Sequential Exporting*

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Abstract

Many new exporters give up exporting very shortly, despite substantial entry costs; others shoot up foreign sales and expand to new destinations. We develop a model based on experimentation to rationalize these and other dynamic patterns of exporting firms. We posit that individual export profitability, while initially uncertain, is positively correlated over time and across destinations. This leads to "sequential exporting," where the possibility of profitable expansion at the intensive and extensive margins makes initial entry costs worthwhile despite high failure rates. Firm-level evidence from Argentina's customs, which would be difficult to reconcile with existing models, strongly supports this mechanism. Sequential exporting also has important and novel policy implications: a reduction in trade barriers has delayed effects, while also promoting entry in third markets. This trade externality poses challenges for the quantification of the effects of trade liberalization programs and implies that the consequences of international trade agreements are significantly richer than traditional models suggest.

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1 Introduction

How do firms break in foreign markets? To understand patterns of international trade and the impact of trade liberalization, answering this question convincingly is of central importance. Recent trade theories, starting with Melitz (2003), put great emphasis on the sunk costs firms have to incur to start exporting, and existing estimates indicate that those costs are indeed likely to be high.[1] Yet recent empirical research has uncovered patterns of foreign entry that seem difficult to reconcile with high sunk entry costs. For example, describing the behavior of Colombian firms, Eaton et al. (2008) observe that many domestic firms enter foreign markets every year. They often start selling small quantities to a single neighbor country, and yet almost half of them cease all exporting activities in less than a year. Those who survive, on the other hand, tend to expand their presence in their current destinations, and a sizeable fraction of the new exporters also expands to other markets.

How can we explain so much entry activity with so little initial sales and so low survival rates? After all, low sales within a short period likely imply negative profits, unless sunk costs are implausibly small. And what could explain the seemingly sequential entry pattern of the surviving exporters? We propose a simple model that rationalizes these recently uncovered empirical findings, while also providing a number of additional empirical implications for the dynamic pattern of exporting firms. The model relies on a basic premise: firms are initially uncertain about their export profitability, but ex ante uncertain success factors are highly persistent and have global scope. In other words, a firm's export profitability is correlated over time within a market and also across destinations. The global scope could reflect, for example, export-specific capabilities that, if possessed, the firm could harness in multiple destinations.

If a firm's export profit in a market is uncertain but correlated over time, entry allows the firm to learn its profit potential there today and in the future. Furthermore, if the profitability uncovered in that market provides information about the firm's profitability in other foreign markets, this too should be taken into account in the decision to start exporting. This can lead to a process of "sequential exporting," in which firms use their initial export experience to infer information on their future success there and elsewhere. Like an option contract, the decision to start exporting gives the firm the opportunity to, in some states of nature, enjoy profits in the future, there and in other markets. In other states of nature, by contrast, there would not be any profit to be made abroad. This reconciles first-market rapid growth and early expansion to other markets with high initial failure rates, even in the presence of high irreversible entry costs.

Our model highlights a distinction that is often overlooked in empirical analyses of exporting firms, namely whether a market is the firm's first foreign market or not. Using firm-level data

[1] For example, Das et al. (2007) structurally estimate sunk entry costs for Colombian manufacturers of leather products, knitted fabrics, and basic chemicals to be at least \$344,000 in 1986 U.S. dollars. Morales et al. (2010) use a different approach but find similarly large magnitudes for chemical manufacturers from Chile.

on all Argentine manufacturing exports between 2002 and 2007, we find strong evidence that this difference is crucial. While firms behave differently in any market after having acquired some experience there, this difference is much more pronounced in a firm's first foreign market. Specifically, conditional on remaining an exporter, growth upon entry at both the intensive margin (the sales in the market) and the extensive margin (the number of markets served) is significantly higher in a firm's first foreign market than in its subsequent markets. The same is true for exit: a firm is more likely to exit from a foreign market right after entering it if that market is the firm's first. These results are not driven by firm heterogeneity, by country-specific shocks, by the possibility of credit constraints, or by learning from rivals. Hence, while uncertainty correlated across time and markets is but one possible force shaping firms' export strategies, our evidence indicates that it plays an unequivocal role. For brevity, we refer to the implications of this uncertainty for exporting firms simply as "sequential exporting."

Our model also implies that the differential effect of the first market should not apply universally to all exporters. For example, if the firm is re-starting to export after a break, there would no longer be a fundamental uncertainty to be uncovered. Similarly, if a firm starts exporting by serving multiple markets, it must be because it is rather confident about its export success, so on average the role of self-discovery should not be as pronounced for such firms as it is for single-market entrants. The uncertainty about export profitability should also be less marked for producers of homogeneous goods, for which reference prices are available. Thus, our mechanism suggests that we should observe rapid first-market export growth, early entry in additional markets and frequent early first-market exit primarily among first-time, single-market exporters of differentiated products. This is indeed what we find empirically.

We sought inspiration for the basic premise of our model in insights from the international business literature, including recent findings on Argentine exporters by Artopoulos, Friel and Hallak (2010). A long tradition in that literature, starting with Johanson and Vahlne (1977), emphasizes the distinct knowledge and competencies—typically related to product adaptation, marketing and distribution—that are required for export success. A firm can properly infer and develop its own "internationalization knowledge," however, only once it starts its foreign operations. Artopoulos, Friel and Hallak (2010) document the importance of this export-specific knowledge with detailed case study analyses of firms from four emerging export sectors in Argentina. Importantly, such export capabilities can be used when accessing different foreign destinations. A similar reasoning applies to firm-specific demand characteristics. For example, trade facilitation agencies place a heavy emphasis on the importance of uncovering foreign demand for would-be exporters, and their advice indicates that the key uncertainty is about persistent demand components,[2] some of which can be present also in different countries. We interpret these observations as suggestive of

[2] See for example the discussion of SITPRO, the British trade facilitation agency, at http://www.sitpro.org.uk. See also Kee and Krishna (2008), who argue that market-, but also firm-specific demand shocks can help reconcile the predictions of heterogeneous firms models with detailed micro evidence. Demidova et al. (2009) confirm this when studying how variations in American and European trade policies vis-à-vis Bangladeshi apparel products affect firms' choices of export destinations.

significant firm-specific export profit uncertainty, which can be resolved only by actual engagement in exporting, but which is informative of a firm's *general* ability to earn profits in foreign markets.

The policy implications of the sequential exporting process are far-reaching. Consider the impact of trade liberalization in different countries for the firms of a "Home" country. When a nearby country lowers its trade barriers, it attracts new exporting firms from Home. As these new exporters learn about their ability to serve foreign markets, some fail and give up exporting, whereas others are very successful and decide to expand to other foreign destinations. As a result, trade liberalization in the nearby country promotes entry not only in that market but also in *third* markets, albeit with a lag. Similarly, the reduction of trade barriers in a distant country, by raising the value of an eventual entry there, also enhances the value of "export experimentation" in a nearby market in the short run. Once some of the entrants realize a high export potential from their experience in the neighbors' markets, they move on to the market of the liberalizing country.

Thus, our findings suggest the existence of a *trade externality*: lower trade barriers in a country induce entry of foreign firms in other markets. This could provide a motive for international coordination of trade policies that is very different from those often emphasized by trade economists.[3] In this sense, our proposed mechanism enhances the rationale for global trade institutions such as the World Trade Organization (WTO). If the trade externality were stronger at the regional level, it could also help to explain the pattern of free trade agreements throughout the world.

In fact, the impact of trade agreements could be very distinct from what existing studies indicate. For example, a regional trade agreement can boost export experimentation by lowering the costs of accessing the markets of bloc partners. As a result of more experimentation, a greater number of domestic firms would eventually find it profitable to export also to bloc outsiders. In that sense, regional integration generates a type of "trade creation" that is very different from the concept economists often emphasize: in addition to promoting intra-bloc trade, a regional trading bloc can also stimulate *exports* to *non*-member countries.[4] If the agreement were of the multilateral type, tracking down its effects becomes even trickier. Indeed, third-country and lagged effects of trade liberalization may help to explain the difficulty in identifying significant trade effects of multilateral liberalization undertaken under the General Agreement on Tariffs and Trade and the WTO (Rose 2004), which contrasts with well-entrenched beliefs that the GATT/WTO system has been crucial in promoting international trade. Notice that although new exporters typically start small, they tend to account for a large part of export growth (about 50% over ten years in the Colombian sample of Eaton et al. 2008, for example), so that these effects are potentially large.

The recent documentation of the pattern of firms' foreign sales[5] has been fostering a still incipient (see Redding 2011) but growing research interest on the dynamics of firms' exporting strategies.[6]

[3] See Bagwell and Staiger (2002) for a general discussion of the motivations for international trade policy negotiations.

[4] Borchert (2009) and Molina (2010) find that RTAs indeed promote exports to non-member countries at the extensive margin, consistently with our theoretical mechanism.

[5] Buono et al. (2008) confirm some of the findings of Eaton et al. (2008) in a study of French firms. Lawless (2009) carries out a related exercise for a survey of Irish exporters.

[6] Segura-Cayuela and Vilarrubia (2008) develop a model where potential exporters are uncertain about country-

The current work of Eaton et al. (2009) and Freund and Pierola (2010), who emphasize learning mechanisms, are the closest to ours. The former develop a model where producers learn about the appeal of their products in a market by devoting resources to finding consumers and by observing the experiences of competitors. Freund and Pierola also consider a single export market, but with product-specific uncertainty, as their focus is on the incentives of firms to develop new products for exporting. Using data on exports of non-traditional agricultural products in Peru, Freund and Pierola uncover interesting patterns of trial and error based on the frequency of entry and exit from foreign markets. In those models, uncertainty is destination-specific and the main goal is to describe firms' export dynamics within a market, without distinction between first and subsequent markets. Here, in contrast, we take a multi-market approach. A central feature of our environment concerns firms' different dynamics in their first and subsequent foreign markets, and the focus is on the option value of a firm's first export experience.

Our work is also related to other recent empirical findings at the product and country levels. Evenett and Venables (2002) document a "geographic spread of exports" for 23 developing countries between 1970 and 1997, in the sense that importing a product from a certain country is more likely if the origin country is supplying the same product to nearby markets. Besedes and Prusa (2006) find that the median duration of exporting a product to the United States is very short, with a hazard rate that decreases sharply over time. Iacovone and Javorcik (2009) find that firms often undertake significant investment before entering foreign markets, as a preparation for exporting. Alvarez et al. (2008) find evidence from Chilean firms that exporting a product to a country increases the likelihood of selling the same product to another foreign market. Bernard et al. (2009) show that the extensive margins of US exports are key to explain variation at long intervals, but that the intensive margin is responsible for most short-run (i.e. year-to-year) variation. These different contributions of the two margins over time reflect the fact that new exporters start small, but grow fast and expand rapidly across destinations if they survive. Our model helps to rationalize these findings as well.

The remainder of the paper is organized as follows. In Section 2 we present our model. In Section 3 we use Argentine customs data to test the distinguishing features of our theoretical mechanism. In Section 4 we show the impact of trade liberalization under our mechanism and the resulting policy implications. We conclude in Section 5.

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specific fixed export costs, but learn about them from other firms in the industry that start exporting to the same market. This idea is related to Hausmann and Rodrik's (2003) earlier insight that ex ante unknown export opportunities can be gauged from the experience of export pioneers, who effectively provide a public good to the rest of the industry. While those authors focus on learning from rivals, we are interested in individual self-discovery. Our work is also related to dynamic export models with idiosyncratic uncertainty. Das et al. (2007) develop an heterogeneous firm model where firm profitability evolves over time according to an exogenous stochastic process determining the firm's entry, exit and production decisions abroad. Arkolakis (2009) proposes a dynamic model with endogenous entry costs that increase with the number of foreign consumers targeted. Eaton et al. (2010) integrate Arkolakis' entry cost structure in a model with different types of firm-specific shocks. The model, which is static (and therefore does not incorporate learning), is set up for studying the role of different types of shocks in determining the geographical pattern of French exports at the firm level.

2 Model

We propose a model whose central assumption is the existence of a fundamental source of uncertainty regarding firms' *general* ability to earn profits abroad, and which can be resolved only through experience in foreign markets.

A direct implication of our central assumption is that a firm's export profitability should be correlated over time and across destinations. Correlation over time can come from persistent but ex ante unknown demand patterns, e.g. related to the appeal of certain product features. It could also represent some idiosyncratic but ex ante unknown export costs that do not change much over time. For example, shipping and other port activities, distribution of goods in foreign markets, export finance and insurance, maintenance of an international division within the firm—all these activities involve relatively stable idiosyncratic costs that are often unknown to the firm until it actually engages into exporting. In turn, positive correlation across countries in export profitability can come from similarities across countries either in demand or supply conditions. The patterns uncovered by gravity equations—which show that bilateral trade correlates strongly with indicators for common language, religion, colonial origin etc.—partly involve demand similarities across countries. Likewise, some of the costs intrinsic to exporting, like those mentioned above, while ex ante unknown for a firm, are often similar across countries.

This seems consistent with evidence from international business studies. These studies stress the different activities (and costs) that exporting requires. On the one hand, new exporters need to learn about local consumer preferences, business practices and institutional environments. On the other hand, they need to learn about how to establish appropriate routines and fine-tune the allocation of resources to export activities. For example, in a review of international marketing studies, Cavusgil and Zou (1994) list product adaptation, distributor support and commitment of managerial resources to exports as key competencies required for a successful export strategy. Similarly, in a study of several Argentine exporters during the 2000's, Artopoulos, Friel and Hallak (2010) find that export success entails substantial changes in product design, production and marketing capabilities. Crucially, they also find that many new exporters were unaware of those changes prior to exporting, presumably because of the tacit nature of that information. Successful exporters are therefore those who are able to develop effective export-specific processes and routines, which Eriksson et al. (1997) refer to as a firm's "internationalization knowledge." Such knowledge, which is obtained through export experience, affects a firm's perceived ability to enter new foreign markets successfully, as they shape their capacity to acquire knowledge of institutions and business practices in new markets. The need for new knowledge and competencies makes export success uncertain at the time of entry, but also implies that the uncertainty is resolved through export experience. The tacit nature of knowledge implies that there are no obvious substitutes to that experience.

