A_{a1} dG(\mu) +$$

$$+\mathbf{1}_{\{q^A_{a1} > 0\}} [V_a(\tau^A) + W_b(\tau^A; f) + W_a(\tau^B; F) + W_b(\tau^B; f)], \tag{A.B.22}$$

where (vi) stands for "Sequential product-market entry" strategy (vi). The first term corresponds to the firm's period 1 operational profits in market A with product a. The second denotes how much the firm expects to earn in period 2 from sequentially entering market A with product b, $W_b(\tau^A; f)$, and/or market B with product a, $W_a(\tau^B; F, f)$, or b, $W_b(\tau^B; F, f)$, but only iff $q^A_{a1} > 0$, i.e., a strictly positive quantity of product a in destination A allows the firm to make a more informed entry decision with either or both products at $t = 2$. The solution to this program is $\widetilde{q}^A_{a1}(\tau^A) = \widehat{q}^A_{a1}(\tau^A)$, as in (A.B.13). Evaluating (A.B.22) at this optimal output choice, we obtain the firm's expected profit from "Sequential product-market entry":

$$\Psi^{(\mathrm{vi})}(\tau^A, \tau^B) \equiv \lim_{\varepsilon \to 0^+} \Psi^{(\mathrm{vi})}(\widetilde{q}^A_{a1}(\tau^A), 0, 0, 0; \tau^A, \tau^B) =$$

$$= \Psi_a(\tau^A) + W_b(\tau^A; f) + W_a(\tau^B; F) + W_b(\tau^B; f). \tag{A.B.23}$$

Just as in Albornoz et al. (2012), we have that some firms will "test" foreign markets before fully exploring them, or exiting them altogether. Experimentation arises even when the variable trade cost is large enough to render period-1 expected operational profits negative in all markets, and despite the existence of sunk costs to export. Intuitively, the firm can choose to incur the sunk cost and a small initial operational loss because it *may* be competitive with one or several products in that foreign market as well as in others. The return from the initial sale allows the firm to find out whether it actually is.

B.3.4 Entry strategy

We can now fully characterize the firm's optimal choice of entry. We have six undominated entry strategies. The net profit of each strategy depends on the fixed costs to enter a new destination, F, and to expand the product scope within a destination, f, corresponding to cases (i) to (vi) above:

(i) The firm does not enter any export market with any product at $t = 1$ ($e^A_{a1} = 0, e^A_{b1} = 0; e^B_{a1} = 0, e^B_{b1} = 0$), making zero net profits, $\Pi^{(\mathrm{i})}_{(0,0,0,0)} = 0$.

(ii) Using (A.B.15), the firm's net profit from Simultaneous product-market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 1$), $\Pi^{(\mathrm{ii})}_{(1,1,1,1)}$, is

$$\Pi^{(\mathrm{ii})}_{(1,1,1,1)} = \Psi_a(\tau^A) + \Psi_a(\tau^B) + \Psi_b(\tau^A) + \Psi_b(\tau^B) - 2F - 2f. \tag{A.B.24}$$

(iii) In turn, we have from (A.B.17) that the firm's net profit from Partially sequential product-market entry, ($e_{a1}^A = 1, e_{b1}^A = 1; e_{a1}^B = 1, e_{b1}^B = 0$), $\Pi_{(1,1,1,0)}^{(\text{iii})}$, is

$$\Pi_{(1,1,1,0)}^{(\text{iii})} = \Psi_a(\tau^A) + \Psi_a(\tau^B) + \Psi_b(\tau^A) + W_b(\tau^B; f) - 2F - f. \tag{A.B.25}$$

(iv) The net profit of Sequential product entry ($e_{a1}^A = 1, e_{b1}^A = 0; e_{a1}^B = 1, e_{b1}^B = 0$) from (A.B.19) is equal to

$$\Pi_{(1,0,1,0)}^{(\text{iv})} = \Psi_a(\tau^A) + \Psi_a(\tau^B) + W_b(\tau^A; f) + W_b(\tau^B; f) - 2F. \tag{A.B.26}$$

(v) The net profit of Sequential market entry ($e_{a1}^A = 1, e_{b1}^A = 1; e_{a1}^B = 0, e_{b1}^B = 0$) from (A.B.21) equals

$$\Pi_{(1,1,0,0)}^{(\text{v})} = \Psi_a(\tau^A) + \Psi_b(\tau^A) + W_a(\tau^B; F) + W_b(\tau^B; f) - F - f. \tag{A.B.27}$$

(vi) And finally, the net profit of Sequential product-market entry ($e_{a1}^A = 1, e_{b1}^A = 0; e_{a1}^B = 0, e_{b1}^B = 0$) from (A.B.23) is given by

$$\Pi_{(1,0,0,0)}^{(\text{vi})} = \Psi_a(\tau^A) + W_b(\tau^A; f) + W_a(\tau^B; F) + W_b(\tau^B; f) - F. \tag{A.B.28}$$

Net profits decrease monotonically with the magnitudes of both one-time fixed costs f and F,[49] and that helps to characterize the optimal entry strategies. It is useful to define four fixed cost thresholds: f^{Mu} and f^{Mo}, where superscript Mu denotes 'multiproduct' while Mo denotes 'monoproduct'; and F^{Sm} and F^{Sq}, with superscript Sm meaning 'simultaneous' and Sq 'sequential.' Those thresholds partition the domain of the entry decisions in nine different regions within which only one of each of the six entry strategies is optimal, as conveyed in Figure B.1 and summarized in Proposition 1.

Figure B.1 illustrates the role of the magnitude of the fixed costs F to enter a destination $j = A, B$ (on the horizontal axis) and to expand the product scope f (on the vertical axis) in determining the optimal entry strategy of a representative multi-/mono- product firm i. Thus, the vertical axis captures the product dimension, while the horizontal one deals with the country dimension in exporters' expansion patterns. Depending on the relative sizes of the fixed costs, a given firm i will consider different optimal entry strategies involving both dimensions of expansion.

Let us start by assuming that firm i is a monoproducer, because the fixed cost to adapt or expand the product scope is prohibitive. This corresponds to the whole upper region of Figure B.1, $f > f^{Mo}(\tau^A)$. There, the only relevant dimension is the country of destination (i.e., the horizontal one), and depending on the relative size of the fixed entry cost F, the firm will enter both destinations $j = A, B$ from the start (low F, or $F \leq F^{Sm}(\tau^B)$), only destination $j = A$ (intermediate F, or $F^{Sm}(\tau^B) < F \leq F^{Sq}(\tau^A, \tau^B; f)$), or not export at all (prohibitive F, or $F > F^{Sq}(\tau^A, \tau^B; f)$). This captures Albornoz et al. (2012)'s 'sequential exporting' contribution, which ignores the product dimension. As the fixed cost to expand the product scope f ceases to be prohibitive, multi-product firm i considers the product dimension of expansion, too.

Starting with low fixed costs to enter destination $j = A, B$ but moderate fixed costs f to expand the product scope $v = a, b$ (middle left region of Figure B.1: $F \leq F^{Sm}(\tau^B)$ and $f^{Mu}(\tau^B) < f \leq f^{Mo}(\tau^A)$) multiproduct firm i finds it optimal to enter at $t = 1$ with both products in destination A but only with its core product a in destination B. As the destination entry cost increases (middle region of Figure B.1: $F^{Sm}(\tau^B) < F \leq F^{Sq}(\tau^A, \tau^B; f)$ and $f^{Mu}(\tau^B) < f \leq f^{Mo}(\tau^A)$), multiproduct

[49]The net profits associated with each of the strategies (i)-(vi) decrease with f and F both directly and indirectly, through the net profits of sequentially expanding the product scope and of sequential entry, $W_b(\tau^j; f)$ and $W_a(\tau^B; F)$, respectively: $\frac{\partial}{\partial f} W_b(\tau^j; f) = -1 + G(2f^{1/2} + \tau^j + c) < 0$, $j = A, B$; and $\frac{\partial}{\partial F} W_a(\tau^B; F) = -1 + G(2F^{1/2} + \tau^B) < 0$.

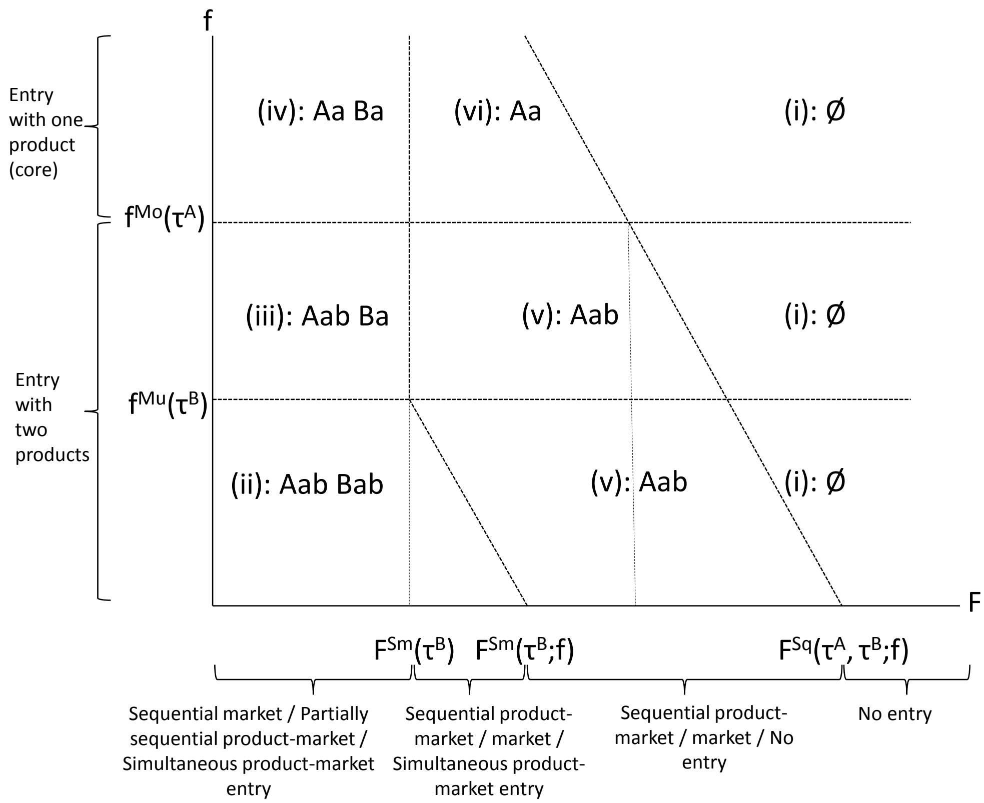


Figure B.1: Optimal entry strategies, depending on the fixed product scope and market entry costs, f and F.

