The Margins of Entry into Export Markets:

Evidence from Colombia

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Abstract

Using transactions-level customs data from Colombia, we study firm-specific export patterns over the period 1996-2005. Our data allow us to track firms' entry and exit into and out of individual destination markets, as well as their revenues from selling there. We find that, in a typical year, nearly half of all Colombian exporters were not exporters in the previous year. These new exporters tend to be extremely small in terms of their overall contribution to export revenues, and most do not continue exporting in the following year. Hence export sales are dominated by a small number of very large and stable exporters. Nonetheless, out of each cohort of new exporters, a fraction of firms go on to expand their foreign sales very rapidly, and over the period of less than a decade, these successful new exporters account for almost half of total export expansion. Finally, we find that new exporters begin in a single foreign market and, if they survive, gradually expand into additional destinations. The geographic expansion paths they follow, and their likelihood of survival as exporters, depend on their initial destination market.

1 Introduction

Research in international trade, both theoretical and quantitative, is increasingly focussed on the role of firm heterogeneity in shaping trade flows. One strand of the literature shows how firm-specific productivity shocks affect the mix of exporting firms and their foreign sales volumes (e.g., Clerides, Lach, and Tybout, 1998; Bernard and Jensen, 1999; Melitz, 2003; Bernard, Eaton, Jensen, and Kortum, 2003; Das, Roberts, and Tybout, 2007; Bernard, Jensen, Reading, and Schott, 2007). These studies provide insight into why some producers export and others do not, and the role of market entry costs in shaping export dynamics. Another strand of the literature documents and interprets the relationship between firms' productivity levels and the collection of foreign markets that they serve (Eaton, Kortum, and Kramarz, 2004 and 2007). These papers find that most exporting firms sell to only one foreign market, with the frequency of firms' selling to multiple markets declining with the number of destinations. At the same time, firms selling to only a small number of markets tend to sell to the most popular ones. Less popular markets are served by firms that export very widely. These patterns are consistent with the notion that firms with relatively low marginal costs can profitably exploit relatively more foreign markets.

While both strands of the literature have furthered our understanding of the relationships between productivity distributions and trade flows, the necessary data have not been available to study both export dynamics and destination-specific flows for the same set of producers. Also, although several papers have examined the relationship between individual producer decisions and aggregate export trajectories, they have done so only for selected manufacturing industries (Roberts and Tybout, 1997b; Das, Roberts, and Tybout, 2007). This study exploits

comprehensive transactions-level trade data from Colombia to generate a new set of stylized facts on both issues.

Our analysis proceeds in several steps. After reviewing patterns of aggregate exports across destination countries and over time, we decompose export growth into two parts: changes in sales volume among incumbent exporters ("the intensive margin") and changes in the set of exporting firms ("the extensive margin"). Next, we track the behavior of "cohorts" of exporters from their first year in foreign markets onward. Finally, we characterize firms' transition paths as they change the set of export markets that they serve.

Several key patterns emerge. First, in any one year, almost all export expansion or contraction comes from changes in sales by firms that have been exporting for at least one year. This dominance of existing firms is despite the fact that one-third to one-half of all exporters are new entrants in a typical year. These new firms by and large do not add much to export growth simply because (i) the majority do not last more than a year and (ii) their sales are very small. Second, however, the new exporters who *do* survive their first year grow especially rapidly for several years thereafter, and together account for about half of the total expansion in merchandise trade over the course of a decade. An explanation for this pattern is that exporters and importers frequently experiment with small scale transactions, and while most of these experiments fail, those that prove mutually profitable quickly lead to larger shipments. Third, as exporters add or drop markets, they appear to follow certain geographic patterns. For example, those that begin by exporting to Latin American destinations are more likely to add markets than those that begin by exporting to the United States. This pattern may partly reflect the nature of the goods being shipped, but it may also mean that certain markets

are well-suited to serve as "testing grounds" for new exporters who wish to learn about their foreign market potential.

2 Data

Our data set includes all export transactions by Colombian firms between 1996 and 2005. Each transaction is recorded separately, and we aggregate transactions by a given firm to obtain total exports by that firm in each year. A transaction record includes the firm's tax ID (which serves as a time-invariant identifier), a product code, the value of the transaction in US dollars, and the country of destination. Because we use the same data that are used for official statistics, the merchandise exports in our data set aggregate to within one percent of total merchandise exports reported by the Colombian Bureau of Statistics (Departamento Administrativo Nacional de Estadística or DANE).[1]

Before turning to the firm-level data themselves, we set the stage by reviewing the aggregate movements in Colombian exports over the period we are considering. Figure 1 depicts annual Colombian merchandise exports from 1996 through 2005 (in current US dollars) to external markets. It also breaks out exports to several significant destinations: (i) the United States, (ii) the European Union, and (iii) Venezuela and Ecuador, Colombia's contiguous neighbors with active cross-border trade.[2] Note that the first seven years exhibit alternating

[1] The deviation is due to mistakes in the records of tax identifiers. Since following firms over time is central to our analysis, our database includes only records of transactions in which the tax identifier has the appropriate format. Not satisfying this requirement is a clear indication that the firm is not correctly identified in the record.