Naturally, we do not suggest that firms do not face any producer-market specific uncertainty, or that all uncertainty requires actual engagement in exporting to be resolved. Producers surely acquire formal knowledge and observe other exporters prior to their foreign entry decision. We focus on the residual uncertainty because it has not been explored yet in this context, but has potentially large and important implications.

2.1 Basic structure

A risk-neutral producer has the option of serving two segmented foreign markets, A and B. Countries A and B are symmetric except for the unit trade costs that the Home firm must pay to export there, denoted by τ^A and τ^B, $\tau^A \leq \tau^B$. To sell in each foreign market, the firm needs to incur in a one-time fixed cost per destination, $F \geq 0$. This corresponds to the costs of establishing distribution channels, of designing a marketing strategy, of learning about exporting procedures, of familiarization with the institutional and policy characteristics of the foreign country, etc.

Variable costs comprise two elements: an unknown *export* unit cost, c^j, and a unit *production* cost that is known to the firm. We normalize the latter to zero. In Section 2.3 we show that allowing for differences in productivity has no qualitative consequence for our main mechanism. The producer faces the following demand in each market $j = A, B$:

$$q^j(p^j) = d^j - p^j, \tag{1}$$

where q^j denotes the output sold in destination j, p^j denotes the corresponding price, and d^j is an unknown parameter.

We therefore allow for uncertainty in both demand and supply parameters. Let

$$\mu^j \equiv d^j - c^j$$

be a random variable with a continuous cumulative distribution function $G(\cdot)$ on the support $[\underline{\mu}, \overline{\mu}]$. We refer to μ^j as the firm's "export profitability" 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 ($d^j = \underline{d}$ and $c^j = \overline{c}$). The analysis becomes interesting when trade costs are such that, upon the resolution of the uncertainty, it may become optimal to serve both, only one, or none of the markets. Accordingly, we assume $\underline{\mu} < \tau^A$—so that exporting may not be worthwhile even if $F = 0$—and $2F^{1/2} + \tau^B < \overline{\mu}$. This last condition implies that exporting to the distant market can be profitable. To ensure that equilibrium prices are always strictly positive, we need that $E\mu < 2d^j$ for all d^j, so we assume throughout the paper that $\underline{d} > \frac{1}{2}E\mu$.[7]

Our central assumption is that export profitability is correlated over time and across markets. This correlation could come from either supply or demand components of uncertainty in the parameter μ, as suggested by our discussion above. To make the analysis as clear and simple as possible, we focus on the limiting case. First, as the definition of μ^j without time subscripts indicates, we consider that the μ^j's are constant over time. Second, we look at the case where the draws of μ^j are perfectly correlated across markets: $\mu^A = \mu^B = \mu$. Each of these assumptions can be relaxed; all of our qualitative results generalize to any strictly positive correlation of export profitabilities

[7] If we adopted instead a demand function of the form $q^j(p^j) = \max\{d^j - p^j, 0\}$, our results would remain unaffected. We develop this case in http://www.economics.soton.ac.uk/staff/calvo/documents/Technical_Addendum_2.pdf.

across markets and over time.[8]

To model the decision to enter foreign markets, we evaluate all profits from an *ex ante* perspective, i.e. at their $t = 0$ expected value. For simplicity we do not consider a discount factor, but this has no bearing on our qualitative results. We denote by e_t^j the firm's decision to enter market j at time t, $j = A, B$, $t = 1, 2$. Thus, $e_t^j = 1$ if the firm enters market j (i.e. pays the sunk cost) at t, $e_t^j = 0$ otherwise. Output q_t^j can be strictly positive only if either $e_t^j = 1$ or $e_{t-1}^j = 1$.

The timing is as follows:

$t = 1$: At period 1, the firm decides whether to enter each market. If the firm decides to enter market j, it pays the per-destination fixed entry cost F and chooses how much to sell there in that period, q_1^j. At the end of period 1, export profits in destination j are realized. If the firm has entered and produced $q_1^j \geq \varepsilon$, where $\varepsilon > 0$ is arbitrarily small, it infers μ from its profit.

$t = 2$: At period 2, if the firm has entered market j at $t = 1$, it decides whether to keep serving on that market given the realization of export profits. If so, it chooses how much to sell in that market, q_2^j. If the firm has not entered destination j at $t = 1$, it decides whether to enter that market. If the firm enters, it pays F and chooses q_2^j. At the end of period 2, export profits are realized.

Hence, the firm can infer its export profitability parameter μ only by actually engaging in exporting, which requires the firm to pay the fixed entry cost F and sell a strictly positive quantity to one of the markets. This is reminiscent of Jovanovic's (1982) model, although a central difference is that we consider entry into several destinations. Clearly, uncovering μ must be costly, or else every firm would, counterfactually, export at least a tiny quantity to gather their export potential. We model this cost as a sunk cost, but this is not necessary for our results. Alternatively, one could specify that a firm needs a minimum scale of experimentation to reliably uncover its true export profitability. We allow this minimum scale to be an arbitrarily small number (ε) because we require the firm to spend F to sell in a foreign market, but one could for example assume the opposite (i.e. set $F = 0$ and require a larger minimum scale).[9]

In reality, entry may also be "passive," where a foreign buyer posts an order and the exporting firm simply delivers it. Trade in intermediate goods, for example, is indeed often importer-driven, rather than exporter-driven. Thus, in general firms may either deliberately choose to enter a market, or simply wait until they are "found" by a foreign buyer. While our model focuses on the former type of entry, a passive first export experience could also resolve uncertainty and lead to active expansion on foreign markets. Our empirical findings certainly involve both types of first export experiences.

[8]We show this for the case where the μ^j's are positively but imperfectly correlated in Appendix B of a previous working paper version of the paper, Albornoz et al. (2010), with additional details in http://www.economics.soton.ac.uk/staff/calvo/documents/Technical_Addendum_1.pdf.

[9]More general forms of experimentation are compatible with our main mechanism. For example, Akhmetova and Mitaritonna (2010) develop a model of entry in foreign markets where demand uncertainty takes time to be unveiled, as in Aghion et al. (1991). As a result, producers also need to decide their levels of experimentation.

2.2 Firm's export decision

There are three undominated entry strategies. The firm may enter both markets simultaneously at $t = 1$ ("simultaneous entry"); enter only market A at $t = 1$, deciding at $t = 2$ whether to enter market B ("sequential entry"); or enter neither market. The other two possibilities, of entering both markets only at $t = 2$ and of entering market B before market A, need not be considered. The latter is dominated by entering market A before market B, since $\tau^A \leq \tau^B$. The former 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 identical fixed entry costs.

We solve for the firm's decision variables $\{e_1^j, e_2^j, q_1^j, q_2^j\}$ using backward induction. We denote optimal quantities in period t under simultaneous entry by $\widehat{q}_t^j$, and under sequential entry by $\widetilde{q}_t^j$.

2.2.1 Period $t = 2$

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

ii) *Simultaneous entry.* 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

$$\max_{q_2^j \geq 0} \left\{ (\mu - \tau^j - q_2^j) q_2^j \right\}, \; j = A, B.$$

This yields

$$\widehat{q}_2^j(\tau^j) = \mathbf{1}_{\{\mu > \tau^j\}} \left(\frac{\mu - \tau^j}{2} \right), \tag{2}$$

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

$$V(\tau^j) = \int_{\tau^j}^{\overline{\mu}} \left(\frac{\mu - \tau^j}{2} \right)^2 dG(\mu), \; j = A, B.$$

$V(\tau^j)$ is the value of continuing to export to market j after profitability in foreign markets has been discovered. If the firm cannot deliver positive profits in a market, it exits to avoid further losses. Otherwise, the firm tunes up its output choice to that market.

iii) *Sequential entry.* When the firm exports to country A in $t = 1$, at $t = 2$ it will have inferred its export profitability μ. Thus, q_2^A is again given by (2): $\widetilde{q}_2^A(\tau^A) = \widehat{q}_2^A(\tau^A) = \mathbf{1}_{\{\mu > \tau^A\}} \left(\frac{\mu - \tau^A}{2} \right)$, generating second-period profit $V(\tau^A)$. Otherwise, if the firm cannot deliver positive profits in a market it exits market A to avoid further losses.

The firm chooses to enter market B at $t = 2$ if the operational profit is greater than the sunk cost to enter that market. This will be the case when the firm realizes its export profitability is large relative to the sunk cost:

$$\left(\frac{\mu - \tau^B}{2} \right)^2 \geq F. \tag{3}$$

Hence, the firm's entry decision in market B at $t = 2$ is

$$e_2^B(\tau^B) = 1 \Leftrightarrow \mu \geq 2F^{1/2} + \tau^B. \tag{4}$$

Thus, defining $F_2^B(\tau^B)$ as the F that solves (3) with equality, the firm enters market B at $t = 2$ 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.

If the firm enters market B, it will choose q_2^B much like it chooses q_2^A, adjusted for market B's specific trade cost, τ^B. However, conditional on $e_2^B = 1$, we know that $\mu > \tau^B$. Therefore, the firm sets $\tilde{q}_2^B(\tau^B) = \frac{\mu - \tau^B}{2}$.

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

$$\begin{aligned} W(\tau^B; F) &\equiv \int_{2F^{1/2}+\tau^B}^{\overline{\mu}} \left[\left(\frac{\mu - \tau^B}{2} \right)^2 - F \right] dG(\mu) \\ &= \left\{ V(\tau^B) - \int_{\tau^B}^{2F^{1/2}+\tau^B} \left(\frac{\mu - \tau^B}{2} \right)^2 dG(\mu) \right\} - F \left[1 - G(2F^{1/2} + \tau^B) \right]. \end{aligned}$$

Function $W(\tau^B; F)$ represents the value of exporting to market B after learning its profitability in foreign markets by entering market A first. The expression in curly brackets represents the (ex ante) expected gross profit from entering market B at $t = 2$. The other term represents the fixed cost from entering B times the probability that entry in that market is profitable.

Thus, the return from first entering destination A includes the value of waiting to subsequently become an informed exporter to destination B, avoiding the costs from directly "testing" that market. In the presence of uncertainty and the irreversible entry 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 and $W(\tau^B; F)$ would collapse to the unconditional expectation of profits in market B, as in $t = 1$. The difference between these 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.

2.2.2 Period $t = 1$

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

ii) *Simultaneous entry.* A firm exporting to both destinations at $t = 1$ chooses q_1^A and q_1^B to maximize gross profits:

$$\begin{aligned} \Psi^{Sm}(q_1^A, q_1^B; \tau^A, \tau^B) \equiv \int_{\underline{\mu}}^{\overline{\mu}} (\mu - \tau^A - q_1^A) q_1^A dG(\mu) + \int_{\underline{\mu}}^{\overline{\mu}} (\mu - \tau^B - q_1^B) q_1^B dG(\mu) \\ + \max \left\{ \mathbf{1}_{\{q_1^A > 0\}}, \mathbf{1}_{\{q_1^B > 0\}} \right\} \left[V(\tau^A) + V(\tau^B) \right], \end{aligned} \tag{5}$$

where superscript Sm stands for "simultaneous" entry. The first two terms correspond to the firm's period 1 per-destination operational profits. The third term denotes how much the firm expects to earn in period 2, depending on whether either $q_1^A > 0$ or $q_1^B > 0$. Since exporting to one market reveals information about the firm's export profitability in both markets, it is enough to have exported a positive amount in period 1 to either destination.

Maximization of (5) yields outputs

$$\widehat{q}_1^A(\tau^A) = \mathbf{1}_{\{E\mu>\tau^A\}}\left(\frac{E\mu-\tau^A}{2}\right)+\mathbf{1}_{\{E\mu\leq\tau^A\}}\varepsilon, \tag{6}$$

$$\widehat{q}_1^B(\tau^B) = \mathbf{1}_{\{E\mu>\tau^B\}}\left(\frac{E\mu-\tau^B}{2}\right), \tag{7}$$

where $\varepsilon > 0$ is an arbitrarily small number. To understand these expressions, notice that there are three possibilities that depend on parameter values. If $E\mu > \tau^B$, $q_1^j = \frac{E\mu-\tau^j}{2}$ for $j = A, B$ is clearly optimal. If $\tau^B \geq E\mu > \tau^A$, $q_1^A = \frac{E\mu-\tau^A}{2}$ and $q_1^B = 0$ is the best choice. If $E\mu \leq \tau^A$, setting $q_1^A = q_1^B = 0$ may appear optimal. However, inspection of (5) makes clear that a small but strictly positive $q_1^A = \varepsilon > 0$ dominates that option, since $\lim_{\varepsilon\to 0}\Psi^{Sm}(\varepsilon, 0; \tau^A, \tau^B) = V(\tau^A) + V(\tau^B) > 0$. Clearly, setting $q_1^A = q_1^B = 0$ forgoes the benefit from uncovering a valuable signal of the firm's export profitability.