firm i ceases to find it optimal to enter B with its core product a, only entering destination A with both products at $t = 1$. Further increases in the destination fixed entry cost (middle right region of Figure B.1: $F > F^{Sq}(\tau^A, \tau^B; f)$ and $f^{Mu}(\tau^B) < f \leq f^{Mo}(\tau^A)$) result in no entry being optimal for firm i in period 1. Moving now to low fixed costs to expand the product scope and to enter foreign destinations, (lower left region of Figure B.1, $F^{Sm}(\tau^B; f) \leq F$ and $f \leq f^{Mu}(\tau^B)$), multiproduct firm i finds it optimal to enter in period 1 into both destinations with both products (i.e., 'global multiproduct firms'). But as the fixed cost to enter new destinations increases (lower center region of Figure B.1, $F^{Sm}(\tau^B; f) < F \leq F^{Sq}(\tau^A, \tau^B; f)$ and $f \leq f^{Mu}(\tau^B)$), multiproduct firm i optimally chooses to only enter destination A with both products at $t = 1$. Finally, for even higher values of the destination fixed entry cost (lower right region of Figure B.1, $F > F^{Sq}(\tau^A, \tau^B; f)$ and $f \leq f^{Mu}(\tau^B)$), multiproduct firm i optimally chooses not to sell abroad. Figure B.1 thus shows that, in the presence of uncertainty about product profitability that is correlated across destinations and products, heterogeneous firms that must incur fixed costs to unveil it expand sequentially along the destination-country and product scope dimensions. Proposition 1 fully characterizes the firm's export decision.

Proposition 1 *(i) There are values F^{Sq} and F^{Sm}, with $F^{Sq} > F^{Sm} \geq 0$, such that at $t = 1$ the firm enters both markets A and B if $F < F^{Sm}$, enters only market A if $F \in [F^{Sm}, F^{Sq}]$, and enters neither market if $F > F^{Sq}$. Moreover, $F^{Sm} > 0$ iff $E\mu > \tau^B$. When $F \in [F^{Sm}, F^{Sq}]$, at $t = 2$ the firm enters market B if it learns that condition (B.3.2) is satisfied. (ii) There are values f^{Mu} and f^{Mo}, with $f^{Mo} > f^{Mu} \geq 0$, such that at $t = 1$ the firm enters in both markets A and B with both products a and b if $f < f^{Mu}$, enters both markets with product a and market A with product b if $f \in [f^{Mu}, f^{Mo}]$, and enters with only product a in either market A or in both markets if $f > f^{Mo}$. Moreover, $f^{Mu} > 0$ iff $E\mu > \tau^B + c$. When $f \in [f^{Mu}, f^{Mo}]$, at $t = 2$ the firm enters market B with product b if it learns that condition (A.B.4) is satisfied. Since trade costs τ^A and τ^B differently affect the four thresholds, and market entry thresholds depend on the fixed cost to expand product scope within them, we can denote the thresholds as $f^{Mo}(\tau^A)$, $f^{Mu}(\tau^B)$, $F^{Sm}(\tau^B; f)$ and $F^{Sq}(\tau^A, \tau^B; f)$.*

Proof. See OA section B.3.6 below. ■

The intuition for these results is simple. Along the market destination dimension, by construction $\tau^A \leq \tau^B$. So, if the firm ever enters any foreign market, it will enter market A. Since there are gains from resolving the uncertainty about export profitability, entry in market A, if it happens, will take place in the first period. Provided that the firm enters country A, it can also enter country B in the first period or wait to learn its export profitability before going to market B. If the firm enters market B at $t = 1$, it earns the expected operational profit in that market in the first period. Naturally, this can be optimal only when the firm expects its operational profit in B to be positive ($E\mu > \tau^B$). By postponing entry the firm forgoes that profit but saves the sunk entry cost if it realizes that its export profitability is not sufficiently high. The size of the sunk cost has no bearing on the former, but increases the latter. Hence, the higher the sunk cost to export, the more beneficial is waiting before sinking F in the less profitable market, B. And similarly along the product dimension: since by construction the core product is more profitable than the non-core one, the firm has the option to postpone expanding the product scope until $t = 2$ at the cost of foregoing $t = 1$ expected profits in the non-core product, but saving the certainty of sinking f until profitability is known to be worth it. Finally, because export profitability is correlated across products and destinations, there is a tension between the cost of expanding the product scope within destinations and the cost of entering new destinations. The optimal entry and expansion path of firm i then depends on the relative sizes of the sunk costs, f and F, which are firm-specific. This is made clear by Figure B.1, which indicates that the former pattern is optimal when market entry sunk costs are high relative to the sunk cost to expand the product scope, i.e., strategy (v). Conversely, when market entry sunk costs are low relative to the cost to expand the product scope within a destination, firms tend to expand geographically first, optimally adopting strategy (iv).

To characterize the optimal entry strategy more precisely, suppose $f = \gamma F$, $\gamma \in (0,1)$. We can then write sunk costs thresholds f^{Mo} and f^{Mu} in terms of the sunk entry cost F, F^{Mo} and F^{Mu}, and visualize the net profit functions on a two-dimensional graph without loss of generality.[50] Proposition 2 derives those thresholds. It shows that there is a unique value of γ for which the net profit of expanding product scope within a destination—strategy (iv)—is equal to the net profit of expanding geographically with the core product—strategy (v).

Proposition 2 *When $f = \gamma F, \gamma \in (0,1)$, the sunk costs to expand product scope f^{Mo} and f^{Mu} can be uniquely expressed in terms of the sunk entry cost F by*

$$f^{Mu}(\tau^B) \equiv \quad \gamma F^{Mu}(\tau^B) : \Psi_b(\tau^B) = W_b(\tau^B; \gamma F^{Mu}(\tau^B)) + \gamma F^{Mu}(\tau^B), \forall \gamma \in (0,1), \tag{A.B.29}$$

$$f^{Mo}(\tau^A) \equiv \quad \gamma F^{Mo}(\tau^A) : \Psi_b(\tau^A) = W_b(\tau^A; \gamma F^{Mo}(\tau^A)) + \gamma F^{Mo}(\tau^A), \forall \gamma \in (0,1). \tag{A.B.30}$$

Furthermore, there is a unique value of γ, denoted γ', equating the net profits of the entry strategies (iv) and (v) such that:

1. For high enough sunk costs to expand product scope, $\gamma > \gamma'$, expanding first product scope within a destination—strategy (iv)—is never optimal;

2. For low enough sunk costs to expand product scope, $\gamma < \gamma'$, expanding geographically across markets with the core product only—strategy (v)—is never optimal.

Proof. When $f = \gamma F, \gamma \in (0,1)$, the net profit functions (A.B.24) and (A.B.25) defining f^{Mu} are:

$$\Pi^{(ii)}_{(1,1,1,1)} = \Psi_a(\tau^A) + \Psi_a(\tau^B) + \Psi_b(\tau^A) + \Psi_b(\tau^B) - 2(1+\gamma)F. \tag{A.B.31}$$

$$\Pi^{(iii)}_{(1,1,1,0)} = \Psi_a(\tau^A) + \Psi_a(\tau^B) + \Psi_b(\tau^A) + W_b(\tau^B; \gamma F) - (2+\gamma)F. \tag{A.B.32}$$

And therefore, condition (A.B.29) obtains from equating the net profits of stategies (ii) and (iii) in:

$$\Pi^{(ii)}_{(1,1,1,1)} = \Pi^{(iii)}_{(1,1,1,0)} + \Psi_b(\tau^B) - W_b(\tau^B; \gamma F) - \gamma F.$$

Proceeding similarly for f^{Mo}, noting that the net profit function (A.B.26) is now given by:

$$\Pi^{(iv)}_{(1,0,1,0)} = \Psi_a(\tau^A) + \Psi_a(\tau^B) + W_b(\tau^A; \gamma F) + W_b(\tau^B; \gamma F) - 2F, \tag{A.B.33}$$

condition (A.B.30) obtains from equating the net profits of stategies (iv) and (iii) in:

$$\Pi^{(iv)}_{(1,0,1,0)} = \Pi^{(iii)}_{(1,1,1,0)} - \Psi_b(\tau^A) + W_b(\tau^A; \gamma F) + \gamma F.$$

Finally, to see that there is a unique value of γ that equates the net profits of strategies (iv) and (v), where

$$\Pi^{(v)}_{(1,1,0,0)} = \Psi_a(\tau^A) + \Psi_b(\tau^A) + W_a(\tau^B; F) + W_b(\tau^B; \gamma F) - F - \gamma F, \tag{A.B.34}$$

[50] It is without loss of generality as long as the assumption that the sunk cost to expand the product scope is smaller than the sunk entry cost to enter a new destination, $f < F$, holds.