[2] Colombia also shares borders with Brazil, Panama, and Peru, but the borders lie mostly in unpopulated

periods of modest growth and decline, with drops in 1998, 2001, and 2002. Growth picks up again in 2003 and then accelerates in the most recent two years. These patterns are reflected closely in exports to the United States, Colombia's largest destination in terms of overall value. Colombia's exports to the European Union, on the other hand, experience a much longer and more pronounced decline over the years 1999 through 2002, recovering to their 1997 level only at the end of the period.[3] Colombian exports to its neighbors have grown overall but have been much more volatile than exports to other destinations, with sharp declines in 1999, 2002, and 2003. These overall patterns should be kept in mind as we turn to the firm level activity underlying them.

3 Total Exports and the Number of Firms: The Cross Section

With our firm-level data we can decompose aggregate exports into (i) the number of firms selling and (ii) average sales per firm. Denoting by $X_n(t)$ aggregate Colombian exports to market n in year t, by $N_n(t)$ the number of firms selling there, and by $\overline{x}_n(t)$ average sales per firm we can write the identity:

$$\ln X_n(t) = \ln N_n(t) + \ln \overline{x}_n(t).$$

jungle areas, so that cross-border trade is much less intense. Moreover, most economic activity in Colombia takes place in the valleys between the various Andean mountain ranges and on the Caribbean coast. These areas are contiguous with Venezuela and Ecuador, but not with the other neighbors.

[3]European integration and the emergence of former Soviet states as new sources of imports probably contributed to the sluggish growth of European demand for Colombian goods.

Figure 2 provides a quick sense of the contribution of the two terms on the right to the term on the left by plotting $N_n(t)$ against $X_n(t)$. Each data point represents a specific destination in a specific year. The relationship is clearly upward sloping, indicating that the extensive margin (more firms) plays an important role.

A regression of $\ln N_n(t)$ against $\ln X_n(t)$ provides a measure of the average contribution of entry to changes in the value of exports. The implied margin is .54, meaning that, in comparing two destination-years, a doubling of export volume reflects just over 50 percent more firms. An implication, of course, is that sales per firm rise by slightly less than 50 percent.

A similar exercise is conducted by Eaton, Kortum, and Kramarz (2004), who relate the total number of French exporters to the market size (rather than total exports as we use here) of the destination for a 1986 cross-section. They find a margin of entry of just under two-thirds. To the extent that total exports of a particular country are proportional to market size (as implied by the standard gravity formulation) the result then implies that the number of French exporters should rise with total French exports with the same elasticity. The lower elasticity we find for Colombia seems to be related to the fact that many destinations are served by just a few, frequently just one or two, Colombian firms. Note in Figure 2 that the relationship between the two margins becomes much tighter for destinations served by 10 or more firms. In the case of France, no market is served by fewer than sixty French exporters.

Note also in Figure 2 that many of the destinations with only one Colombian exporter purchased rather large volumes, suggesting that larger, probably more established, exporters tend to be those that explore new destinations. On the other hand, the destinations that

attract the most Colombian exporters tend to purchase relatively little per exporter. These destinations may present Colombian exporters with relatively low entry-cost barriers and/or a diversified collection of potential buyers. Either characteristic would make them attractive to new exporters who wish to try out foreign markets on a small scale. We will return to consider these possibilities further below.

4 Decomposing Growth: Continuing Firms, Entry, and Exit

Having seen the importance of the extensive margin in explaining cross-sectional variation, we now ask how much it contributes to changes over time. We first look at how growth in exports reflects the contributions of continuing firms, entrants, and exiters using the identity:

$$
\begin{aligned}
&\frac{X_{nCO}(t) - X_{nCO}(t-1)}{\left[X_{nCO}(t-1) + X_{nCO}(t)\right]/2} \\
&= \left(\frac{\sum_{j \in CN_n^{t-1,t}} \left[x_n(j,t-1) + x_n(j,t)\right]/2}{\left[X_{nCO}(t-1) + X_{nCO}(t)\right]/2} \right) \left(\frac{\sum_{j \in CN_n^{t-1,t}} \left[x_n(j,t) - x_n(j,t-1)\right]}{\sum_{j \in CN_n^{t-1,t}} \left[x_n(j,t-1) + x_n(j,t)\right]/2} \right) \\
&+ \frac{NEN_n^{t-1,t}\overline{x}_n(t-1)}{\left[X_{nCO}(t-1) + X_{nCO}(t)\right]/2} + \frac{\sum_{j \in EN_n^{t-1,t}} \left[x_n(j,t) - \overline{x}_n(t-1)\right]}{\left[X_{nCO}(t-1) + X_{nCO}(t)\right]/2} \\
&- \frac{NEX_n^{t-1,t}\overline{x}_n(t-1)}{\left[X_{nCO}(t-1) + X_{nCO}(t)\right]/2} - \frac{\sum_{j \in EX_n^{t-1,t}} \left[x_n(j,t-1) - \overline{x}_n(t-1)\right]}{\left[X_{nCO}(t-1) + X_{nCO}(t)\right]/2}.
\end{aligned}
\tag{1}
$$