Define $\Psi(\tau^j) \equiv \mathbf{1}_{\{E\mu>\tau^j\}}\left(\frac{E\mu-\tau^j}{2}\right)^2 + V(\tau^j)$. Evaluating (5) at the optimal output choices (6), (7) and (2), we obtain the firm's expected gross profit from simultaneous entry:

$$\Psi^{Sm}(\tau^A, \tau^B) \equiv \lim_{\varepsilon\to 0^+}\Psi^{Sm}(\widehat{q}_1^A(\tau^A), \widehat{q}_1^B(\tau^B); \tau^A, \tau^B) = \Psi(\tau^A) + \Psi(\tau^B). \tag{8}$$

iii) *Sequential entry.* At $t = 1$, a firm that enters only market A chooses q_1^A to maximize

$$\Psi^{Sq}(q_1^A; \tau^A, \tau^B) \equiv \int_{\underline{\mu}}^{\overline{\mu}}(\mu - \tau^A - q_1^A)q_1^A dG(\mu) + \mathbf{1}_{\{q_1^A>0\}}\left[V(\tau^A) + W(\tau^B; F)\right], \tag{9}$$

where Sq stands for "sequential" entry. The firm learns its export profitability iff $q_1^A > 0$. A strictly positive quantity allows the firm to make a more informed entry decision in market B at $t = 2$, according to (4). Clearly, the solution to this program is $\widetilde{q}_1^A(\tau^A) = \widehat{q}_1^A(\tau^A)$, as in (6). Evaluating (9) at the optimal output choice $\widetilde{q}_1^A(\tau^A)$, we obtain the firm's expected profit from sequential entry:

$$\Psi^{Sq}(\tau^A, \tau^B) \equiv \lim_{\varepsilon\to 0^+}\Psi^{Sq}(\widetilde{q}_1^A(\tau^A); \tau^A, \tau^B) = \Psi(\tau^A) + W(\tau^B; F). \tag{10}$$

We therefore have that some firms will "test" foreign markets before fully exploring them (or exiting them altogether). Interestingly, experimentation can arise 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

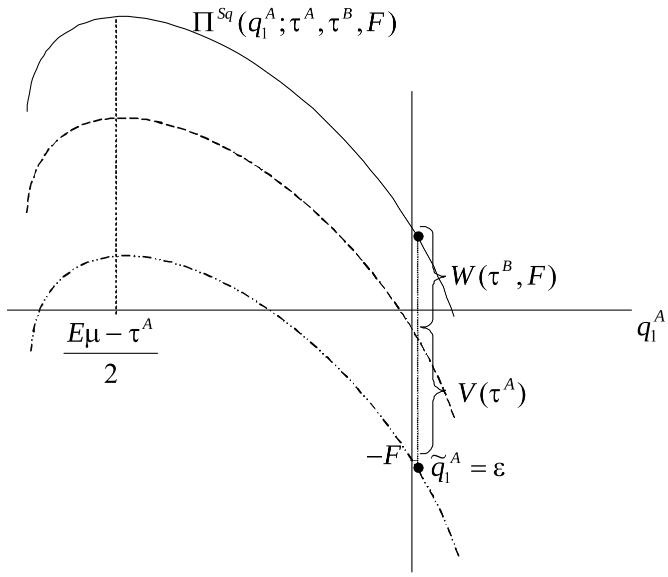

Figure 1: The Profit Function from Sequential Exporting when $E\mu < \tau^A$

small initial operational loss because it *might* be competitive 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.

Figure 1 illustrates this point by showing a situation where export experimentation is worthwhile even though $E\mu < \tau^A$. The lowest curve represents the profit of entering market A when experimentation is useless. The middle curve adds the value of experimentation in the entry market; the highest curve includes also the value of experimentation across markets. In this example, experimentation is worthy only because success in A is informative about success in B; otherwise the value of information would not be high enough to compensate for the sunk costs [i.e., $V(\tau^A) + W(\tau^B; F) > F > V(\tau^A)$].

2.2.3 Entry strategy

We can now fully characterize the firm's entry strategy. Using (8), the firm's net profit from simultaneous entry, Π^{Sm}, is

$$\Pi^{Sm} = \Psi(\tau^A) + \Psi(\tau^B) - 2F. \tag{11}$$

In turn, we have from (10) that the firm's net profit from sequential entry, Π^{Sq}, is

$$\Pi^{Sq} = \Psi(\tau^A) + W(\tau^B; F) - F. \tag{12}$$

Simultaneous entry is optimal if $\Pi^{Sm} > \Pi^{Sq}$ and $\Pi^{Sm} \geq 0$. Conversely, sequential entry is optimal if $\Pi^{Sq} \geq \Pi^{Sm}$ and $\Pi^{Sq} \geq 0$. If neither set of conditions is satisfied, the firm does not enter any market. Using (11) and (12), we can rewrite these conditions as follows. Simultaneous entry is optimal if

$$\begin{cases} F < \Psi(\tau^B) - W(\tau^B; F) & \text{and} \\ F \leq \left[\Psi(\tau^A) + \Psi(\tau^B)\right]/2. \end{cases}$$

Notice that the right-hand side of the second inequality above is strictly greater than the right-hand side of the first inequality, since $W(\tau^B; F) > 0$, $\Psi(.)$ is a decreasing function and $\tau^A \leq \tau^B$. Intuitively, if F is small enough to make simultaneous entry preferred to sequential entry, it also makes simultaneous entry preferred to no entry at all. Thus, simultaneous entry is optimal if

$$F < \Psi(\tau^B) - W(\tau^B; F). \tag{13}$$

In turn, sequential entry is optimal if

$$\Psi(\tau^B) - W(\tau^B; F) \leq F \leq \Psi(\tau^A) + W(\tau^B; F). \tag{14}$$

Inequalities (13) and (14) define the firm's entry strategy at $t = 1$. The firm enters market A at $t = 1$ if either (13) or (14) are satisfied; it enters market B at $t = 1$ if (13) is satisfied but (14) is not:

$$e_1^A(\tau^A, \tau^B) = 1 \Leftrightarrow F \leq \Psi(\tau^A) + W(\tau^B; F), \tag{15}$$

$$e_1^B(\tau^B) = 1 \Leftrightarrow F < \Psi(\tau^B) - W(\tau^B; F). \tag{16}$$

Naturally, the condition for $e_1^B = 1$ is stricter than the condition for $e_1^A = 1$. Condition (16) implies that $e_1^B = 1$ (in which case simultaneous entry occurs) only if the sunk cost to export is sufficiently small. The following proposition shows this and other results that fully characterize the firm's export decision. See Appendix A for all proofs.

Proposition 1 *There are numbers 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 (4) is satisfied.*

The intuition for these results is simple. 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 make sense only when the operational profit in B is expected 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.

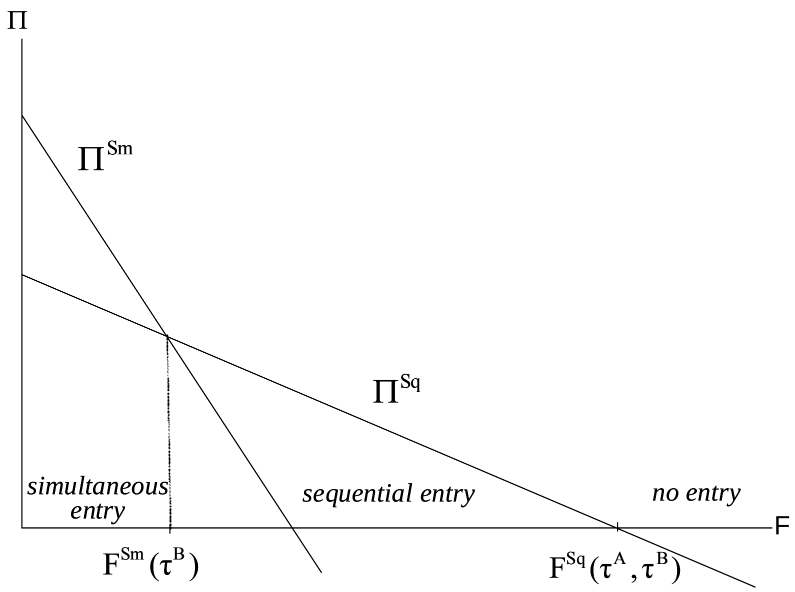

Figure 2: Optimal Entry Strategy ($E\mu > \tau^B$)

Figure 2 illustrates this result when $E\mu > \tau^B$, in which case simultaneous entry is optimal for small enough F. Notice that trade cost τ^B affects both thresholds, while trade cost τ^A only affects F^{Sq}. Thus, we can denote the thresholds as $F^{Sq}(\tau^A, \tau^B)$ and $F^{Sm}(\tau^B)$. We characterize how trade costs affect each of the thresholds in Section 4.

2.3 Differences in productivity

We have developed the analysis so far without mentioning how differences in productivity would affect our results. Yet the large and growing literature spurred by Melitz (2003) emphasizes that productivity differences are key to explain firms' export behavior. As we now show, they matter in our analysis too, not disrupting but rather reinforcing our mechanism.

To allow for differences in productivity, define a firm's unit costs as $\frac{1}{\varphi} + c$, where $\varphi \in [0, \infty)$ denotes the firm's (known) efficiency in production (i.e. its measure of productivity) and c again reflects its (unknown) unit export cost. It is easy to see, for example, that more productive firms will sell larger quantities (and expect higher profits) in the destinations they serve. More important for our purposes is how differences in productivity affect entry patterns in foreign markets. The following proposition shows that the more productive a firm is, the less stringent the start-up fixed entry thresholds F^{Sq} and F^{Sm} become.

Proposition 2 *F^{Sq} and F^{Sm} are increasing in productivity φ.*

Figure 3 illustrates Proposition 2. If productivity is too low ($\varphi < \frac{1}{\bar{\mu} - \tau^A}$), there is no hope of making profits through exporting, and therefore the firm does not enter any foreign market even if $F = 0$. Similarly, the firm would never enter simultaneously if it did not expect to make

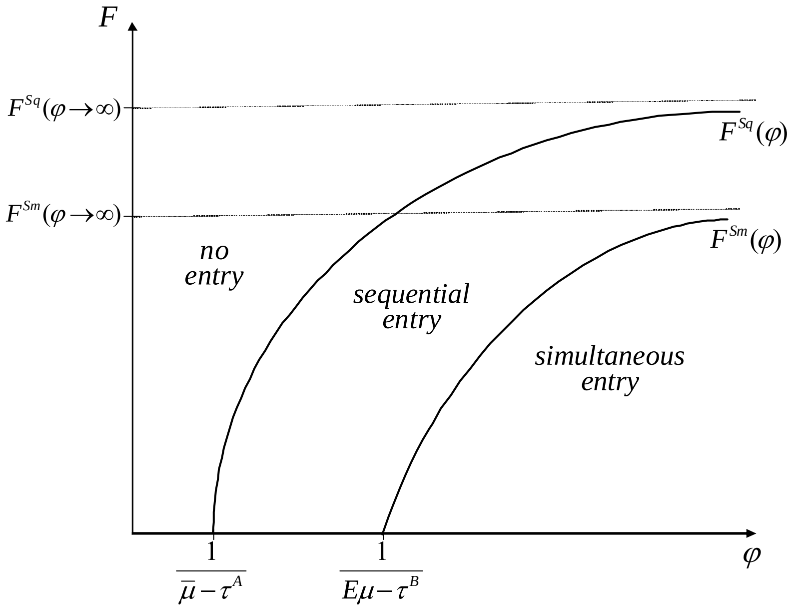

Figure 3: Optimal Entry Strategy with Varying Productivity

positive operational profits in market B (i.e. if $\varphi > \frac{1}{E\mu-\tau^B}$). By contrast, observe that as the unit production cost falls to zero (i.e. $\varphi \to \infty$), the thresholds approach those defined in Proposition 1.

Thus, varying productivity levels shift the thresholds defining sequential and simultaneous entry in foreign markets in an unambiguous way. Higher productivity increases the expected profits from entering foreign markets simultaneously, as well as the expected profits from exporting at all. The entry strategies can therefore still be characterized by the sunk cost thresholds. The only difference is that 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 simultaneously to multiple destinations. Hence productivity differences and self-discovery forces interact to determine export dynamics, complementing each other.

2.4 Testable implications

Our model is parsimonious in many dimensions. For example, we assume that firms learn fully about their profitability in foreign market j by selling at market i, $i \neq j$. In reality, the correlation of export profitabilities across markets is surely less than perfect. However, if it is not negligible, the main messages of the model remain intact (we show this formally in Albornoz et al. 2010). The same is true about correlation of export profitabilities in a given market over time. Effectively, our running hypothesis is that firms extract the highest informational content from their first export experience. The implications of the model should be interpreted accordingly. Similarly, to derive explicit testable predictions, one would need to extend the model to $T > 2$ periods and $N > 2$ foreign countries (as we also do in Albornoz et al. 2010). Since this is rather straightforward, here we discuss only informally how they follow from our setup.

The model implies, first, that conditional on survival we should expect faster intensive margin export growth when firms are learning their export profitabilities—i.e. right after they enter their first foreign market. The reason is simple. Since export profitability is uncertain for a firm before it starts exporting, first-year exports are on average relatively low. If the firm anticipates positive variable profit in its first market, it produces according to this expectation. If the firm stays there in the second period, it must be because its uncovered export potential is indeed relatively high ($\mu > \tau^A$). Since the relevant distribution of μ becomes a truncation of the original one, conditional on survival firms on average expand sales in their first market. If the firm had entered that market just to learn about its export potential there (and to potentially benefit from expanding to other destinations in the future), the firm initially produces just the minimum necessary for effective learning and the same argument applies even more strongly. On the other hand, once the uncertainty about export profitability has been resolved, there is no reason for further changes in sales, and there should be no growth in export volumes in the years following this discovery period. Similarly, since the profitability of the firm in its first export destination conveys all information about export profitability in other destinations, there is no reason for export growth in markets other than the firm's first either.