notice from

$$\Pi^{(iv)}_{(1,0,1,0)} = \Pi^{(v)}_{(1,1,0,0)} + \Psi_a(\tau^B) - W_a(\tau^B; F) - F - \Psi_b(\tau^A) + W_b(\tau^A; \gamma F) + \gamma F$$

that equating (A.B.33) and (A.B.34) is equivalent to

$$\Psi_a(\tau^B) - W_a(\tau^B; F) - F = \Psi_b(\tau^A) - W_b(\tau^A; \gamma F) - \gamma F,$$

where the left-hand side of the equality is independent of γ whilst the right-hand side is decreasing in γ. It therefore follows that there is a unique $\gamma' \in (0, 1)$ where the equality holds for all values of the fixed entry cost F. Recalling from Proposition 1 that the left-hand side of the above equality takes value zero when $F = F^{Sm}(\tau^B)$ according to expression A.B.42), whilst the right-hand side takes value zero when $F = \gamma F^{Mo}(\tau^A)$ according to expression (A.B.30), we can further establish that:

$$\begin{aligned} F^{Sm}(\tau^B) = \gamma F^{Mo}(\tau^A) &\iff \gamma = \gamma' \\ F^{Sm}(\tau^B) > \gamma F^{Mo}(\tau^A) &\iff \gamma > \gamma' \\ F^{Sm}(\tau^B) < \gamma F^{Mo}(\tau^A) &\iff \gamma < \gamma'. \end{aligned}$$

This completes the proof. ■

The intuition behind Proposition 2 is simple: for low values of the sunk cost to expand the product scope ($\gamma < \gamma'$, denoted $\underline{\gamma}$), it is optimal for a firm that enters a new destination (say A) with its core product a to expand the product scope there conditional on surviving, before entering a new destination (say B)—strategy (v). In Figure B.1, γ' corresponds to the slope of a ray going from the origin to point $(f^{Mo}(\tau^A), F^{Sm}(\tau^B)$. Optimal strategies when $\gamma < \gamma'$ are shown in Figure B.2.

Similarly, for high values of the sunk cost to expand the product scope ($\gamma > \gamma'$, denoted $\overline{\gamma}$), it is optimal for a firm that enters a new destination (say A) with its core product a and survives there, to first enter another destination (say B) with the same product (a) rather than expanding the product scope in destination A—strategy (iv). This second case is illustrated in Figure B.3.[51]

B.3.5 Testable Predictions

Our model predicts, first, that conditional on survival the growth of a firm's exports is on average highest in the firm's core product, early in its first foreign market.

Prediction 1 (Prediction 1) *Conditional on survival, the growth rate of exports of a firm is on average higher between the first and second years for its first-ever export spell than for its other export spells.*

[51] Notice from Figure B.1 that, for a given firm, depending on parameter values for c and f, either "Sequential market entry"–strategy (v)—or "Sequential product entry"–strategy (iv)—is dominant: both strategies never co-exist. When the unit cost of the non-core product, $c > \tau^B - \tau^A$, and the sunk cost to expand product scope in market A, $F - f \leq \left(\frac{E\mu - \tau^B}{2}\right)^2 - \left(\frac{E\mu - c - \tau^A}{2}\right)^2$, are sufficiently high, the "Sequential market entry" strategy (v) is dominated by strategy (iv), "Sequential product entry." In all other cases, "Sequential market entry" dominates, i.e., whenever $c \leq \tau^B - \tau^A$ or $c > \tau^B - \tau^A$ but the sunk cost to expand product scope is sufficiently low relative to the sunk cost of entering market B, $F - f > \left(\frac{E\mu - \tau^B}{2}\right)^2 - \left(\frac{E\mu - c - \tau^A}{2}\right)^2$. In terms of ex-ante profitability $E\mu$, the firm adopts a "Sequential market entry" over a "Sequential product entry" if $E\mu \geq \frac{2(F-f)}{c+\tau^A-\tau^B} + \frac{c+\tau^A+\tau^B}{2}$. Otherwise, the firm prefers to adopt a "Sequential product entry" strategy.

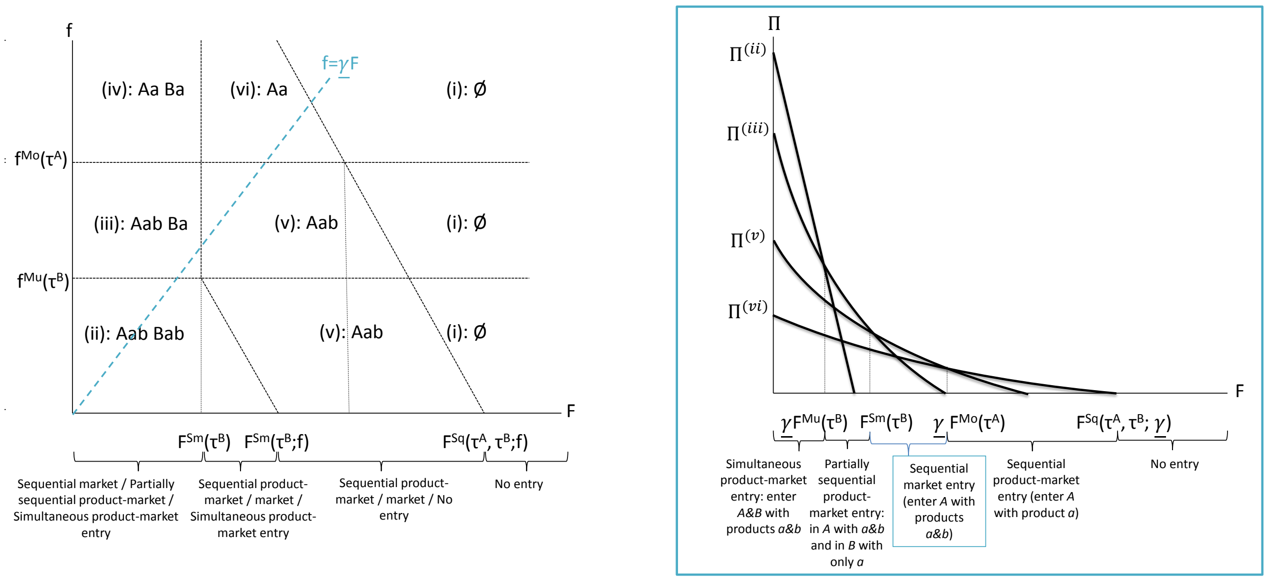


Figure B.2: Optimal entry strategies (left panel) and net profits from optimal entry strategies at $t = 1$ (right panel) when $f = \underline{\gamma}F$.

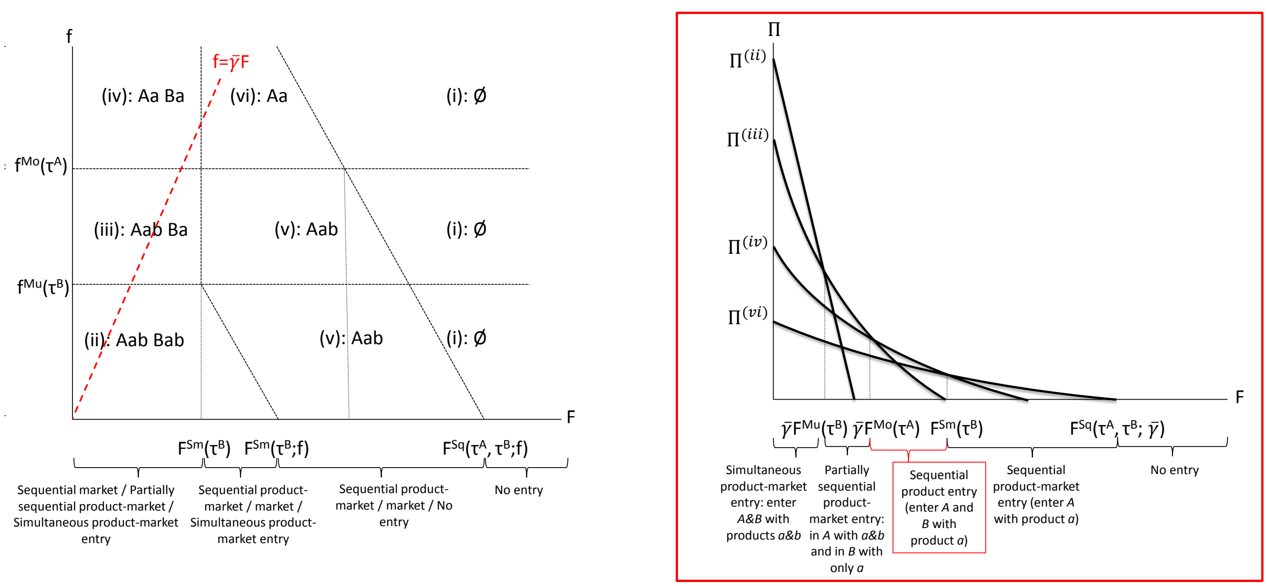


Figure B.3: Optimal entry strategies (left panel) and net profits from optimal entry strategies at $t = 1$ (right panel) when $f = \overline{\gamma}F$.