Obviously, our model delivers these results too bluntly. It abstracts from a range of shocks that are likely to affect the firm's output choices and growth; we seek to control for those in our empirical analysis. There are also other reasons to expect export growth in new foreign markets, which we discuss later. Moreover, while we assume that export profitability is perfectly correlated across markets and time, that assumption is clearly too strong. In particular, export profitability that is imperfectly correlated across markets implies strictly positive first-to-second year export growth in every market the firm expands to and survives. The hypothesis we test, instead, is that firms learn *more* about their export profitabilities in their first markets, so the early expansion of surviving firms is greater in their initial markets than in their subsequent markets.

The second implication of the model relates to entry patterns. Once a firm starts exporting, it will uncover its export profitability. Some new exporters will realize that their export profitabilities are sufficiently high and decide to expand in the next period to other markets where they anticipate positive profits. By contrast, experienced exporters have already learnt enough about their export profitability, and therefore have already made their entry decisions in the past.

Again, the message from our basic model is extreme, as it abstracts from all other motives for expansion to different foreign markets—which we seek to control for in our empirical analysis. But it helps to highlight our central point, that (surviving) new exporters have an *additional* motivation for expansion.

The third implication of the model refers to the exit patterns of exporting firms. Because an experienced exporter is better informed about its own export profitability than a new exporter, the latter is more likely than the former to find out that it is not worthwhile to keep serving a market. Critically, the model implies that this is also true when comparing firms that have just entered a given foreign destination, but when this is the first foreign market for one firm and not for the other. Generally, while many (un-modeled) factors can cause a firm to abandon a foreign destination, the model shows that being a new exporter creates an additional motivation to do so, in expected terms.

The model also has implications for the dynamic behavior of different types of exporters. First, it implies that the behavior of *simultaneous exporters*—firms that start exporting to more than one destination—should be different from the behavior of the (more prevalent) strict sequential exporters. The model indicates that, if a firm is willing to pay the sunk costs to start its foreign operations in multiple markets simultaneously, it must be because it is rather optimistic about its export profitability (i.e. $E\mu$ must be large relative to τ^B and to F). This implies less volatility (i.e. exiting less frequently and expanding less vigorously) in the behavior of simultaneous exporters relative to the firms that break in a single foreign destination.

Second, some seemingly new exporters are actually *re-entrants*. These are the firms that did not export at $t-1$ but did so before $t-1$ and exported again at t. While the model does not explain the behavior of re-entrant exporters, a simple extension that allows for firm-country temporary shocks would readily do so. But if self-discovery is indeed an important force shaping the dynamic behavior of firms in foreign markets (and barring problems with "short memory"), the effect of being "new" should not be as strong for returning exporters upon re-entry as it is for ("true") new exporters, since they already have a reliable signal of (the permanent component of) their export profitabilities.

Third, uncertainty about producer-specific export profitability is likely to be greater for differentiated products than for *homogeneous goods*, which tend to have a well-defined reference price and whose export procedures are likely to be more standardized. Accordingly, the distinction between the behavior of new and old exporters should be more pronounced for the foreign sales of differentiated products than of homogeneous goods.

3 Evidence

We now test the predictions of the model. We start by briefly describing the data.

3.1 Data

Our data comes from the Argentine Customs Office. We observe the annual value (in US dollars) of the foreign sales of each Argentine manufacturing exporter between 2002 and 2007, distinguished by country of destination. Over our sample period, Argentine manufacturing exports involved 15,301 exporters and 130 foreign destinations. Among new exporters, 79% of new exporters start in a single market, 15% enter initially in two or three foreign countries, and 6% start with more than three destinations. On average, exporting firms serve three distinct foreign markets, although around 40% of the exporting firms serve only one market outside Argentina.

Appendix B presents the trends of aggregate exports in Argentina during 2002-2007, as well as annual exports by sector and by destination. As we show there, new exporters are markedly different from experienced exporters. Such differences are not specific to Argentina; in fact, they echo the regularities observed by other authors in different countries (e.g. Eaton et al. 2008 in Colombia, Buono et al. 2008 in France, Lawless 2009 in Ireland). However, those authors do not distinguish between the behavior of exporters in their first and their subsequent foreign markets. As Table 1 illustrates, this distinction is very important.

Table 1: Firm-level export growth, First Market versus New Market

Year	First Market 2003		Second Market 2004		New Market 2003	
	USD	Growth (%)	USD	Growth (%)	USD	Growth (%)
2003	35465				96541	
2004	102718	190	33831		200799	108
2005	139439	36	69100	104	304295	52
2006	163864	18	87036	26	340015	12
2007	216865	32	95835	10	449147	32

Table 1 reports the foreign sales of firms that break into a new market in 2003 and keep exporting there in the subsequent years of our data set.[10] We distinguish those exporting in 2003 for the first time ("First Market 2003") from those already exporting elsewhere ("New Market 2003"). To keep the comparison focused, we also look at the sales of the firms from the first group that expand to other markets in 2004 ("Second Market 2004"). The table displays each group's average export value by year. The average firm from all groups increases exports in every period, especially from its first to its second year in a market. Yet the feature of the table that really stands out is the markedly higher initial growth of the new exporters in their first market (190%), relative both to the initial growth of experienced exporters entering new markets (108%) and to the initial growth of the same firms but in the markets they enter later (104%). As we will show, this distinction is also important at the extensive margin, and remains very salient in the data after controlling for firm heterogeneity, country-year specific shocks and other effects.

3.2 Intensive margin export growth

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

Prediction 1 *Conditional on survival, the growth rate of exports to a market is on average higher between the first and second periods in the first foreign market served by the firm than in subsequent markets or later in the firm's first market.*

[10] We focus on 2003 to obtain the longest possible time span after entry.

We test this prediction by estimating the following equation:

$$\Delta \log X_{ijt} = \alpha_1 (FY_{ij,t-1} \times FM_{ij}) + \alpha_2 FM_{ij} + \alpha_3 FY_{ij,t-1} + \{FE\} + u_{ijt},$$

where $\Delta \log X_{ijt}$ is the growth rate of the value of exports between t and $t-1$ by firm i in market j, $FY_{ij,t-1}$ is a dummy indicating whether firm i exported to destination j in $t-1$ for the first time, and FM_{ij} indicates whether j is the firm's first export market. Prediction 1 indicates that $\alpha_1 > 0$. Parameter α_1 indicates whether the growth of continuing exporters is different for fledgling exporters. We also include FM and FY by themselves, because there could be other reasons that make growth distinct in the first export market of a firm or in the firm's first periods of activity in a foreign market, respectively.

Of course, many other factors affect a firm's export growth in a market, such as the general characteristics of the destination country, the economic conditions in the year, and the firm's own distinguishing characteristics. To account for those factors, we include a wide range of fixed effects, indicated by $\{FE\}$, including year, destination—or alternatively, year-destination—and firm fixed effects. Firm fixed effects control for all systematic differences across firms that do not change over time and affect export growth (firm-specific export growth trends). Year-destination fixed effects control for all aggregate shocks that affect the general attractiveness of a market—aggregate demand growth, exchange rate variations, political changes etc. In these and all subsequent regressions, our standard errors allow for clusters in firms.

Importantly, the sample used in this regression consists of firms that exported for at least two consecutive years to a destination—i.e. firms that survive more than a year in a foreign market—and all results are conditional on survival. Thus, selection is not an issue here.

Table 2 displays the results. Results with different sets of fixed effects are presented in columns 1-4. Coefficients for FM_{ij} and $FY_{ij,t-1}$ suggest that growth is not in general higher in firms' first market, but it is so in their early periods of activity in a market. This could reflect market-specific uncertainty (as in Eaton et al. 2009 and Freund and Pierola 2010), or perhaps the dynamics of trust in business relationships.[11] It also reflects a simple accounting phenomenon: since firms enter markets over the year, initial exports appear artificially low in the first year whenever the data are on an annual basis, as here.

Our central finding is that the coefficient associated with the interaction $FY_{ij,t-1} \times FM_{ij}$ is positive and significant in all specifications that include firm fixed effects.[12] Being a new exporter is associated with higher growth over and above the growth of firms in their first year of serving a particular market, or in their initial market. This additional growth component can be explained

[11] Rauch and Watson (2003) argue that exporters to a market "start small" and are only able to expand once their foreign partners are convinced of their reliability. Araujo and Ornelas (2007) point out that evolving trust levels within partnerships substitute for weak cross-border contract enforcement, implying that trade volumes increase over time, conditional on survival.

[12] The insignificant coefficient in the regression without firm fixed effects simply reveals the degree of firm heterogeneity in our sample. It indicates that firms that have high initial growth tend to enter more markets, washing out the differential first-market effect when the firms' average export growth is not accounted for.

Table 2: Intensive Margin Growth (Dependent Variable: $\Delta \log X_{ijt}$)

OLS	1	2	3	4	5	6
$FY_{ij,t-1} \times FM_{ij}$	-.032	.141**	.098**	.095**	.165**	.171**
	(.028)	(.036)	(.036)	(.036)	(.057)	(.036)
FM_{ij}	.025	-.013	-.009	-.008	-.034	-.069*
	(.018)	(.038)	(.039)	(.038)	(.06)	(.036)
$FY_{ij,t-1}$	.263**	.238**	.233**	.233**	.242**	.237**
	(.014)	(.016)	(.016)	(.016)	(.025)	(.016)
$\log X_{i,t-1}$						-.001**
						(.0001)
Firm FE		yes	yes	yes	yes	yes
Year FE			yes			
Destination FE			yes			
Year-Destination FE				yes	yes	yes
Credit-constrained sectors					no	
Number of obs	107390	107390	107390	107390	43258	107390
R-squared	.01	.09	.10	.10	.10	.10

**: significant at 1%; *: significant at 5%
Robust standard errors adjusted for clusters in firms.

neither by market-specific uncertainty nor by the above mentioned accounting phenomenon (which applies equally to all markets in a firm's export history).

The effect of being a new exporter on intensive-margin growth is economically sizeable, too. Unconditional intensive-margin growth in our sample is 20%. However, average growth is about 23 percentage points higher in a firm's initial period of activity in a market, and this effect jumps to 33 percentage points if the market is the firm's first.

It is plausible that this result may be driven by credit constraints, which are likely to affect new exporters more than experienced exporters, since the latter tend to have access to greater retained earnings. To account for the role of credit constraints, we would ideally use credit constraint information at the firm level. Since that information is unavailable to us, we borrow Manova's (2008) measure of 'asset tangibility' to identify the industries that are least credit constrained, i.e. those that have the highest proportion of collateralizable assets. We then define an industry to be relatively credit unconstrained if the value of asset tangibility for the industry is above the median for the whole manufacturing sector (i.e. 30%), and examine whether results are significantly different in the subsample of credit unconstrained firms. Column 5 shows the results. The coefficient on $FY_{ij,t-1} \times FM_{ij}$ remains highly significant and is in fact larger, suggesting that credit constraints actually *limit* the magnitude of the early expansion of new exporters in their first markets.

A common view in the literature is that firms start exporting after experiencing positive persistent idiosyncratic productivity shocks (e.g. Arkolakis 2009, Irrarazabal and Opromolla 2008). Due to serial correlation, growth in exports fades over time as shocks die out. This could explain why early export growth is highest in the first market. A way to partially control for this effect is to include the firm's lagged aggregate export level (in millions). Column 6 shows that, when doing so, the effect of $FY_{ij,t-1} \times FM_{ij}$ on export growth remains positive and significant. It is also considerably higher than in the equivalent specification without the control for lagged exports (column 4). Furthermore, summing the coefficients of $FY_{ij,t-1} \times FM_{ij}$, $FY_{ij,t-1}$ and FM_{ij} in columns 4 and 6, we find that the growth differential between old and new exporters is hardly affected by size controls (about 33 percentage points in both cases).

3.3 Entry

Our model also predicts that new exporters are more likely to enter new foreign destinations:

Prediction 2 *Conditional on survival, new exporters are more likely to enter other foreign markets than experienced ones.*

To test this prediction, we create for every firm i exporting to some destination s other than r at period $t-1$, a binary variable $Entry_{irt}$ that takes value one if firm i *enters* destination r at time t, and zero otherwise. Therefore non-entry corresponds to the choice by an exporting firm i to *not enter* destination r at time t, although it might do so in the future. When $Entry_{irt} = 1$, that firm-destination pair ir leaves the sample from $t+1$ onwards. The sample consists of all firms that export for at least 2 years.

Since entry in a specific country in a specific year is a rather rare event for any firm, we group countries in nine relatively homogenous regions to make the analysis more meaningful: Mercosur, Chile-Bolivia (Argentina's neighbors that are not full Mercosur members), Other South America, Central America-Mexico, North America, Spain-Italy (Argentina's main historical migration sources), EU-27 except Spain-Italy, China, and Rest of the World.[13] As we discuss below, we obtain equivalent results when using the total number of national markets served by a firm.

We thus run the following regression on the probability of starting to export to a new market:

$$\Pr[Entry_{irt} = 1] = \beta_1 FY_{i,t-1} + \{FE\} + v_{irt},$$

where $FY_{i,t-1}$ indicates whether the firm's export experience started at $t-1$ (i.e., whether t is firm i's second year as an exporter). We include a wide range of fixed effects here as well. Coefficient β_1 indicates whether fledgling exporters are more or less likely to enter new destinations than experienced exporters.

Results with different sets of fixed effects are presented in columns 1-3 of Table 3. $FY_{i,t-1}$ has a positive and highly significant coefficient in all three specifications. The magnitudes may look small at first, but recall that they reflect entry in a given region in a given year, so the entry we consider is a rather specific event. We find that the probability of entering an "average" destination in an "average" year is around one percentage point higher if the firm is a new exporter. This compares with an overall average probability of 7% of entering a new foreign region.

[13] We experimented with alternative groupings of destinations; they yield qualitatively equivalent results. Similarly, notice that our grouping of countries in regions implies that when a firm enters a new country in a region r where it already exports, this is not coded as entry. Considering entry/non-entry within the region does not make an important difference to the results either.

Again, this may be explainable by credit constraints. For example, if firms face liquidity constraints at entry, then the inability of either financing sunk entry costs internally or of obtaining the necessary external credit could force some firms to enter foreign markets sequentially when they would prefer to enter them simultaneously. Employing a panel of bilateral exports at the industry level, Manova (2008) finds that credit constraints are indeed important determinants of export participation. Similarly, Muuls (2009) finds that credit constraints make Belgian exporters less likely to expand to other foreign destinations. Since credit constraints may be correlated with being a new exporter, we need to check whether they are driving our results. Column 4 shows the results when we exclude the firms in the sectors more likely to be credit constrained according to Manova's measure. Results are unchanged.

Table 3: Probability of Exporting to a New Market

Dependent Variable:	$Entry_{irt}$	$Entry_{irt}$	$Entry_{irt}$	$Entry_{irt}$	$Entry_{irt}$	$Entry_{irt}$	$Entry_{irt}$	$D(ND)_{it}$
LPM	1	2	3	4	5	6	7	8
$FY_{i,t-1}$	.008**	.015**	.009**	.009**	.009**	.009**	.006**	.048**
	(.001)	(.002)	(.002)	(.002)	(.004)	(.002)	(.002)	(.010)
$\log X_{i,t-1}$						-.001*		
						(.0001)		
$\Delta logX_{i,-r,t}$							.006**	.052**
							(.001)	(.003)
$\Delta logX_{i,-r,t} \times FY_{i,t-1}$							-.005**	-.043**
							(.002)	(.008)
$NArgExp_{kr,t-1}$					.095**			
					(.009)			
$\Delta logXArgExp_{krt}$					.004**			
					(.001)			
Tests:								
$FY_{i,t-1} + (\Delta logX_{i,-r,t} \times FY_{i,t-1}) \times .10 = 0$							5.25	
							[.002]	
$FY_{i,t-1} + (\Delta logX_{i,-r,t} \times FY_{i,t-1}) \times .08 = 0$								19.80
								[.0001]
Firm FE		yes	yes	yes	yes	yes	yes	yes
Year FE								yes
Year-Destination FE			yes	yes	yes	yes	yes	
Credit-constrained sectors				no				
Number of obs	235693	235693	235693	87892	227769	235693	220335	29760
R-squared	.0002	.08	.09	.09	.10	.09	.10	.32

**: significant at 1%; *: significant at 5%
Robust standard errors adjusted for clusters in firms. P-values in square brackets.

Another possibility is that FY is just picking up the effects of within-industry learning, as for example in Hausmann and Rodrik (2003) or Krautheim (2008). That is, firms may use the entry of domestic rivals in foreign markets as a signal of their own odds of success as exporters.[14] To

[14] The idea of learning from the experience of others in foreign markets extends also to the product extensive margin (Iacovone and Javorcik 2010), as well as to decisions beyond exporting, such as foreign direct investments (Lin and Saggi 1999).

consider this possibility, we estimate the following expanded specification of our entry regression:

$$\Pr[Entry_{irt} = 1] = \beta_1 FY_{i,t-1} + \beta_2 NArgExp_{kr,t-1} + \beta_3 \Delta logX(ArgExp_{krt}) + \{FE\} + \xi_{ijt},$$

where $NArgExp_{kr,t-1}$ is the number of Argentine exporters (measured in thousands) in industry k selling to region r at $t-1$ and $\Delta logX(ArgExp_{krt})$ is the export growth to r of these same competitors between t and $t-1$. These variables control, respectively, for static and dynamic characteristics of export profitability that a firm may infer from observing its rivals. Column 5 displays the results. Consistently with within-industry learning effects, the number and the growth rates of domestic competitors in a given destination help to explain entry there. Nevertheless, the result that a new exporter is more likely to enter a new destination than an experienced exporter remains unchanged.

Now, although we control for time-invariant unobserved heterogeneity by using firm fixed effects, it could be that firms' extensive margin expansion in their early years as exporters simply reflects positive idiosyncratic productivity shocks that induced them to start exporting in the first place. As before, we can control for persistent shocks by including the firm's lagged export level. As shown in column 6, the effect of $FY_{i,t-1}$ withstands this control. Moreover, since idiosyncratic productivity shocks would induce expansion at both intensive and extensive margins, we can also control for them by introducing intensive margin export growth (in the current destinations), by itself and interacted with our indicator for new exporters, $FY_{i,t-1}$:

$$\Pr[Entry_{irt} = 1] = \beta_1 FY_{i,t-1} + \beta_2 \Delta logX_{i,-r,t} + \beta_3 \left[\Delta logX_{i,-r,t} \times FY_{i,t-1}\right] + \{FE\} + \eta_{irt}.$$

The results are displayed in column 7. The coefficient of $FY_{i,t-1}$ remains positive and significant. But we want to check whether being a new exporter matters for subsequent entry also among the firms expanding at the intensive margin. The relevant comparison is between new and old exporters growing at the same rate g. A fledgling exporter growing at rate g is more likely to enter a new destination than an experienced exporter growing at same rate if $\beta_1 + \beta_3 g > 0$. At the point estimates, this condition is equivalent to $g < 1.2$. Close to 97% of the observations satisfy this condition. At the sample median, $g = .10$, this sum is positive and highly statistically significant, as the F-test shows.

Finally, in column 8 we run a different regression, where we simply look at whether a surviving exporter increased its number of foreign destinations (in which case $D(ND)_{it} = 1$). This regression has the disadvantage of treating all destinations equally. On the other hand, it considers entry in each of the 130 individual markets in the sample. We find that new exporters are 4.8 percentage points more likely to expand the number of markets they serve than experienced ones. This is near a fifth of the overall (unconstrained) probability that a surviving exporter will expand the number of destinations it serves, 22%. As we also include intensive-margin growth in the regression, the point estimates indicate that a new exporter growing at rate g is more likely to add a new destination than an experienced exporter growing at the same rate if $g < 1.12$. At the sample median of

$g = .08$, the F-test shows that this condition is easily satisfied.

3.4 Exit

We turn now to the exit patterns of exporting firms. Our model predicts that the probability that firm i will exit a particular export market j in period t ($Exit_{ijt} = 1$) is higher if the firm exported for the first time in $t-1$:

Prediction 3 *New exporters are more likely to exit than experienced exporters, including those that are new in a market but have export experience elsewhere.*

To test this prediction, we estimate the following equation:

$$\Pr[Exit_{ijt} = 1] = \gamma_1(FY_{ij,t-1} \times FM_{ij}) + \gamma_2 FM_{ij} + \gamma_3 FY_{ij,t-1} + \{FE\} + \zeta_{ijt}.$$

Coefficient γ_1 indicates whether the exit behavior of fledgling exporters is different from the behavior of older exporters. The sample consists of all exporting firms. Again, we introduce fixed effects to account for country and year specific factors that affect exit. Firm fixed effects, on the other hand, are *not* appropriate for the exit regressions, since we want to identify the behavior of single-year exporters. As most single-year exporters represent only one observation in our data set, they are excluded when we focus on within-firm variation. The only cases of single-year exporters that remain after controlling for firm fixed effects are re-entrant single-year exporters (firms that exported prior but not at $t-2$, and exited after exporting again at $t-1$) or simultaneous single-year exporters (those that broke simultaneously into more than one market in $t-1$ and exited in t). But as we show in the next subsection, the behavior of those types of exporters is very different.

Table 4 shows the results. Observe first that, in all estimations without firm fixed effects (columns 1-3 and 6-7), the coefficients associated with $FY_{ij,t-1}$ and FM_{ij} are positive and significant, indicating that in general exit from a market is more likely in a firm's first market and in its early periods of operation in a market. More importantly, the coefficient of the interaction $FY_{ij,t-1} \times FM_{ij}$ is also positive and significant in those regressions, confirming that exit rates from a market are highest for fledgling exporters. Magnitudes are also economically significant. Being a fledgling exporter increases the probability of exiting a market by almost 29 percentage points relative to an exporter with experience and in a market other than its first, by 15 percentage points relative to an experienced exporter operating in its first foreign market, and by over 26 percentage points relative to an experienced exporter that has just entered an additional market. These figures compare with an overall average probability of 7% of exiting a market in a certain year.

Once firm fixed effects are introduced (columns 4 and 5), the sign of the interaction (and of $FY_{ij,t-1}$) shifts to negative. This shows that the exit patterns of firms that re-start to export or start exporting in more than one market simultaneously are indeed very different from those of the firms that start with a single market. Specifically, new simultaneous exporters and re-entrants are, jointly, less likely to exit than continuing exporters.

Table 4: Probability of Exit (Dependent Variable: $Exit_{ijt}$)

LPM	1	2	3	4	5	6	7
$FY_{ij,t-1} \times FM_{ij}$	.122**	.121**	.125**	-.199**	-.197**	.123**	.137**
	(.004)	(.006)	(.006)	(.003)	(.003)	(.008)	(.004)
FM_{ij}	.154**	.149**	.138**	-.015**	-.017**	.133**	.125**
	(.003)	(.004)	(.004)	(.003)	(.003)	(.006)	(.006)
$FY_{ij,t-1}$	.017**	.015**	.025**	-.011**	-.013**	.021**	.025**
	(.001)	(.001)	(.001)	(.001)	(.001)	(.002)	(.001)
$\log X_{i,t-1}$							-.002**
							(.0002)
Firm FE				yes	yes		
Sector FE		yes	yes			yes	yes
Year-Destination FE			yes		yes	yes	yes
Credit-constrained sectors						no	
Number of obs	119610	119610	119610	119610	119610	71349	119610
R-squared	.13	.14	.15	.69	.70	.15	.15

**: significant at 1%; *: significant at 5%
Robust standard errors adjusted for clusters in firms.

In column 6 we exclude firms from sectors likely to be credit constrained. Estimates are virtually unchanged from those in columns 1-3. In column 7 we control for firms' lagged export levels, since low sales in a year may suggest a low expectation of survival. This is indeed what we find. There is however little change in the coefficient of $FY_{ij,t-1} \times FM_{ij}$. If we interpret a firm's lagged export levels as a proxy for firm size previous to entry, the results in column 7 imply a hazard rate decreasing in export tenure, controlling for firm size.

3.5 Re-entrants, Simultaneous Exporters, Homogeneous Products

As discussed in the previous section, we expect the differential effect between new and old exporters to be less pronounced for firms that are re-starting to export (and therefore are not really "new" exporters), for those that start selling to multiple foreign markets (which according to our model should be more optimistic about their export profitability), and for those that sell homogeneous goods (and are likely to face less uncertainty ex ante).

Since we cannot spot all re-entrants (i.e. some firms that we identify as "true" new exporters may have exported before 2002, the first year of our sample), in the previous regressions we treat all firms that export at t but not at $t-1$ as new exporters.[15] But we can also test explicitly for differential effects between "true" new exporters and the firms that we can identify as re-entrants. To do so, we re-run the main regressions on intensive margin, entry and exit restricting the sample to those firms that we can identify as re-entrants. We also run the main regressions restricting the sample to the firms that start to export in more than one country. Further, we run the regressions again by restricting the sample to homogeneous products; we follow Rauch's (1999) "conservative" classification to define a good as homogeneous. Finally, we re-run the regressions excluding all the

[15] Observations associated with the activities of identified re-entrants range from 2% to 6% of the observations in the different samples.

observations included in the previous "special" samples. We denote the firms in that sample by "SqExp." We add year-destination fixed effects in all regressions, sector fixed effects in the exit regression, and firm fixed effects in the intensive margin and entry regressions.

Table 5 displays the results for the intensive margin growth. First year-first market growth is not especially higher for any of the three special groups, but it is for the SqExp firms. Simultaneous and homogeneous goods exporters do grow faster early in a market, but this growth is not different in the first market relative to subsequent markets.

Table 5: Intensive Margin Growth (Dependent Variable: $\Delta \log X_{ijt}$)

	Re-entrants	Simultaneous	Homogenous	SqExp
$FY_{ij,t-1} \times FM_{ij}$	.136	.034	-.008	.214**
	(.168)	(.091)	(.155)	(.051)
FM_{ij}	-.405**	-.029	.088	.017
	(.140)	(.069)	(.155)	(.051)
$FY_{ij,t-1}$	-.031	.249**	.352**	.226**
	(.154)	(.075)	(.049)	(.017)
Firm FE	yes	yes	yes	yes
Year-Destination FE	yes	yes	yes	yes
Number of obs	5029	9220	9226	87202
R-squared	.436	.285	.118	.009

**: significant at 1%; *: significant at 5%
Robust standard errors adjusted for clusters in firms.
'Re-entrants' are firms that export in year t, having exported also previously to $t-1$ but not in $t-1$.
'Simultaneous' are firms that sell to more than one foreign destination in their first year of exporting.
'Homogenous' are firms that sell homogenous goods according to Rauch's (1999) classification.
'SqExp' encompasses the firms not included in the other categories.

Table 6 shows the results for the entry regressions. Only the SqExp firms display a distinguishably higher probability of entering a different region right after its first year as exporter.

Table 6: Probability of Exporting to a New Market (Dependent Variable: $Entry_{irt}$)

	Re-entrants	Simultaneous	Homogenous	SqExp
$FY_{i,t-1}$	-.061*	.001	.012	.012**
	(.031)	(.007)	(.008)	(.002)
Firm FE	yes	yes	yes	yes
Year-Destination FE	yes	yes	yes	yes
Number of obs	6884	21564	13844	196389
R-squared	.17	.15	.08	.09

**: significant at 1%; *: significant at 5%
Robust standard errors adjusted for clusters in firms.
'Re-entrants' are firms that export in year t, having exported also previously to $t-1$ but not in $t-1$.
'Simultaneous' are firms that sell to more than one foreign destination in their first year of exporting.
'Homogenous' are firms that sell homogenous goods according to Rauch's (1999) classification.
'SqExp' encompasses the firms not included in the other categories.