Proof. Consider the first market, A, for the core product a. Conditional on entry, export volume at $t=1$ is given by $q_{a1}^A = \mathbf{1}_{\{E\mu>\tau^A\}}\frac{E\mu-\tau^A}{2} + \mathbf{1}_{\{E\mu\leq\tau^A\}}\varepsilon$. At $t=2$, the firm decides to stay active there if $\mu > \tau^A$, and in that case produces $q_{a2}^A = \frac{\mu-\tau^A}{2}$. Ex post quantities conditional on survival are distributed according to $G(\cdot|\mu > \tau^A)$. It follows that the average surviving firm will produce the ex ante expected quantity $E(q_{a2}^A\big|\,\mu > \tau^A) = \frac{\int_{\tau^A}^{\overline{\mu}}\left(\frac{\mu-\tau^A}{2}\right)dG(\mu)}{1-G(\tau^A)} = \frac{E(\mu|\mu>\tau^A)-\tau^A}{2} > 0$. There are two cases. If $E\mu \leq \tau^A$, export growth from first to second year is $\sigma_a^A \equiv \frac{E(\mu|\mu>\tau^A)-\tau^A}{2} - \varepsilon > 0$. Otherwise, $\sigma_a^A = \frac{E(\mu|\mu>\tau^A)-\tau^A}{2} - \frac{E\mu-\tau^A}{2} = \frac{1}{2}[E(\mu|\,\mu > \tau^A) - E\mu]$. We now show that σ_a^A is strictly positive in this second case:

$$
\begin{aligned}
E(\mu|\,\mu > \tau^A) &= \int_{\tau^A}^{\overline{\mu}} \mu dG(\mu|\,\mu > \tau^A) \\
&= \int_{\tau^A}^{\overline{\mu}} \mu \frac{dG(\mu)}{1-G(\tau^A)} \\
&= \frac{1}{1-G(\tau^A)}\left\{\overline{\mu} - \int_{\tau^A}^{\overline{\mu}} G(\mu)d\mu\right\} \\
&= \frac{1}{1-G(\tau^A)}\left\{E\mu + \int_{\underline{\mu}}^{\tau^A} G(\mu)d\mu\right\} \\
&> \left\{E\mu + \int_{\underline{\mu}}^{\tau^A} G(\mu)d\mu\right\} \\
&> E\mu,
\end{aligned}
$$

where the third equality follows from integration by parts and the fourth from rewriting $E\mu = \overline{\mu} - \int_{\underline{\mu}}^{\tau^A} G(\mu)d\mu - \int_{\tau^A}^{\overline{\mu}} G(\mu)d\mu$ as $\overline{\mu} - \int_{\tau^A}^{\overline{\mu}} G(\mu)d\mu = E\mu + \int_{\underline{\mu}}^{\tau^A} G(\mu)d\mu$. Now, if $\tau^A \in (\underline{\mu}, \overline{\mu})$, we must have that $G(\tau^A) > 0$, which is equivalent to $1 - G(\tau^A) < 1 \Leftrightarrow \frac{1}{1-G(\tau^A)} > 1$, so that the first inequality follows. Hence, conditional on survival, the firm expects to increase its export volume of product a to market A in the second period. In all subsequent periods, expected growth in market A conditional on survival is nil, since $E(q_{at}^A\big|\,\mu > \tau^A) = \frac{E(\mu|\mu>\tau^A)-\tau^A}{2}$ for all $t > 1$.

Consider now foreign market j, $j \neq A$, for product a once the firm has learnt μ in A in period $t=1$. Since the firm enters market j only if $\mu > 2F^{1/2}+\tau^j$, $E(q_{at+1}^j\Big|\,\mu > 2F^{1/2}+\tau^j) = E(q_{at}^j\Big|\,\mu > 2F^{1/2}+\tau^j) = \frac{E(\mu|\mu>2F^{1/2}+\tau^j)-\tau^j}{2}$ for all $t > 1$. Thus, export growth of product a in market $j \neq A$ is nil in all periods.

Consider now product b in market A. Conditional on entry, export volume at $t=1$ is given by $q_{b1}^A = \mathbf{1}_{\{E\mu>\tau^A+c\}}\frac{E\mu-c-\tau^A}{2}$ because the firm will never optimally experiment with its non-core product, i.e., if $E\mu \leq \tau^A$. At $t=2$, the firm decides to stay active there if $\mu > \tau^A + c$, and in that case produces $q_{b2}^A = \frac{\mu-c-\tau^A}{2}$. Ex post quantities conditional on survival are distributed according to $G(\cdot|\mu > c+\tau^A)$. It follows that the average surviving firm will produce the ex ante expected quantity $E(q_{b2}^A\big|\,\mu > \tau^A + c) = \frac{\int_{\tau^A+c}^{\overline{\mu}}\left(\frac{\mu-c-\tau^A}{2}\right)dG(\mu)}{1-G(\tau^A+c)} = \frac{E(\mu|\mu>\tau^A+c)-c-\tau^A}{2} > 0$. Therefore, export growth from first to second year is $\sigma_b^A = \frac{E(\mu|\mu>\tau^A+c)-c-\tau^A}{2} - \frac{E\mu-c-\tau^A}{2} = \frac{1}{2}[E(\mu|\,\mu > \tau^A + c) - E\mu] > 0$, since $\tau^A > 0$ and $c > 0$. Because the firm has entered with both a and b in $t=1$, both are first products, and firm export growth between its first and second year in its first-ever export spell is an export sales weighted average of both:

$$\omega_t \sigma_a^A + (1-\omega_t)\sigma_b^A > 0 : \omega_t \equiv \frac{x_{iAat}}{x_{iAat} + x_{iAbt}} \in (0,1),$$

which is larger than export growth in subsequent years in its first-ever export spell, or in subsequent export spells of the firm, where export growth is nil. To see this last point, consider foreign market j, $j \neq A$, for product b once the firm has learnt μin A in period $t = 1$. Since the firm expands its product scope only if $\mu > 2f^{1/2} + c + \tau^j$, $E(q_{bt+1}^j \Big| \mu > 2f^{1/2} + c + \tau^j) = E(q_{bt}^j \Big| \mu > 2f^{1/2} + c + \tau^j) = \frac{E(\mu|\mu > 2f^{1/2} + c + \tau^j) - c - \tau^j}{2}$ for all $t > 1$. Thus, export growth of product b in market j is also nil in all periods. ■

Second, our model predicts that the probability that firm i will exit a particular export market j with product p in period t ($Exit_{ijpt} = 1$) is higher if the firm exported for the first time in $t - 1$.

Prediction 2 *Exit rates are on average higher after a firm's first-ever export spell than after its other export spells.*

Proof. Let the probability of exiting a foreign market right after entering there with product v be $\Pr(e_{v2}^A = 0|e_{v1}^A = 1)$ if the foreign market is the firm's first, and $\Pr(e_{vt+1}^j = 0|e_{vt}^j = 1 \ \& \ e_{vt-1}^j = 1)$, $t \geq 2$, $j \neq A$, otherwise. The latter is also equal to the probability of exiting a market after being there for more than one period. The model implies that

$$\Pr(e_{v2}^A = 0|e_{v1}^A = 1) = G(\tau^A) > 0 = \Pr(e_{vt+1}^j = 0|e_{vt}^j = 1 \ \& \ e_{vt-1}^j = 1).$$

Similarly, because the firm may have optimally entered with both products in period 1, consider now the probability of dropping a non-core product $v = b$ right after entering there with it, relative to the probability of dropping a core-product $v = a$:

$$\Pr(e_{b2}^A = 0|e_{b1}^A = 1) = G(\tau^A + c) > G(\tau^A) = \Pr(e_{a2}^A = 0|e_{a1}^A = 1) > 0,$$

since $c > 0$, completing the proof. ■

Third, our model predicts that new exporters are more likely to add new products into already entered destinations, enter new foreign destinations or both.

Prediction 3 *Conditional on survival, an exporter is more likely to expand its product scope and/or its geographical presence after its first-ever export spell than after its other export spells.*

Proof. Denote the probability that a firm that has just started to export product v will enter a new foreign market j in the next period with that product by $\Pr(e_{v2}^j = 1|e_{v1}^A = 1 \ \& \ e_{v1}^j = 0)$, and the probability that a firm that has been an exporter of that same product v for a longer period will enter market j by $\Pr(e_{vt}^j = 1|\prod_{i=1}^{t-1} e_{vt-i}^A = 1 \ \& \ e_{vt-1}^j = 0)$, $t \geq 2$. The model implies that $\Pr(e_{v2}^B = 1|e_{v1}^A = 1 \ \& \ e_{v1}^j = 0) = 1 - G(2F^{1/2} + \tau^j) > 0 = \Pr(e_{vt}^j = 1|\prod_{i=1}^{t-1} e_{vt-i}^A = 1 \ \& \ e_{vt-1}^j = 0)$. Consider now the probability that a firm that has just started to export product v will expand its product scope there in the next period, $\Pr(e_{b2}^A = 1|e_{a1}^A = 1 \ \& \ e_{b1}^A = 0) = 1 - G(2f^{1/2} + c + \tau^A) > 0$. But the probability that a firm that has been an exporter of that same product a for a longer period will expand its product scope there is nil according to the model, $\Pr(e_{bt}^A = 1|\prod_{i=1}^{t-1} e_{at-i}^A = 1 \ \& \ e_{bt-1}^A = 0) = 0$, concluding the proof. ■

Finally, when there are enough firms with lower product than destination sunk costs, and per unit costs to expand the product scope smaller than the difference in per unit trade costs (i.e.,

$F \geq f$ and $c \leq \tau^B - \tau^A$), our model implies that new exporters are more likely to expand their product scopes in their first market(s) than they are to enter new destinations with their first product(s) right after surviving their first-ever product spells. [52]

Prediction 4 *If $2F^{1/2} + \tau^B \geq 2f^{1/2} + c + \tau^A$, an exporter is more likely to expand with different products in its first market(s) than it is to expand with its first product(s) in different markets, right after a successful first-ever spell.*