Table 7 presents the exit regressions. First year-first market exit rates are especially high for the SqExp firms and also for producers of homogeneous goods; the effect is however twice as large for the former. For simultaneous exporters, the interaction term is also positive and significant. However, the coefficients of FM and FY are themselves negative and significant, and of a magnitude similar to the coefficient of the interaction term. Thus, for firms in their first market, the additional effect on exit rates from being in the first year is given by the sum of the coefficients on FY and $FM \times FY$, which is indistinguishable from zero. The same is true for the additional effect from being in the first market for firms that are new in a market.

Table 7: Probability of Exit (Dependent Variable: $Exit_{ijt}$)

	Re-entrants	Simultaneous	Homogenous	SqExp
$FY_{ij,t-1} \times FM_{ij}$	.032	.233**	.123**	.247**
	(.106)	(.042)	(.017)	(.007))
FM_{ij}	-.125	-.217**	.124**	.138**
	(.108)	(.045)	(.024)	(.005)
$FY_{ij,t-1}$	-.101	-.239**	.010**	.022**
	(.107)	(.043)	(.004)	(.001)
Sector FE	yes	yes	yes	yes
Year-Destination FE	yes	yes	yes	yes
Number of obs	1849	7014	9637	102731
R-squared	.16	.07	.16	.19

**: significant at 1%; *: significant at 5%
Robust standard errors adjusted for clusters in firms.
'Re-entrants' are firms that export in year t, having exported also previously to $t-1$ but not in $t-1$.
'Simultaneous' are firms that sell to more than one foreign destination in their first year of exporting.
'Homogenous' are firms that sell homogenous goods according to Rauch's (1999) classification.
'SqExp' encompasses the firms not included in the other categories.

In sum, re-entrants are neither more likely to grow if they survive, nor more likely to exit right after re-entering their first market, than later in their export experience. Neither are they more likely to expand to different regions right after re-starting foreign sales than later. Being new does not matter for the dynamic pattern of firms that start selling in multiple markets either. The same is true for producers of homogeneous goods except for their exit rates, which are higher upon entry than later in their export experience. This differential effect for new exporters of homogeneous products is nevertheless not as high as it is for the SqExp group of firms.

An alternative way to check for the differential effects is to interact dummy variables for each subsample with our key covariates in the growth, entry and exit regressions. This allows us to compare the relative strength of sequential exporting behavior in each group relative to the reference group of all experienced exporters. The results from this exercise are, on the whole, similar to those reported here. They are available in a previous working paper version of this article (Albornoz et al. 2010, section 3.3).

3.6 Other robustness checks

We have also run additional regressions to check whether the results we obtain are driven by some omitted variable correlated with FM or FY. These are as follows. (i) We exclude exports of "samples," defined as yearly transactions of less than \$1000, to see whether our results are driven by very small exporters.[16] (*ii*) We re-define "initial experience" more liberally, setting $FY = 1$ for the first two years of exporting. (*iii*) We employ different adjustments of robust standard errors, like clustering in destinations and firm-destinations. (*iv*) We use lagged exports to the same destination ($X_{ij,t-1}$) instead of lagged total exports ($X_{i,t-1}$) to control for size in the growth and exit regressions. None of the results from those alternative specifications change our main messages in an important way. We also test whether experience in the second year is relevant. We find that the coefficients associated with $FY_{ij,t-2} \times FM_{ij}$, for the intensive margin and exit, or $FY_{i,t-1}$, for entry, are either insignificant or considerably smaller than the equivalent for the first year. This suggests that learning takes place mostly in the first year. These robustness checks are unreported to save space but available upon request.

3.7 Alternative mechanisms

Our empirical analysis strongly supports the qualitative predictions from our model. The plausibility of our mechanism is also in harmony with case study evidence on firms starting to export. While there are (obviously) other forces that shape the dynamic behavior of exporting firms, we are unaware of alternative theoretical models that could deliver this set of predictions without adopting the key element of our mechanism, namely export profitabilities at the firm level that are ex ante uncertain but correlated over time and across destinations.

There are forces that could explain some of the empirical findings we uncover. The difficulty is in finding a single mechanism that generates the dynamic patterns in *all* the three margins we explore. Consider for example that not uncertainty, but binding capacity constraints are the key behind the empirical findings we obtain. If a firm faced binding capacity constraints as it entered foreign markets, but capacity could be expanded disproportionately within a year, intensive-margin growth and the probability of expansion to other markets would indeed be disproportionately high in the second year. However, high early exit would remain puzzling, as survival should not depend on (sunk) capacity-building costs. Likewise, a "learning-by-exporting" process by which an exporter's productivity improves with exposure to foreign competition would be compatible with high early intensive-margin growth, provided that most learning takes place in the initial period of foreign activities. A learning-by-exporting process is, however, also difficult to reconcile with our findings about high early exit.[17]

Similarly, the firm fixed effects that we use in the intensive margin and entry regressions imply that there is more to the dynamics of new exporters than deterministic productivity differences in level or trend, but they cannot account for idiosyncratic firm productivity shocks. We attempt to control for time-varying idiosyncratic shocks by adding firms' lagged export volumes and lagged export growth. Still, it is arguable that these proxies do not capture time-varying, firm-specific

[16] We also try \$2000 and \$3000 as alternative thresholds.

[17] Since the evidence on learning from exporting indicates that, if it exists, it is likely to be specific to the destination market (see the survey by Wagner 2007), such a mechanism would also be unable to explain why fledgling exporters are more likely to enter new markets than experienced exporters.

shocks fully. If so, it would be conceivable that the portion of the autocorrelated productivity shocks not captured by our proxies may explain why intensive-margin growth and the probability of entry in new destinations are especially high in the early periods of exporting. However,as pointed out by Ruhl and Willis (2008), models with sunk export costs and persistent TFP shocks predict that the hazard rate out of exporting *increases* with export tenure, as serially correlated shocks die out over time. We find that the opposite is true, when firms break into a new foreign market[18] and especially in their first export destinations.[19]

Still, these findings would not be inconsistent with stochastic productivity advances, as Arkolakis and Papageorgiou (2010) show in current work in progress. Their goal is to explain how age, conditional on size, affects firm dynamics in a closed economy. They allow TFP to follow a first-order Markov process, but firms can uncover their demand parameter only by producing, as in Jovanovic (1982). This assumption is crucial to generate growth and exit hazard rates that decline with age, controlling for size. In a multi-market setting like ours, it would be tantamount to assuming that a firm has to export to gauge its export profitability.

Another possibility is that firms develop "global reputations." This could be studied, for example, in a framework that extends partnership models like Rauch and Watson's (2003) or Araujo and Ornelas' (2007) to a multi-market context. The key element would be that exporters' activities across markets need to become public information to all distributors globally. If this process took place within a short period of time after the first export incursion, then such a model could probably deliver empirical regularities similar to the ones we obtain. If, however, global reputation took longer to build than a single year, this would not be the main force driving our empirical findings.

4 Trade Policy Implications

Our empirical analysis strongly suggests that correlation of firms' export profitabilities over time and across destinations is an important ingredient of firms' export decisions. Does that matter? Should we care? We argue that we should. In addition to providing new insights on firms' decisions to export and their dynamic behavior in foreign markets, the mechanism we propose also implies that the impact of trade policy on trade flows is more nuanced (and potentially much larger) than standard trade theories suggest. This opens new perspectives from which we can understand and assess the benefits of trade policy coordination across countries, as in regional and multilateral trade agreements. Our mechanism also uncovers dynamic effects of trade policy, which have been relatively neglected by researchers. To make these contributions clear, we examine the effects of trade liberalization in a simple extension of the model that includes many firms/sectors.

Consider a continuum of total mass one of firms with heterogeneous sunk costs of exporting, F. Let F follow a continuous c.d.f. $H(F)$ on the support $[0, \infty)$. As before, for each firm ex ante

[18] As in previous studies focusing on the hazard rates out of exporting, such as Besedes and Prusa (2006).

[19] Recent stochastic models of export dynamics without sunk export costs, such as Arkolakis (2009) or Irrarazabal and Opromolla (2009), fail to generate some of our empirical findings, too. In particular, in those models the growth rate and the hazard rate need not decrease with age, once size is controlled for.

profitability follows $G(\mu)$. Let $h(\cdot)$ and $g(\cdot)$ denote the p.d.f.s of $H(\cdot)$ and $G(\cdot)$, respectively. We assume that F and μ are independently distributed. Assuming independence is analytically very convenient. In particular, it implies an equivalence between having a single firm (as in the basic model) and a continuum of monopolists.

The number of potential firms in Home is exogenous and normalized to one. The total number of exporters to market $j = A, B$ in period $t = 1, 2$, M_t^j, follows from Proposition 1:

- $M_1^A = H\left[F^{Sq}(\tau^A, \tau^B)\right]$ firms export to market A at $t = 1$;
- $M_1^B = H\left[F^{Sm}(\tau^B)\right]$ of firms export to market B at $t = 1$;
- $M_2^A = H\left[F^{Sq}(\tau^A, \tau^B)\right]\left[1 - G(\tau^A)\right]$ of firms export to market A at $t = 2$, all of which already exported to A at $t = 1$;
- $M_2^B = H\left[F^{Sm}(\tau^B)\right]\left[1 - G(\tau^B)\right] + \int_{F^{Sm}}^{F^{Sq}}\left[1 - G(2F^{\frac{1}{2}} + \tau^B)\right]dH(F)$ firms export to market B at $t = 2$. The first term corresponds to continuing exporters, the second to entrants;
- $1 - H\left[F^{Sq}(\tau^A, \tau^B)\right]$ firms do not export.

Quantities sold in markets $j = A, B$ at $t = 1$ follow $\widehat{q}_1^j$, as defined in expressions (6) and (7). sold at $t = 2$ by new and old exporters follow the expressions developed in subsection 2.2.1.

Let us then look at the effects of a $t = 1$ permanent decrease in trade cost τ^j on export levels. Consider first the intensive margin. Clearly, a fall in τ^A increases sales of current exporters to A at $t = 1$ without affecting sales to B, while a fall in τ^B has symmetric immediate effects. At $t = 2$, export levels rise for surviving exporters. This is counterbalanced by a negative composition effect: the new entrants benefiting from lower trade costs operate at a lower-than-average scale. The overall intensive margin effect is therefore generally ambiguous.[20]

The most interesting and novel features of the model regard however the extensive margin effects of trade liberalization. As a first step, we determine how variable trade costs affect the entry thresholds $F^{Sm}(\tau^B)$ and $F^{Sq}(\tau^A, \tau^B)$.

Lemma 1 *Variable trade costs in markets A and B affect the sunk cost thresholds as follows:*

- $\frac{dF^{Sm}}{d\tau^A} = 0$;
- $\frac{dF^{Sm}}{d\tau^B} = -\mathbf{1}_{\{E\mu > \tau^B\}} \frac{\left(\frac{E\mu - \tau^B}{2}\right) + \int_{\tau^B}^{2\left[F^{Sm}\right]^{1/2} + \tau^B}\left(\frac{\mu - \tau^B}{2}\right)dG(\mu)}{G(2[F^{Sm}]^{1/2} + \tau^B)} \leq 0$;
- $\frac{dF^{Sq}}{d\tau^A} = -\frac{\left[\mathbf{1}_{\{E\mu > \tau^A\}}\left(\frac{E\mu - \tau^A}{2}\right) + \int_{\tau^A}^{\overline{\mu}}\left(\frac{\mu - \tau^A}{2}\right)dG(\mu)\right]}{2 - G\left(2[F^{Sq}]^{1/2} + \tau^B\right)} < 0$;

[20] Lawless (2010) shows that both effects exactly offset each other in a heterogeneous firms' model *a la* Melitz (2003) whenever export sales follow a Pareto distribution. She finds ambiguous intensive margin effects of trade cost reductions in empirical work on U.S. firms' exports.

- $\frac{dF^{Sq}}{d\tau^B} = -\frac{\left[\int_{2[F^{Sq}]^{1/2}+\tau^B}^{\overline{\mu}} \left(\frac{\mu-\tau^B}{2}\right) dG(\mu)\right]}{2-G\left(2[F^{Sq}]^{1/2}+\tau^B\right)} < 0.$

We can now establish the extensive margin effects of trade liberalization in countries A and B in both the short and the long runs.

Proposition 3 *Trade liberalization in a country has qualitatively different effects on entry in the short and long runs, and encourages entry in other countries. Specifically:*

a) A decrease in τ^A at $t = 1$, holding τ^B fixed:

1. *increases the number of Home exporters to A at $t = 1$ and at $t = 2$;*
2. *has no effect on Home exports to B at $t = 1$, but increases the number of Home exporters to B at $t = 2$.*

b) A decrease in τ^B at $t = 1$, holding τ^A fixed and such that τ^B remains larger than τ^A:

1. *increases the number of Home exporters to A at $t = 1$ and $t = 2$;*
2. *increases the number of Home exporters to B at $t = 1$ and $t = 2$.*

Proposition 3 has three startling elements. First, it shows that trade liberalization has immediate as well as delayed effects on trade flows. This distinction is especially important given economists' typical focus on the static gains from trade; our analysis indicates that we should not disregard lagged responses of trade flows to trade barriers. Second, the Proposition shows that trade liberalization in a country induces entry into other countries. Third, it shows that this induced entry in other markets is always present in the long run, but not necessarily in the short run.