Proof. Denote the probability that a firm that has just survived its first-ever export spell with its first product(s) v enters with product v' (expands its product scope) in its first market(s) j by $\Pr(e^j_{v'2} = 1|e^j_{v1} = 1 \ \& \ e^j_{v'1} = 0)$, and the probability that a firm that has just survived its first-ever export spell enters new markets $j' \neq j$ with its first product(s) $v$by $\Pr(e^{j'}_{v2} = 1|e^j_{v1} = 1$ & $e^{j'}_{v1} = 0)$. The model implies that $\Pr(e^j_{v'2} = 1|e^j_{v1} = 1 \ \& \ e^j_{v'1} = 0) = \Pr(e^A_{b2} = 1|e^A_{a1} = 1$ & $e^A_{b1} = 0) + \Pr(e^B_{b2} = 1|e^A_{a1} = 1 \ \& \ e^B_{a1} = 1 \ \& \ e^j_{b1} = 0) = 1 - G(2f^{1/2} + c + \tau^A) + 1 - G(2f^{1/2} + c + \tau^B)$. To see this, notice that only firms entering with strategies (iv) (enter with product a in A and B) and (vi) (enter market A with product a) can expand in $t = 2$ their product scopes in their first market(s). Firms that have not entered (strategy (i)) have not uncovered their profitability, while firms that have entered market A with products a and b in $t = 1$ (strategies (ii), (iii) and (v)) cannot further expand their scope there. Therefore, there are only two possibilities to expand with different products in the firm's first market(s), each corresponding to one of the probabilities above: enter with product b in market$A$ at $t = 2$, $\Pr(e^A_{b2} = 1|e^A_{a1} = 1 \ \& \ e^A_{b1} = 0) = 1 - G(\mu|\mu > 2f^{1/2} + c + \tau^A)$, by condition (A.B.6), and entering with product b in market B at $t = 2$, $\Pr(e^B_{b2} = 1|e^A_{a1} = 1 \ \& \ e^B_{a1} = 1$ & $e^j_{b1} = 0) = 1 - G(\mu|\mu > 2f^{1/2} + c + \tau^B)$ by condition (A.B.8). Consider now the probability that a firm that has just started to export product v expands geographically with it in the next period, $\Pr(e^{j'}_{v2} = 1|e^j_{v1} = 1 \ \& \ e^{j'}_{v1} = 0) = \Pr(e^B_{a2} = 1|e^A_{a1} = 1 \ \& \ e^A_{b1} = 0) + \Pr(e^B_{b2} = 1|e^A_{a1} = 1 \ \& \ e^A_{b1} = 1$ & $e^B_{v1} = 0) = 1 - G(2F^{1/2} + \tau^B) + 1 - G(2f^{1/2} + c + \tau^B)$. This is because only firms entering with strategies (v) (enter with products a and b in A) and (vi) (enter market A with product a) can expand in $t = 2$ with their first product(s) in different markets. Firms that have not entered (strategy (i)) have not uncovered their profitability, while firms that have entered market B with products a and/or b in $t = 1$ (strategies (ii)-(iv)) cannot further expand geographically. Therefore, there are only two possibilities of expanding in new markets with their first product(s), each corresponding to one of the probabilities above: enter with product a in market B at $t = 2$, $\Pr(e^B_{a2} = 1|e^A_{a1} = 1$ & $e^A_{b1} = 0) = 1 - G(\mu|\mu > 2F^{1/2} + \tau^B)$, by condition (A.B.8), and entering with product b in market B at $t = 2$, $\Pr(e^B_{b2} = 1|e^A_{a1} = 1 \ \& \ e^A_{b1} = 1 \ \& \ e^B_{v1} = 0) = 1 - G(\mu|\mu > 2f^{1/2} + c + \tau^B)$ by condition (A.B.8). Then, expanding the product scope is more likely than expanding geographically right after surviving firm i's first-ever export spell if

$$1 - G(2f^{1/2} + c + \tau^A) + 1 - G(2f^{1/2} + c + \tau^B) - 1 + G(2F^{1/2} + \tau^B) - 1 + G(2f^{1/2} + c + \tau^B) > 0$$
$$G(2F^{1/2} + \tau^B) - G(2f^{1/2} + c + \tau^A) > 0$$
$$(2F^{1/2} + \tau^B) - (2f^{1/2} + c + \tau^A) \geq 0,$$

which is true because $G'(.) \geq 0$. Finally, since firms that have started to export in $t = 1$ (following strategies (i)-(vi)) fully uncover their export profitability, their probability to either expand their product scopes or enter new destinations at later periods, $t \geq 2$, is nil, concluding the proof. ■

[52] An extension of the model with higher correlation in profitability across products than across markets would also generate that prediction.

B.3.6 Proof of Proposition 1

We refer to Figure B.1 and start from the south-west corner:

(a) Starting for low fixed entry costs F and for a sufficiently small fixed cost to expand product scope f: Aab Bab or Simultaneous product-market entry is optimal if $\Pi^{(ii)}_{(1,1,1,1)} > \Pi^{(iii)}_{(1,1,1,0)}$ and $\Pi^{(ii)}_{(1,1,1,1)} \geq 0$. Conversely, Aab Ba or Partially sequential product-market entry is optimal if $\Pi^{(iii)}_{(1,1,1,0)} \geq \Pi^{(ii)}_{(1,1,1,1)}$ and $\Pi^{(iii)}_{(1,1,1,0)} \geq 0$. Using (A.B.23) and (A.B.24), we can rewrite these conditions as

$$\Pi^{(ii)}_{(1,1,1,1)} = \Pi^{(iii)}_{(1,1,1,0)} + \Psi_b(\tau^B) - W_b(\tau^B; f) - f.$$

Aab Bab or Simultaneous product-market entry is optimal if $\Psi_b(\tau^B) - W_b(\tau^B; f) - f > 0$, i.e., if the net profit to expand product scope in market B at $t = 1$ is larger than the option to wait and uncover the firm's profitability and expand product scope in $t = 2$. Rewriting the inequality as $\Psi_b(\tau^B) > W_b(\tau^B; f) + f$ and noting that the left-hand side does not depend on f while the right-hand side is increasing in f,([53]) it follows that there must be a unique fixed cost f^{Mu} that equates the net profits of the two entry strategies:

$$\Psi_b(\tau^B) = W_b(\tau^B; f^{Mu}) + f^{Mu}. \tag{A.B.35}$$

Thus, Simultaneous product-market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 1$) is optimal for a sufficiently small fixed cost to expand product scope in market B at $t = 1$ if

$$e^j_{v1}(\tau^B) = 1, \forall (j, v) \Leftrightarrow f < f^{Mu}(\tau^B), \tag{A.B.36}$$

Therefore, Partially sequential product-market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 0$) is optimal if

$$e^j_{a1}(\tau^B) = 1, j = A, B; e^A_{b1}(\tau^B) = 1 \Leftrightarrow f^{Mu}(\tau^B) \leq f \leq \Psi_a(\tau^A) + \Psi_a(\tau^B) + \Psi_b(\tau^A) + W_b(\tau^B; f) - 2F. \tag{A.B.37}$$

where the second inequality is the condition for the net profit of the Partially sequential product-market entry strategy to be non-negative, i.e., $\Pi^{(iii)}_{(1,1,1,0)} \geq 0$.

(b) For low fixed entry costs F, as the fixed cost to expand product scope f increases, we move towards the north-west corner of Figure B.1 . There, the firm compares the net profit of Aab Ba, or Partially sequential product-market entry, $\Pi^{(iii)}_{(1,1,1,0)}$, to the net profit of Aa Ba, or Sequential product entry ($e^A_{a1} = 1, e^A_{b1} = 0; e^B_{a1} = 1, e^B_{b1} = 0$), $\Pi^{(iv)}_{(1,0,1,0)}$, given by (A.B.25). Partially sequential product-market entry is then optimal if $\Pi^{(iii)}_{(1,1,1,0)} \geq \max\{\Pi^{(iv)}_{(1,0,1,0)}, 0\}$. Conversely, Sequential product entry is optimal if $\Pi^{(iv)}_{(1,0,1,0)} \geq \max\{\Pi^{(iii)}_{(1,1,1,0)}, 0\}$.

Using (A.B.24) and (A.B.25), we can rewrite these conditions as

$$\Pi^{(iii)}_{(1,1,1,0)} = \Pi^{(iv)}_{(1,0,1,0)} + \Psi_b(\tau^A) - W_b(\tau^A; f) - f.$$

Aab Ba or Partially sequential product-market entry is optimal if $\Psi_b(\tau^A) - W_b(\tau^A; f) - f > 0$, i.e., if the net profit to expand product scope in market A at $t = 1$ is larger than the option to wait

[53]Defining the right-hand side of the inequality $W_b(\tau^B; f) + f \equiv H_b(\tau^B; f)$, it trivially follows from Leibniz' rule that $\frac{\partial}{\partial f} H_b(\tau^B; f) = G(2f^{1/2} + \tau^B + c) > 0$, where $G(.)$ is the profitability probability distribution expressed in terms of the core product a.

and uncover the firm's profitability and expand product scope in $t = 2$. Rewriting the inequality as $\Psi_b(\tau^A) > W_b(\tau^A; f) + f$ and noting that the left-hand side does not depend on f while the right-hand side is increasing in f, it follows that there must be a unique fixed cost f^{Mo} that equates the net profits of the two entry strategies:

$$\Psi_b(\tau^A) = W_b(\tau^A; f^{Mo}) + f^{Mo}. \tag{A.B.38}$$

Thus, Partially sequential product-market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 0$) is optimal for a sufficiently small fixed cost to expand product scope in market A in $t = 1$ if

$$e^j_{a1}(\tau^B) = 1, j = A, B; e^A_{b1}(\tau^B) = 1 \Leftrightarrow f < f^{Mo}(\tau^A). \tag{A.B.39}$$

Therefore, Sequential product entry ($e^A_{a1} = 1, e^A_{b1} = 0; e^B_{a1} = 1, e^B_{b1} = 0$) is optimal if

$$e^j_{a1}(\tau^A) = 1, j = A, B \Leftrightarrow f^{Mo}(\tau^A) \leq f \leq \Psi_a(\tau^A) + \Psi_a(\tau^B) + \Psi_b(\tau^A) + W_b(\tau^B; f) - 2F, \tag{A.B.40}$$

where the second inequality is the condition for the net profit of the Sequential product entry strategy to be non-negative, i.e., $\Pi_{(1,0,1,0)^{(\text{iv})}} \geq 0$.