To see this more intuitively, consider first the short run. A lower τ^A makes early entry in market A more appealing, as expected, but so does a lower τ^B, because it increases the profits from potentially entering market B at $t = 2$. By contrast, while τ^B directly affects the decision to enter market B at $t = 1$, τ^A plays no direct role in that decision. The reason is that the choice between entering markets sequentially or simultaneously is unaffected by τ^A. Conversely, in the long run there is no asymmetry and cross-market effects are always present. As variable trade costs fall, firms' potential future gains from learning their export profitabilities increase. As a result, more firms choose to engage in exporting. Among those new exporters, a fraction will find it profitable to enter other destinations in the future.

Hence, Proposition 3 implies that trade liberalization in a country creates *trade externalities* to other countries. From the perspective of Argentine firms, for example, this means that events such as the opening of the Chinese market since the late 1990s may have induced some firms to start exporting to Argentina's *neighbors*: even though trade policy in those countries have changed little in the last ten years, the better prospect of serving the Chinese market increases the attractiveness of experimenting as exporters, and nearby markets could serve that role. Similarly, the formation of Mercosur in 1991 may have been responsible for the subsequent entry of some Argentine firms in North American or European markets, as they realized their export potential by serving the Mercosur partners.

The Mercosur example also highlights the fact that the consequences of trade agreements could be very different from what existing studies suggest. Specifically, an RTA will tend to spawn an *extensive margin trade creation effect*—and one that involves *third countries*. That is, even from a purely partial equilibrium perspective, regional integration can create trade with non-partner countries for reasons that are entirely different from those emphasized in the existing literature, and involving not greater imports, but enhanced *exports* to non-members. Naturally, empirical research focused on this effect is necessary to gather its practical relevance.[21]

It is also important to note that our structure abstracts from several channels through which trade liberalization can affect firms (e.g. by changing the number of active firms), some of which may interact with the forces we highlight here. Still, as long as sequential entry remains optimal for some firms, the nature of our main policy implications would not be qualitatively altered.

5 Conclusion

Using data on Argentine exports at the firm-destination-year level, we find that, entry sunk costs notwithstanding, many of the firms that start exporting drop out of the export business very shortly. By contrast, the successful ones grow at both the intensive and the extensive margins. We refer to this empirical pattern as "sequential exporting." This pattern is not generally observed, however, when firms re-start exporting after a break, or among firms that start exporting simultaneously to multiple markets, or among exporters of homogeneous goods.

While rich in several dimensions, recent trade models based on selection due to heterogeneity in productivity and export sunk costs are often ill-equipped to address these dynamic patterns. Here we argue that export profit idiosyncratic uncertainty and the role of self-discovery are also key ingredients to firms' export dynamics.[22] We develop what is perhaps the simplest model that can

[21] Our data set does not permit such an evaluation because Argentina has not entered in any RTA since Mercosur, which came into force eleven years before our sample starts. However, two recent empirical papers find that RTAs are indeed very conducive of sequential exporting. Borchert (2009) finds that the growth of Mexican exports to *Latin America* from 1993—right before NAFTA came into force—to 1997 is higher, the greater the reduction in the preferential U.S. tariff under NAFTA for that product. Moreover, and critically, this effect comes entirely from changes in the *extensive* margin. Similarly, using trade data for 36 countries at the 5-digit level and eleven RTAs over an 11-year window, Molina (2010) identifies a strong positive effect of RTAs in promoting exports of products first sold to RTA partners as a result of intra-bloc liberalization to countries outside the bloc. While most existing trade models would find it difficult to explain these findings, they correspond to a direct implication of our model. A related study by Molina, Bussolo and Iacovone (2010) on the extensive margin effects of the accession of the Dominican Republic to the Central American Free Trade Agreements, which includes the U.S., is also in line with RTAs playing a decisive role in boosting firms' incentives to experiment in foreign markets. They document a sharp increase in the number of exporting firms from the Dominican Republic to the bloc partners immediately after the agreement took effect, followed by a sharp increase in exit in the subsequent year.

[22] A step towards integrating some of our insights within a heterogeneous productivity framework has been undertaken by Arkolakis and Papageorgiou (2010) in current work in progress.

address the implications of this mechanism. A firm discovers its profitability as an exporter only after exporting takes place. The firm conditions the decision to serve other destinations on this information. Since breaking into new markets entails unrecoverable costs and export profitability has global scope, the firm has an incentive to enter foreign destinations sequentially. For example, neighboring markets can serve as "testing grounds" for future expansions to larger or more distant markets.

This mechanism has far-reaching implications for trade policy. First, it implies a *trade externality*: exports to a country could increase because *other* countries have liberalized trade, thereby making experimentation in foreign markets more profitable. As a result, quantitative assessments of major proposals for multilateral liberalization, like those discussed under the current Doha Round of negotiations in the World Trade Organization, could greatly understate their impact on trade flows, since they do not account for lagged and third-country effects on firms' export decisions. The same is true for studies seeking to evaluate the historical effectiveness of the GATT/WTO system in promoting trade (e.g. Rose 2004). Furthermore, and although our model is not designed for normative analysis, it seems clear that the trade externality we uncover reinforces the need for multilateral coordination of trade policies across countries.[23]

Similar implications apply to the more limited—but much more widespread—arrangements of liberalization at the regional level. Regional liberalization raises the number of firms willing to experiment with intra-regional exports. Eventually, some of those firms choose to break into extra-regional markets as well. This lagged trade-creation effect toward non-members corresponds to an implication of regional trade agreements that the literature has so far entirely neglected.

Notice, on the other hand, that the trade externality by itself does not warrant export promotion policies. One may be led to think that, because entry in one foreign market can lead to future entry in other destinations, governments may play a positive role in this process by enacting policies that induce domestic firms to start exporting. But this need not be the case if individual firms take all the benefits related to their future export performance into account when deciding whether to become an exporter. Naturally, if the government had access to a better technology to acquire and disseminate information than those available to the private sector, then there could be a role for export promotion policies.[24] Similarly, if there were market inefficiencies—e.g. credit constraints that prevent willing domestic firms from entering foreign markets—then their interaction with our proposed mechanism could provide a role for public intervention. But such market inefficiencies alone may already justify active trade policies at the national level, even in the absence of sequential exporting. A careful assessment of such issues would nevertheless require a fully specified general equilibrium model. This is beyond the scope of this paper, but future research building on our framework could deliver important insights for the design of national trade policies.

[23] None of the existing explanations for multilateral trade cooperation—based on terms of trade effects (Bagwell and Staiger 1999), commitment motives (Maggi and Rodriguez-Clare 2007), production relocation externalities (Ossa 2009), strategic uncertainty (Calvo-Pardo 2009), or profit-shifting motives (Mrazova 2010)—accounts for the sequentiality of firms' export strategies.

[24] Lederman, Olarreaga and Payton (2010) provide suggestive evidence that this may be the case.

Sequential exporting strategies could also help to rationalize some empirical findings from the trade literature, such as the apparent excess sensitivity of trade flows to changes in trade barriers (Yi 2003) and the greater sensitivity of trade flows to trade costs at the extensive relative to the intensive margin (Bernard et al. 2007, Mayer and Ottaviano 2007). Similarly, the sequential exporting process hints that the gains from trade may extend well beyond the static gains typically emphasized in the literature. However, for a thorough evaluation of the implications of sequential exporting for these issues, a more general theoretical structure would be required.

A distinct but equally promising avenue for future research is in exploring the mechanism we lay out in this paper at a more disaggregated level, seeking to identify the types of products, or the sectors, as well as the characteristics of foreign markets, for which the process of sequential exporting is more relevant.[25] For example, it would be very interesting to evaluate whether there is a dynamic counterpart to the hierarchy of markets uncovered by Eaton et al. (2010). They find that distant, difficult markets are accessed solely by the highly productive firms; is it also true that those firms sell to difficult markets only later in their internationalization process? To focus on the basic mechanism we abstract from these issues here, taking instead the extreme view that the correlation of export profitabilities across destinations is the same for all sectors and for all pairs of countries. Undeniably, this is a crude approximation. In reality, we should observe instead a matrix of correlations across countries for each sector. Exploring the structure of those matrices is beyond the scope of this paper, but it could prove very useful, making it possible to fine tune the analysis of firms' export strategies and of the impact of trade policies. We look forward to advances in those areas.[26]

6 Appendices

6.1 Appendix A: Proofs

Proof of Proposition 1. Rewrite condition (16) for $e_1^B = 1$ as

$$F + W(\tau^B; F) < \Psi(\tau^B). \tag{17}$$

[25] Alternatively, one could study the sequentiality of a firm's entry modes in a foreign market. This is the approach followed by Conconi et al. (2010) in recent work, where they modify our framework to study whether exporting to a market serves as a testing ground for a firm's (potential) future foreign direct investment in that market.

[26] Three recent papers provide some initial steps in this direction. Using our data set and empirical methodology, Elliott and Tian (2010) evaluate the patterns of sequential exporting of Argentine firms in Asia. They find that China serves as the main stepping stone for entry in the ten members of the ASEAN free trade bloc. Japan also plays such a role, but the effect is smaller, while entry in Europe and in the U.S. does not foster subsequent entry in ASEAN. Defever et al. (2010) generalize our setup to a spatial model to study the geographic spread of Chinese exports between 2003 and 2005. They find a positive correlation in unobserved firm profits across neighboring countries, even after controlling for firm productivity. Morales et al. (2010) develop a novel structure based on a moment inequalities approach to estimate firms' fixed and sunk costs of accessing foreign country i after having sold in a different foreign country j. This path-dependence, which the authors refer to as "extended gravity" factors, matters if a firm's export profitability is correlated across markets (in their model through correlation in costs). Looking at chemical firms from Chile and focusing on proximity and on the similarity of GDPs and language, Morales et al. find that extended gravity factors play indeed an important role in explaining entry in foreign markets.

The right-hand side of (17) is independent of F, whereas the left-hand side is strictly increasing in F. To see that, use Leibniz's rule to find that

$$\begin{aligned}\frac{\partial\left[F+W(\tau^B;F)\right]}{\partial F} &= 1-\int_{2F^{1/2}+\tau^B}^{\overline{\mu}} dG(\mu) \\ &= G(2F^{1/2}+\tau^B)>0. \end{aligned} \tag{18}$$

Defining F^{Sm} as the F that would turn (17) into an equality, $e_1^B=1$ if $F<F^{Sm}$. However, $F^{Sm}=0$ if $E\mu\leq\tau^B$, since in that case (17) becomes

$$F+\int_{2F^{1/2}+\tau^B}^{\overline{\mu}}\left[\left(\frac{\mu-\tau^B}{2}\right)^2-F\right]dG(\mu)<\int_{\tau^B}^{\overline{\mu}}\left(\frac{\mu-\tau^B}{2}\right)^2 dG(\mu).$$

This expression becomes an equality when $F=0$. Given (18), it follows that it does not hold for any $F>0$.

Next rewrite condition (15) for $e_1^A=1$ as

$$F-W(\tau^B;F)\leq\Psi(\tau^A). \tag{19}$$

The right-hand side of (19) is independent of F, whereas it is straightforward to see that the left-hand side is strictly increasing in F. Thus, defining F^{Sq} as the F that solves (19) with equality, $e_1^A=1$ if $F\leq F^{Sq}$. Since F^{Sm} is the value of F that leaves the firm indifferent between a sequential and a simultaneous entry strategy [i.e. $\Pi^{Sq}(F^{Sm})=\Pi^{Sm}(F^{Sm})>0$], while F^{Sq} is the value of F that leaves the firm indifferent between sequential entry and no entry [i.e. $\Pi^{Sq}(F^{Sq})=0$], because profits are decreasing in the value of the sunk entry cost, $\partial\Pi^{Sq}(F)/\partial F=G(2F^{1/2}+\tau^B)-2<0$, it follows that $F^{Sq}>F^{Sm}$.

Finally, since the firm learns μ at $t=1$ when $F\in[F^{Sm},F^{Sq}]$, it enters market B at $t=2$ according to (4). ■

Proof of Proposition 2. Rewrite condition (16) for $e_1^B=1$ as

$$F<\Psi(\tau^B+\frac{1}{\varphi})-W(\tau^B+\frac{1}{\varphi};F). \tag{20}$$

Analogously to Proposition 1, $F^{Sm}=0$ if $E\mu\leq\tau^B+\frac{1}{\varphi}$, in which case $\frac{dF^{Sm}}{d\varphi}=0$. Otherwise, the expression above rewritten as an equality defines F^{Sm} implicitly:

$$F^{Sm}=\left[\Psi(\tau^B+\frac{1}{\varphi})-W(\tau^B+\frac{1}{\varphi};F^{Sm})\right],$$

or equivalently,

$$F^{Sm} = \left(\frac{E\mu - \tau^B - \frac{1}{\varphi}}{2}\right)^2 + \int_{\tau^B+\frac{1}{\varphi}}^{\overline{\mu}} \left(\frac{\mu - \tau^B - \frac{1}{\varphi}}{2}\right)^2 dG(\mu)$$
$$- \int_{2(F^{Sm})^{1/2}+\tau^B+\frac{1}{\varphi}}^{\overline{\mu}} \left[\left(\frac{\mu - \tau^B - \frac{1}{\varphi}}{2}\right)^2 - F^{Sm}\right] dG(\mu).$$

Totally differentiating this expression and manipulating it, we find

$$\begin{aligned}\frac{dF^{Sm}}{d\varphi} &= \frac{\partial\Psi(\tau^B + \frac{1}{\varphi})/\partial\varphi - \partial W(\tau^B + \frac{1}{\varphi}; F^{Sm})/\partial\varphi}{1 + \partial W(\tau^B + \frac{1}{\varphi}; F^{Sm})/\partial F} \\ &= \frac{(E\mu - \tau^B - \frac{1}{\varphi}) + \int_{\tau^B+\frac{1}{\varphi}}^{2[F^{Sm}]^{1/2}+\tau^B+\frac{1}{\varphi}} (\mu - \tau^B - \frac{1}{\varphi}) dG(\mu)}{2\varphi^2 G(2\,[F^{Sm}]^{1/2} + \tau^B + \frac{1}{\varphi})} > 0.\end{aligned}$$