Comparing conditions (A.B.35) and (A.B.38), we can further establish that

$$f^{Mu}(\tau^B) \leq f^{Mo}(\tau^A), \forall \tau, \tag{A.B.41}$$

after noting that $W_b(\tau^B; f^{Mu}) + f^{Mu} = \Psi_b(\tau^B) \leq \Psi_b(\tau^A) = W_b(\tau^A; f^{Mo}) + f^{Mo}$ since $\tau^A \leq \tau^B$, and that $W_b(\tau; f) + f \equiv H_b(\tau, f)$ is increasing in f. Condition (A.B.41) effectively means that only for a sufficiently high fixed cost of expanding the product scope within destinations, $f \in (f^{Mo}(\tau^A), +\infty)$, the firm will prefer to enter both markets with its core-product only (Aa Ba) rather than entering both destinations with both products (Aab Bab). For lower fixed costs to expand product scope, the firm will enter market A with both products and market B only with product a if $f \in (f^{Mu}(\tau^B), f^{Mo}(\tau^A)]$, while entering both markets with both products when $f \in [0, f^{Mu}(\tau^B)]$.

(c) For high fixed costs to expand product scope $f \in (f^{Mo}(\tau^A), +\infty)$, as the fixed entry cost F increases, we move from the north-west and towards the north-east corner of Figure B.1. Due to the high fixed cost to expand product scope, the firm only considers entry with the core product, and effectively we are back to Albornoz et al. (2012). There, the firm compares the net profit of Aa Ba or Sequential product entry, $\Pi^{(\text{iv})}_{(1,0,1,0)}$, to the net profit of Aa or Sequential product-market entry ($e^A_{a1} = 1, e^A_{b1} = 0; e^B_{a1} = 0, e^B_{b1} = 0$), $\Pi^{(\text{vi})}_{(1,0,0,0)}$, given by (A.B.27). Aa Ba or Sequential product entry is optimal if $\Pi^{(\text{iv})}_{(1,0,1,0)} > \Pi^{(\text{vi})}_{(1,0,0,0)}$ and $\Pi^{(\text{iv})}_{(1,0,1,0)} \geq 0 = \Pi^{(\text{i})}_{(0,0,0,0)}$. Conversely, Aa or Sequential product-market entry is optimal if $\Pi^{(\text{vi})}_{(1,0,0,0)} \geq \Pi^{(\text{iv})}_{(1,0,1,0)}$ and $\Pi^{(\text{vi})}_{(1,1,0,0)} \geq 0 = \Pi^{(\text{i})}_{(0,0,0,0)}$. If neither set of conditions is satisfied, the firm does not enter any market making zero profits, $\Pi^{(\text{i})}_{(0,0,0,0)} = 0$. Using (A.B.25) and (A.B.27), we can rewrite these conditions as

$$\Pi^{(\text{iv})}_{(1,0,1,0)} = \Pi^{(\text{vi})}_{(1,0,0,0)} + \Psi_a(\tau^B) - W_a(\tau^B; F) - F.$$

Aa Ba or Sequential product entry is optimal if $\Psi_a(\tau^B) - W_a(\tau^B; F) - F > 0$, i.e., if the net profit to enter market B at $t = 1$ with the core product a is larger than waiting to uncover the firm's profitability in A first. Rewriting the inequality as $\Psi_a(\tau^B) > W_a(\tau^B; F) - F$ and noting that the left-hand side does not depend on F while the right-hand side is increasing in F, it follows that there must be a unique fixed cost F^{Sm} that equates the net profits of the two entry strategies:

$$\Psi_a(\tau^B) = W_a(\tau^B; F^{Sm}) + F^{Sm}. \tag{A.B.42}$$

Thus, Aa Ba or Sequential product entry ($e^A_{a1} = 1, e^A_{b1} = 0; e^B_{a1} = 1, e^B_{b1} = 0$) is optimal for a sufficiently low fixed cost to enter market A at $t = 1$, i.e., if

$$e^j_{a1}(\tau^B) = 1, j = A, B \Leftrightarrow F < F^{Sm}(\tau^B). \tag{A.B.43}$$

In turn, Aa or Sequential product-market entry ($e^A_{a1} = 1, e^A_{b1} = 0; e^B_{a1} = 0, e^B_{b1} = 0$) is optimal when $\Pi^{(\text{vi})}_{(1,0,0,0)} \geq \Pi^{(\text{iv})}_{(1,0,1,0)}$ and $\Pi^{(\text{vi})}_{(1,0,0,0)} \geq 0 = \Pi^{(\text{i})}_{(0,0,0,0)}$. Using (A.B.27), we can rewrite these conditions as

$$\Psi_a(\tau^A) + W_b(\tau^A; f) + W_b(\tau^B; f) \geq F - W_a(\tau^B; F).$$

Noting that the left-hand side of the inequality does not depend on F while the right-hand side is increasing in F, ([54]) it follows that there must be a unique fixed cost F^{Sq} that equates the net profits of Aa or Sequential product-market entry to those of no entry:

$$\Psi_a(\tau^A) + W_b(\tau^A; f) + W_b(\tau^B; f) = F^{Sq} - W_a(\tau^B; F^{Sq}). \tag{A.B.44}$$

Therefore, Aa Sequential product-market entry is optimal when

$$e^A_{a1}(\tau^A, \tau^B; f) = 1 \Leftrightarrow F^{Sq}(\tau^A, \tau^B; f) \geq F > F^{Sm}(\tau^B). \tag{A.B.45}$$

Comparing conditions (A.B.42) and (A.B.44), we can show that

$$F^{Sq}(\tau^A, \tau^B; f) > F^{Sm}(\tau^B), \forall f, \tag{A.B.46}$$

after noting that $F^{Sq} > F^{Sq} - W_a(\tau^B; F^{Sq}) = \Psi_a(\tau^A) + W_b(\tau^A; f) + W_b(\tau^B; f) \geq \Psi_a(\tau^A) \geq \Psi_a(\tau^B) = F^{Sm} + W_a(\tau^B; F^{Sm}) \geq F^{Sm}$ for all values of f, since $W_b(\tau^j; f) \geq 0, \forall (j, f)$ and $\tau^A \leq \tau^B$ implies that $\Psi_a(\tau^A) \geq \Psi_a(\tau^B)$. Notice that the 'sequential' entry fixed cost threshold depends on f while the 'simultaneous' market entry one does not:

$$F^{Sq}(\tau^A, \tau^B; f) > F^{Sm}(\tau^B) \text{ when } f \in (f^{Mo}(\tau^A), +\infty) \tag{A.B.47}$$

which explains the vertical threshold line for the latter but not for the former in Figure B.1. when the firm considers entry with only one product.[55]

[54] From applying Leibniz's rule, it follows that $\frac{\partial}{\partial F}[F - W_a(\tau^B; F)] = 2 - G(2F^{1/2} + \tau^B) > 0$.

[55] To see why $F^{Sq}(\tau^A, \tau^B; f)$ depends on f when $f \in (f^{Mo}(\tau^A), +\infty)$ evaluate the net profit of strategy (vi) at the point $f = f^{Mo}$ and $F = F^{Sq}$, i.e., where the firm is indifferent between entering sequentially in market A with the core product a and not entering any market,

$$\begin{aligned}
\Pi^{(\text{vi})}_{(1,0,0,0)}\Big|_{(f=f^{Mo}, F=F^{Sq})} &= \Psi_a(\tau^A) + W_b(\tau^A; f^{Mo}) + W_a(\tau^A; F^{Sq}) - F^{Sq} + W_b(\tau^B; f^{Mo}) \\
&= \Psi_a(\tau^A) + [\Psi_b(\tau^A) - f^{Mo}] + [-\Psi_a(\tau^A) - W_b(\tau^A; f^{Mo}) - W_b(\tau^B; f^{Mo})] + W_b(\tau^B; f^{Mo}) \\
&= 0 = \Pi^{(\text{i})}_{(0,0,0,0)}
\end{aligned}$$

where the second equality follows from imposing conditions (A.B.38) and (A.B.44). At that point, the net profits of Aa or Sequential product-market entry, (vi), is equal to the net profit of no entry, (i). The effect on the net profit of increasing the fixed cost to expand the product scope at this point is given by:

Finally notice that the above inequality is strict, i.e., $\lim_{f\to+\infty} W_b(\tau^j; f) = 0$ because the option value of expanding the product scope is decreasing in the fixed cost, implying that

$$\lim_{f\to+\infty} F^{Sq}(\tau^A, \tau^B; f) = \Psi_a(\tau^A) \geq \Psi_a(\tau^B) > \Psi_a(\tau^B) - W_a(\tau^B; F^{Sm}(\tau^B)) = F^{Sm}(\tau^B)$$

which is why in Figure B.1, $F^{Sq}(\tau^A, \tau^B; f)$ never crosses the vertical fixed cost entry threshold $F^{Sm}(\tau^B)$.