Next rewrite condition (15) for $e_1^A = 1$ as

$$F \leq \Psi(\tau^A + \frac{1}{\varphi}) + W(\tau^B + \frac{1}{\varphi}; F). \tag{21}$$

This expression defines F^{Sq} implicitly when it holds with equality:

$$F^{Sq} = \Psi(\tau^A + \frac{1}{\varphi}) + W(\tau^B + \frac{1}{\varphi}; F^{Sq}),$$

or equivalently,

$$F^{Sq} = \mathbf{1}_{\{E\mu > \tau^A + \frac{1}{\varphi}\}} \left(\frac{E\mu - \tau^A - \frac{1}{\varphi}}{2}\right)^2 + \int_{\tau^A+\frac{1}{\varphi}}^{\overline{\mu}} \left(\frac{\mu - \tau^A - \frac{1}{\varphi}}{2}\right)^2 dG(\mu)$$
$$+ \int_{2(F^{Sq})^{1/2}+\tau^B+\frac{1}{\varphi}}^{\overline{\mu}} \left[\left(\frac{\mu - \tau^B - \frac{1}{\varphi}}{2}\right)^2 - F^{Sq}\right] dG(\mu).$$

Totally differentiating this expression and manipulating it, we find

$$\begin{aligned}\frac{dF^{Sq}}{d\varphi} &= \frac{\partial\Psi(\tau^A + \frac{1}{\varphi})/\partial\varphi + \partial W(\tau^B + \frac{1}{\varphi}; F^{Sq})/\partial\varphi}{1 - \partial W(\tau^B + \frac{1}{\varphi}; F^{Sq})/\partial F} \\ &= \frac{1}{2\varphi^2 \left[2 - G(2\,[F^{Sq}]^{1/2} + \tau^B + \frac{1}{\varphi})\right]} \times \left[\mathbf{1}_{\{E\mu > \tau^A + \frac{1}{\varphi}\}} \left(E\mu - \tau^A - \frac{1}{\varphi}\right) + \right. \\ &\quad \left. + \int_{\tau^A+\frac{1}{\varphi}}^{\overline{\mu}} (\mu - \tau^A - \frac{1}{\varphi}) dG(\mu) + \int_{2[F^{Sq}]^{1/2}+\tau^B+\frac{1}{\varphi}}^{\overline{\mu}} (\mu - \tau^B - \frac{1}{\varphi}) dG(\mu)\right] > 0,\end{aligned}$$

completing the proof. ■

Proof of Lemma 1. Condition (16) for $e_1^B = 1$ defines F^{Sm} implicitly when it holds with equality: $F^{Sm} = \mathbf{1}_{\{E\mu > \tau^B\}} \left[\Psi(\tau^B) - W(\tau^B; F^{Sm})\right]$. It is straightforward to see that $\frac{dF^{Sm}}{d\tau^A} = 0$. From Proposition 1, we know that $F^{Sm} = 0$ if $E\mu \leq \tau^B$, so in that case $\frac{dF^{Sm}}{d\tau^B} = 0$ too. If instead $E\mu > \tau^B$, then $F^{Sm} > 0$ and we can find $dF^{Sm}/d\tau^B$ by applying the implicit function theorem:

$$\begin{aligned} \frac{dF^{Sm}}{d\tau^B} &= \mathbf{1}_{\{E\mu > \tau^B\}} \left[\frac{\partial\Psi(\tau^B)/\partial\tau^B - \partial W(\tau^B; F^{Sm})/\partial\tau^B}{1 + \partial W(\tau^B; F^{Sm})/\partial F}\right] \\ &= -\mathbf{1}_{\{E\mu > \tau^B\}} \left[\frac{\left(\frac{E\mu - \tau^B}{2}\right) + \int_{\tau^B}^{2\left[F^{Sm}\right]^{1/2} + \tau^B} \left(\frac{\mu - \tau^B}{2}\right) dG(\mu)}{G(2\left[F^{Sm}\right]^{1/2} + \tau^B)}\right] \leq 0. \end{aligned}$$

Condition (15) for $e_1^A = 1$ defines F^{Sq} implicitly when it holds with equality: $F^{Sq} = \Psi(\tau^A) + W(\tau^B; F^{Sq})$. Applying the implicit function theorem to this identity, we obtain

$$\frac{dF^{Sq}}{d\tau^A} = \frac{\partial\Psi(\tau^A)/\partial\tau^A}{1 - \partial W(\tau^B; F^{Sq})/\partial F} = -\frac{\left[\mathbf{1}_{\{E\mu > \tau^A\}}\left(\frac{E\mu - \tau^A}{2}\right) + \int_{\tau^A}^{\overline{\mu}} \left(\frac{\mu - \tau^A}{2}\right) dG(\mu)\right]}{2 - G\left(2\left[F^{Sq}\right]^{1/2} + \tau^B\right)} < 0, \text{ and}$$

$$\frac{dF^{Sq}}{d\tau^B} = \frac{\partial W(\tau^B; F)/\partial\tau^B}{1 - \partial W(\tau^B; F^{Sq})/\partial F} = -\frac{\left[\int_{2[F^{Sq}]^{1/2} + \tau^B}^{\overline{\mu}} \left(\frac{\mu - \tau^B}{2}\right) dG(\mu)\right]}{2 - G\left(2\left[F^{Sq}\right]^{1/2} + \tau^B\right)} < 0,$$

completing the proof. ■

Proof of Proposition 3. The proof follows from the definition of M_t^j, Lemma 1, and the facts that $H(\cdot)$ is a non-decreasing function and that both $1 - G(\tau_B + 2F^{\frac{1}{2}})$ and $1 - G(\tau_B)$ are decreasing in τ_B. Differentiating the M_t^j's with respect to both variable trade costs, we obtain:

- $\frac{dM_1^A}{d\tau^j} = h(F^{Sq})\frac{dF^{Sq}}{d\tau^j} < 0$, $j = A, B$;
- $\frac{dM_1^B}{d\tau^A} = h(F^{Sm})\frac{dF^{Sm}}{d\tau^A} = 0$;
- $\frac{dM_2^A}{d\tau^A} = h(F^{Sq})\frac{dF^{Sq}}{d\tau^A}\left[1 - G(\tau^A)\right] - H(F^{Sq})g(\tau^A) < 0$;
- $\frac{dM_2^B}{d\tau^A} = h(F^{Sq})\frac{dF^{Sq}}{d\tau^A}\left[1 - G(2\left[F^{Sq}\right]^{1/2} + \tau^B)\right] < 0$;
- $\frac{dM_1^B}{d\tau^B} = h(F^{Sq})\frac{dF^{Sm}}{d\tau^B} < 0$;
- $\frac{dM_2^A}{d\tau^B} = h(F^{Sq})\frac{dF^{Sq}}{d\tau^B}\left[1 - G(\tau^A)\right] < 0$.

To find $\frac{dM_2^B}{d\tau^B}$, notice that

$$\begin{aligned}\frac{dM_2^B}{d\tau^B} =& h(F^{Sm})\frac{dF^{Sm}}{d\tau^B}\left[1-G(\tau^B)\right] - H(F^{Sm})g(\tau^B) \\ &+ h(F^{Sq})\frac{dF^{Sq}}{d\tau^B}\left[1-G(2\left[F^{Sq}\right]^{1/2}+\tau^B)\right] - \int_{F^{Sm}}^{F^{Sq}} g(2F^{\frac{1}{2}}+\tau^B)dH(F) \\ &- h(F^{Sm})\frac{dF^{Sm}}{d\tau^B}\left[1-G(2\left[F^{Sm}\right]^{1/2}+\tau^B)\right] \\ =& h(F^{Sq})\frac{dF^{Sq}}{d\tau^B}\left[1-G(2\left[F^{Sq}\right]^{1/2}+\tau^B)\right] - \int_{F^{Sm}}^{F^{Sq}} g(2F^{\frac{1}{2}}+\tau^B)dH(F) + \\ &+ h(F^{Sm})\frac{dF^{Sm}}{d\tau^B}\left[G(2\left[F^{Sm}\right]^{1/2}+\tau^B) - G(\tau^B)\right] - H(F^{Sm})g(\tau^B),\end{aligned}$$

which is negative since each of its terms are negative. ■

6.2 Appendix B: Descriptive Statistics

Argentine manufacturing exports grew by 220% between 2002 and 2007, after the steep depreciation of its currency in early 2002. However, as Table 8 reveals, export growth was similar in most industries. The only relevant change in the export structure was an increase in Petroleum's relative share (from 23% in 2002 to 30% in 2007) at the expense of the Automotive and Transport industry's (17% to 13%).

Table 8: Argentinean Manufacturing Exports by Industry

Industry	**Exports*** 2002	**Exports*** 2007	**Growth** (%)	**Share** 2002	**Share** 2007
Food, Tobacco and Beverages	4979	10884	119	23	23
Petroleum	4967	13863	179	23	30
Chemicals	1514	3466	129	7	7
Rubber and Plastics	928	1845	99	4	4
Leather and Footwear	829	1144	38	4	2
Wood Products, Pulp and Paper Products	506	998	97	2	2
Textiles and Clothing	533	775	45	2	2
Metal Products, except Machinery	2102	4092	95	10	9
Machinery and Equipment	1127	3137	178	5	7
Automotive and Transport Equipment	3492	5894	69	16	13
Electrical Machinery	385	426	11	2	1
Total Manufacturing	20837	45773	120	100	100

* Million USD

The distribution of export destinations has changed somewhat more significantly during the sample period. Using the regions defined in subsection 3.3, Table 9 shows a growing importance of Mercosur after 2003 (receiving 35% of all Argentine exports in 2007) and a decline in the participation of Chile and Bolivia, from 17% in 2002 to 10% in 2007. Starting from a low level, the importance of China has increased significantly, having more than doubled its share of Argentine exports during our sample period, to 7%. Meanwhile North America, non-Mercosur Latin American markets and the European Union have become relatively less important as destinations for Argentine exports.

Table 9: Argentinean Manufacturing Exports by Region (% of total value)

Region	2002	2003	2004	2005	2006	2007
Mercosur	32	25	27	28	32	35
Chile-Bolivia	17	18	16	15	13	10
Rest of the World	16	15	17	17	20	20
North America	15	19	17	18	13	13
EU-27 except Spain-Italy	6	6	5	5	5	5
Central America-Mexico	6	6	7	6	7	6
China	3	6	6	5	5	7
Other South America	3	3	3	3	3	3
Spain-Italy	3	3	3	3	2	2

Table 10 displays the share of Argentine exporters that each region receives, in general (columns DS) and among new exporters (columns FMS). The ratio FMS/DS is a proxy for the relative importance of the region as a "testing ground" for Argentine exporters. If it is greater than one, it suggests the region is relatively attractive as a "testing ground." The table shows that this is the case for Spain-Italy, Mercosur, North America, Chile-Bolivia and, recently, China.

Table 10: Argentinean Manufacturing First Markets by Region (%)

Region	2003			2007		
	FMS	DS	FMS/DS	FMS	DS	FMS/DS
Mercosur	29	24	1.23	36	25	1.44
Chile-Bolivia	20	16	1.26	17	14	1.20
North America	12	9	1.39	9	7	1.32
Spain-Italy	11	7	1.71	8	5	1.45
Rest of the World	8	17	.46	12	20	.61
Central America-Mexico	7	11	.67	4	10	.43
Other South America	7	9	.72	7	10	.69
EU-27 except Spain-Italy	5	7	.74	6	8	.71
China	0	1	.50	2	1	1.52

FMS: share of region j as first export destination by number of firms.
DS: share of region j as export destination by number of firms.

Table 11 reveals some interesting features of different types of exporters. First, new exporters—which correspond to the sum of "entrants" (firms that not do not export in $t-1$ but do so in both t and $t+1$) and "single-year" exporters (i.e. firms that export in t but not in either $t-1$ or $t+1$)—are common in our sample, representing on average 24% of all exporters in a year. Second, many new exporters are single-year (38% on average) and their share rises over time, reaching 47% of all new exporters in 2006. Third, "continuers" (those that export in $t-1$, t and $t+1$) account for the bulk of exports in Argentina, while entrants and "exiters" (firms that export in $t-1$ and in t but not in $t+1$) are much smaller, and single-year exporters even more so.

Table 11: Exports by Type of Exporter

Number of firms					
Year	Total	Entrant	Exiter	Continuer	Single-Year
2002	7205				
2003	8251	1484	499	5520	748
2004	9055	1569	487	6517	482
2005	10884	1568	1053	7033	1230
2006	10944	1244	1230	7371	1099
2007	10062				
Total Value of exports (US$ Millions)					
Year	Total	Entrant	Exiter	Continuer	Single-Year
2002	17890				
2003	18554	80	299	18183	26
2004	23544	133	34	23369	16
2005	29060	204	161	28603	102
2006	30872	362	127	30405	41
2007	41395				
Exports per firm (US$ Thousands)					
Year	Total	Entrant	Exiter	Continuer	Single-Year
2002	2483				
2003	2249	54	598	3294	34
2004	2600	85	70	3586	32
2005	2670	130	153	4067	83
2006	2821	291	103	4125	37
2007	4114				

Note: "Entrants" in year t are firms that not did not export in $t-1$, exported in t, *and will export* in $t+1$ as well. "Exiters" exported in $t-1$ and in t, but are not exporters in $t+1$. "Continuers" export in $t-1$, t and $t+1$. "Single-Year" exporters are firms that exported in t but neither in $t-1$ nor in $t+1$.

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