(d) Now consider the case where $f \in (f^{Mu}(\tau^B), f^{Mo}(\tau^A)]$ in Figure B.1, we need to compare the net profit of Aab Ba or Partially sequential product-market entry, $\Pi^{(iii)}_{(1,1,1,0)}$, to the net profit of Aab or Sequential market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 0, e^B_{b1} = 0$), $\Pi^{(v)}_{(1,1,0,0)}$, given by (O.A.26). Aab Ba or Partially sequential product-market entry is then optimal if $\Pi^{(iii)}_{(1,1,1,0)} > \Pi^{(v)}_{(1,1,0,0)}$ and $\Pi^{(iii)}_{(1,1,1,0)} \geq 0$. Conversely, Aab or Sequential market entry is optimal if $\Pi^{(v)}_{(1,1,0,0)} \geq \Pi^{(iii)}_{(1,1,1,0)}$ and $\Pi^{(v)}_{(1,1,0,0)} \geq 0$. Using (A.B.24) and (A.B.26), we can rewrite these conditions as

$$\Pi^{(iii)}_{(1,1,1,0)} = \Pi^{(v)}_{(1,1,0,0)} + \Psi_a(\tau^B) - W_a(\tau^B; F) - F.$$

Aab Ba or Partially sequential product-market entry is optimal if $\Psi_a(\tau^B) - W_a(\tau^B; F) - F$, i.e., if the net profit to enter market B at $t = 1$ is larger than the option to wait and uncover the firm's profitability first. But noticing that this condition is identical to (A.B.42) above, Aab or Sequential market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 0$) is optimal for a sufficiently low fixed cost to enter market A at $t = 1$, i.e., if

$$e^j_{a1}(\tau^B) = 1, j = A, B; e^A_{b1}(\tau^B) = 1 \Leftrightarrow F < F^{Sm}(\tau^B). \tag{A.B.48}$$

$$\frac{\partial}{\partial f}\,\Pi^{(vi)}_{(1,0,0,0)}\Big|_{(f=f^{Mo},F=F^{Sq})} = \frac{\partial}{\partial f}W_b(\tau^A; f^{Mo}) + \frac{\partial}{\partial f}W_b(\tau^B; f^{Mo}) + [\frac{\partial}{\partial F}W_a(\tau^A; F^{Sq}) - 1]\frac{\partial F^{Sq}}{\partial f}$$

where the first two terms are negative, while the third captures the effect on the sequential fixed cost entry threshold F^{Sq} of an increase in f. If the sequential fixed cost entry threshold did not depend on f, the third term would be zero, and increasing the fixed cost of expanding the product scope would reduce profits below zero, i.e., $\Pi^{(vi)}_{(1,0,0,0)}\Big|_{(f>f^{Mo},F=F^{Sq})} < 0 = \Pi^{(i)}_{(0,0,0,0)}\Big|_{(f>f^{Mo},F=F^{Sq})}$. Therefore, increases in f need to be compensated by reductions in F^{Sq},

$$\frac{\partial F^{Sq}}{\partial f} = \frac{\frac{\partial}{\partial f}W_b(\tau^A; f) + \frac{\partial}{\partial f}W_b(\tau^B; f)}{1 - \frac{\partial}{\partial F}W_a(\tau^A; F^{Sq})} < 0$$

to restore the indifference between the two profit strategies so that:

$$\begin{aligned}
\frac{\partial}{\partial f}\,\Pi^{(vi)}_{(1,0,0,0)}\Big|_{(f=f^{Mo},F=F^{Sq})} &= \frac{\partial}{\partial f}W_b(\tau^A; f^{Mo}) + \frac{\partial}{\partial f}W_b(\tau^B; f^{Mo}) + [\frac{\partial}{\partial F}W_a(\tau^A; F^{Sq}) - 1]\frac{\partial F^{Sq}}{\partial f} \\
&= \frac{\partial}{\partial f}W_b(\tau^A; f^{Mo}) + \frac{\partial}{\partial f}W_b(\tau^B; f^{Mo}) - [1 - \frac{\partial}{\partial F}W_a(\tau^A; F^{Sq})]\frac{\frac{\partial}{\partial f}W_b(\tau^A; f^{Mo}) + \frac{\partial}{\partial f}W_b(\tau^B; f^{Mo})}{1 - \frac{\partial}{\partial F}W_a(\tau^A; F^{Sq})} \\
&= 0
\end{aligned}$$

Intuitively, increases in the fixed cost to expand the product scope within a market, f, reduces the expected profits of entering that market, F, reducing the break-even entry threshold that leaves the firm indifferent between entering market A at $t = 1$ and not entering at all.

In turn, Aab or Sequential market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 0, e^B_{b1} = 0$) is optimal when $\Pi^{(v)}_{(1,1,0,0)} \geq \Pi^{(iii)}_{(1,1,1,0)}$ and $\Pi^{(v)}_{(1,1,0,0)} \geq 0 = \Pi^{(i)}_{(0,0,0,0)}$. Using (A.B.26), this rewrites as

$$\Psi_a(\tau^A) + \Psi_b(\tau^A) + W_b(\tau^B; f) - f \geq F - W_a(\tau^B; F).$$

Noting that the left-hand side of the inequality does not depend on F while the right-hand side is increasing in F, it follows that there must be a unique fixed cost F^{Sq} that equates the net profits of Aab or Sequential market entry to those of No entry:

$$\Psi_a(\tau^A) + \Psi_b(\tau^A) + W_b(\tau^B; f) - f = F^{Sq} - W_a(\tau^B; F^{Sq}). \tag{A.B.49}$$

Therefore, Aab or Sequential market entry is optimal when

$$e^A_{v1}(\tau^A, \tau^B; f) = 1, v = a, b \Leftrightarrow F^{Sq}(\tau^A, \tau^B; f) \geq F > F^{Sm}(\tau^B). \tag{A.B.50}$$

Notice that when $f = f^{Mo}$, condition (A.B.38), $\Psi_b(\tau^A) = W_b(\tau^A; f^{Mo}) + f^{Mo}$, makes conditions (A.B.44) and (A.B.49) equivalent.

(e) Finally, we need to consider the case where $f \in [0, f^{Mu}(\tau^B)]$ in Figure B.1. There we need to compare the net profit of Aab Bab or Simultaneous product-market entry, $\Pi^{(ii)}_{(1,1,1,1)}$, to the net profit of Aab or Sequential market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 0, e^B_{b1} = 0$), $\Pi^{(v)}_{(1,1,0,0)}$, given by (A.B.26). Aab Bab or Simultaneous product-market entry is then optimal if $\Pi^{(ii)}_{(1,1,1,1)} \geq \max\{\Pi^{(v)}_{(1,1,0,0)}, 0\}$.

Conversely, Aab or Sequential market entry is optimal if $\Pi^{(v)}_{(1,1,0,0)} \geq \Pi^{(ii)}_{(1,1,1,1)}$ and $\Pi^{(v)}_{(1,1,0,0)} \geq 0$. Using (A.B.23)and (A.B.26), we can rewrite these conditions as

$$\Pi^{(ii)}_{(1,1,1,1)} = \Pi^{(v)}_{(1,1,0,0)} + \Psi_a(\tau^B) - W_a(\tau^B; F) - F + \Psi_b(\tau^B) - W_b(\tau^B; f) - f.$$

Aab Bab or Simultaneous product-market entry is optimal if $\Psi_a(\tau^B) - W_a(\tau^B; F) - F + \Psi_b(\tau^B) - W_b(\tau^B; f) - f > 0$, i.e., if the net profit to enter market B at $t = 1$ is larger than the option to wait and uncover the firm's profitability first before entering B. Rewriting the inequality as $\Psi_a(\tau^B) + \Psi_b(\tau^B) - W_b(\tau^B; f) - f > W_a(\tau^B; F) + F$ and noting that the left-hand sidae does not depend on F while the right-hand side is increasing in F, it follows that there must be a unique fixed cost F^{Sm} that equates the net profits of the two entry strategies:

$$\Psi_a(\tau^B) + \Psi_b(\tau^B) - W_b(\tau^B; f) - f = W_a(\tau^B; F^{Sm}) + F^{Sm}. \tag{A.B.51}$$

Thus, Aab Bab or Simultaneous product-market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 1, e^B_{b1} = 1$) is optimal for a sufficiently low fixed cost to enter market A at $t = 1$, i.e., if

$$e^j_{v1}(\tau^B; f) = 1, \forall (j, v) \Leftrightarrow F < F^{Sm}(\tau^B; f). \tag{A.B.52}$$

Note that, when $f = f^{Mu}(\tau^B)$, $F^{Sm}(\tau^B; f^{Mu}) = F^{Sm}(\tau^B)$, since the left-hand side of conditions (A.B.42) and (A.B.51) coincide whenever condition (A.B.35) holds. And, as apparent from Figure B.1, since the threshold $F^{Sm}(\tau^B; f)$ is linearly decreasing in f ([56]), whenever $f = 0$ we have

[56]Totally differentiating condition (A.B.51) in f and F^{Sm} yields:

$$\frac{dF^{Sm}}{df} = -\frac{G(2f^{1/2} + \tau^B + c)}{G(2\,[F^{Sm}]^{1/2} + \tau^B)} < 0.$$

The same holds true when totally differentiating condition (A.B.49). However, the slopes can but do not need to that condition (A.B.51) becomes $F^{Sm} + W_a(\tau^B; F^{Sm})\big|_{f=0} = \Psi_a(\tau^B) + \Psi_b(\tau^B) - W_b(\tau^B; 0) - 0 = \Psi_a(\tau^B) + \left(\frac{E\mu - \tau^B - c}{2}\right)^2 > \Psi_a(\tau^B) \geq F^{Sm}(\tau^B)$.

In turn, Aab or Sequential market entry ($e^A_{a1} = 1, e^A_{b1} = 1; e^B_{a1} = 0, e^B_{b1} = 0$) is optimal when $\Pi^{(v)}_{(1,1,0,0)} \geq \Pi^{(ii)}_{(1,1,1,1)}$ and $\Pi^{(v)}_{(1,1,0,0)} \geq 0 = \Pi^{(i)}_{(0,0,0,0)}$. Using (A.B.26),this rewrites as

$$\Psi_a(\tau^A) + \Psi_b(\tau^A) + W_b(\tau^B; f) - f \geq F - W_a(\tau^B; F).$$

Noting that this condition is equivalent to condition (A.B.49), we have that Aab or Sequential market entry is optimal when

$$e^A_{v1}(\tau^A, \tau^B; f) = 1, v = a, b \Leftrightarrow F^{Sq}(\tau^A, \tau^B; f) \geq F > F^{Sm}(\tau^B; f). \tag{A.B.53}$$

This concludes the proof. ■

B.3.7 Differences in productivity

Our analysis, as reflected in Figure B.1, is for a single firm with a generic productivity level. Define a firm's unit costs as $1/\varphi + c_v$, where $\varphi \in [0, \infty]$ denotes the firm's (known) efficiency in the production of a given variety v (or productivity) and c_v reflects its unknown unit export cost. It is not difficult to see how the results would extend to firms with different levels of productivity φ. Essentially, varying productivity levels would shift the thresholds defining sequential and simultaneous entry in foreign markets, for both monoproduct and multi-product entry strategies as conveyed by Figure B.4 for the case the fixed cost to expand the product scope is low relative to the market entry cost, $f = \underline{\gamma} F$, displayed in Figure B.2.

In that scenario, recall that it is optimal for the firm that enters a new destination (say A) with its core product a to expand its product scope there before entering a new destination (say B), i.e., entry strategy (v) dominates entry strategy (iv). Therefore, for intermediate values of productivity ($\frac{1}{\overline{\mu} - \tau^A} \leq \varphi \leq \frac{1}{E\mu - c - \tau^B}$) the firm will never enter into a new destination with its core product a (Aa Ba or Sequential product entry, iv) before first expanding there its product scope (to product b), conditional on surviving. If productivity is too low ($\varphi < \frac{1}{\overline{\mu} - \tau^A}$), there is no hope of making profits through exporting, and therefore the firm does not enter any foreign market with any product even if $F = 0$. Similarly, the firm would never enter simultaneously in both markets with the core and the non-core products if it did not expect to make positive operational profits in market B with the non-core product b (i.e., if $\varphi > \frac{1}{E\mu - c - \tau^B}$). By contrast, observe that as the unit production cost falls to zero (i.e., $\varphi \to \infty$), the thresholds approach those defined in Proposition 2.

A similar figure conveying similar conclusions can be drawn when the fixed cost to expand the product scope is high relative to the market entry cost, $f = \overline{\gamma} F$, as captured by Figure B.3. Therefore, generally, higher productivity increases the expected profits from entering foreign markets simultaneously with both products, sequentially with either one or both products, as well as the expected profits from exporting at all. Hence the more productive a firm is, the higher its sunk cost thresholds will be, implying that more productive firms are more likely to export, and to start exporting many products simultaneously to multiple destinations.

coincide, as it can be seen from totally differentiating the latter:

$$\frac{dF^{Sq}}{df} = \frac{G(2f^{1/2} + \tau^A + c) + G(2f^{1/2} + \tau^B + c) - 2}{2 - G(2\left[F^{Sq}\right]^{1/2} + \tau^B)} < 0.$$

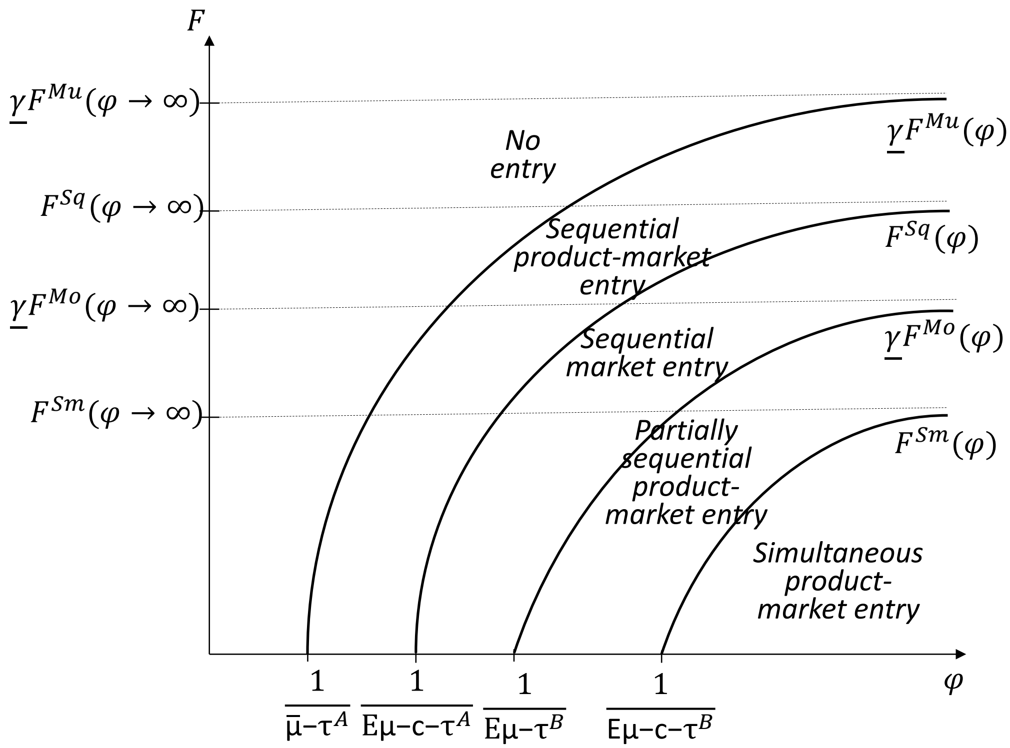


Figure B.4: Optimal Entry strategies with Varying Productivity

References

Albornoz, F., H. F. Calvo-Pardo, G. Corcos, and E. Ornelas (2012). Sequential Exporting. *Journal of International Economics 88*(1), 17–31.

Arkolakis, C. (2016). A Unified Theory of Firm Selection and Growth. *The Quarterly Journal of Economics 131*(1), 89–155.

Arkolakis, C., S. Ganapati, and M.-A. Muendler (2021). The Extensive Margin of Exporting Products: A Firm-level Analysis. *American Economic Journal: Macroeconomics 13*(4), 182–245.

Arkolakis, C., T. Papageorgiou, and O. Timoshenko (2018). Firm Learning and Growth. *Review of Economic Dynamics 27*, 146–168.

Bergounhon, F., C. Lenoir, and I. Méjean (2018). A Guideline to French Firm-level Trade Data. Unpublished Manuscript.

Bernard, A. B., E. A. Bøler, R. Massari, J.-D. Reyes, and D. Taglioni (2017). Exporter Dynamics and Partial-Year Effects. *American Economic Review 107*(10), 3211–28.

Bernard, A. B., J. B. Jensen, S. J. Redding, and P. K. Schott (2009). The Margins of US Trade. *American Economic Review, Papers and Proceedings 99*(2), 487–93.

Bernard, A. B., J. B. Jensen, S. J. Redding, and P. K. Schott (2018). Global Firms. *Journal of Economic Literature 56*(2), 565–619.

Bernard, A. B., S. J. Redding, and P. K. Schott (2011). Multiproduct Firms and Trade Liberalization. *The Quarterly Journal of Economics 126*(3), 1271–1318.

Berthou, A. and V. Vicard (2015). Firms' Export Dynamics: Experience Versus Size. *The World Economy 38*(7), 1130–1158.

Beveren, I. V., A. B. Bernard, and H. Vandenbussche (2012). Concording EU Trade and Production Data over Time. NBER Working Paper 18604.

Blum, B. S., S. Claro, I. Horstmann, and T. Tombe (2020). The DNA of New Exporters: Spin-offs and FDI at the Extensive Margin of Trade. *AER: Insights 3*(2), 397–408.

Chen, C., T. Senga, C. Sun, and H. Zhang (2018). Uncertainty, Imperfect Information, and Expectation Formation over the Firm's Life Cycle. Discussion Papers 18010, RIETI.

Ciliberto, F. and I. C. Jäkel (2021). Superstar exporters: An empirical investigation of strategic interactions in Danish export markets. *Journal of International Economics 129*, 103405.

Eaton, J., M. Eslava, M. Kugler, and J. Tybout (2008). Export Dynamics in Colombia: Firm Level Evidence. In E. Helpman, D. Marin, and T. Verdier (Eds.), *The Organization of Firms in a Global Economy*, Chapter 8. Cambridge, MA: Harvard University Press.

Eckel, C., L. Iacovone, B. S. Javorcik, and J. P. Neary (2016). Testing the Core-competency Model of Multi-product Exporters. *Review of International Economics 24*(4), 699–716.

Eckel, C. and J. P. Neary (2010). Multi-product Firms and Flexible Manufacturing in the Global Economy. *The Review of Economic Studies 77*(1), 188–217.

Fernandes, A. P. and H. Tang (2014). Learning to Export from Neighbors. *Journal of International Economics 94*(1), 67–84.

Freund, C. and M. D. Pierola (2020). The Origin and Dynamics of Export Superstars. *The World Bank Economic Review 34*(1), 28–47.

Gumpert, A., H. Li, A. Moxnes, N. Ramondo, and F. Tintelnot (2020). The life-cycle dynamics of exporters and multinational firms. *Journal of International Economics 126*(C).

Head, K., T. Mayer, and J. Ries (2010). The Erosion of Colonial Trade Linkages after Independence. *Journal of International Economics 81*(1), 1–14.

Jovanovic, B. (1982). Selection and the Evolution of Industry. *Econometrica: Journal of the Econometric Society*, 649–670.

Levinsohn, J. and A. Petrin (2003). Estimating Production Functions Using Inputs to Control for Unobservables. *The Review of Economic Studies 70*(2), 317–341.

Manova, K. (2013). Credit Constraints, Heterogeneous Firms, and International Trade. *Review of Economic Studies 80*(2), 711–744.

Pierce, J. R. and P. K. Schott (2012). Concording U.S. Harmonized System Categories over Time. Finance and Economics Discussion Series 2012-16, Board of Governors of the Federal Reserve System (U.S.).

Ruhl, K. J. and J. L. Willis (2017). New Exporter Dynamics. *International Economic Review 58*, 703–726.

Timoshenko, O. A. (2015). Product Switching in a Model of Learning. *Journal of International Economics 95*(2), 233–249.