Here $X_{nCO}(t)$ denotes total Colombian exports to destination n in year t and $x_n(j,t)$ is exports by firm j to destination n in period t. The terms $CN_n^{t-1,t}$, $EN_n^{t-1,t}$, and $EX_n^{t-1,t}$ represent, respectively, the set of firms that exported to n in $t-1$ and t, that exported in t but not $t-1$,

and that exported in $t-1$ and not t. We refer to these sets of firms as pairwise continuing, pairwise entering, and pairwise exiting. $NEN_n^{t-1,t}$ and $NEX_n^{t-1,t}$ represent the number of firms in the $EN_n^{t-1,t}$ and $EX_n^{t-1,t}$ sets, respectively. The term $\overline{x}_n(t-1)$ represents average exports of a firm to destination n in period $t-1$.[4]

The left-hand side of equation (1) measures the growth in exports between $t-1$ and t. The expression on the first line of the right-hand side represents the contribution to growth of pairwise continuing firms, defined here as those that exported in both periods. It equals the share of continuing firms' exports over the two years times the growth in their sales.

The second and third lines measure the contributions of entry and exit, respectively, to export growth. The contribution of entry is expressed as the sum of two terms: (i) the growth in exports implied by the increase in the number of exporters *if new firms had the same average sales as those of the average firm in period* $t-1$; and (ii) the difference between exports of entrants and those of the average firm in $t-1$. The first term is thus gross percentage entry in terms of numbers of firms and the sum of the first and second is the total contribution of entry to growth. Similarly, the contribution of exit is expressed as the sum of the contraction that would have occurred *if each exiting firm had been as large as the average* $t-1$ *exporter*, and a term that corrects for the fact that exiting firms are relatively small.

[4]Note that we follow the convention of treating growth as the change between two dates divided by the average level in the two dates rather than the change divided by the level in the earlier date. Benefits are that (i) x percent growth followed by $-x$ percent growth returns us to the same level and (ii) values close to zero in the first year have a less extreme effect on the growth rate.

4.1 Aggregate Growth

Table 1 presents the results of applying equation (1) to decompose aggregate export growth, year by year. Cross-year averages of the growth components are presented in the last row. Also, to highlight the cumulative effects of entry and exit, the next-to-last row presents a cross-decade application of the decomposition. This latter set of figures treats all exporters observed in 2005 but not in 1996 as entering firms, all exporters observed in 1996 but not 2005 as exiting firms, and exporters observed in both years as continuers.[5]

The calculations in this table pool all the destinations. The main line for each component represents the contribution to growth itself by the corresponding term and the expression in parentheses below is the percentage contribution to the total change. Similarly, Figure 3 shows year-to-year export growth disaggregated into the three basic components of equation (1) for all destinations. In addition to the contributions of continuing firms, entry, and exit, it also shows the *net* effect of entry and exit.

Table 1 and Figure 3 indicate that continuing firms drive most of the year to year fluctuations, although much less so after 2001. Note, for instance, that in Figure 3 the lines for total growth and growth by continuers are almost identical up to 2001. For later years, total growth takes off, reflecting an increase in net entry. Looking at the cross-decade decomposition, however, net entry contributed to over a quarter of the growth in exports (26%, or 17.4 percentage points of growth, calculated from the next-to-last line in Table 1).

Breaking the net entry effect for a typical year into its individual components, one finds that

[5] The bottom row of the table reports annual averages. Unlike the other rows the overall growth rate in the first column does not relate exactly to the remaining components according to the identity above since some of the individual terms enter nonadditively.

if entrants had exported as much per firm as pairwise continuers, they would have generated about 46 percentage points of total annual export growth, on average (last line of table 1). But since their exports per firm were smaller the net export growth from gross entry averaged only 3.2 percentage points. Some algebra shows that behind these figures is an average size of entrants, relative to those of firms selling the previous year, equal to $1-(42.2/45.4) = .066$ or 6.6 percent.[6] Similarly, exiting firms would have reduced exports by 43.6 percentage points per year if they had exported as much per firm as a typical firm the previous year. But since their exports per firm were smaller by factor of 5.5 percent, gross exit implied only 2.3 percentage points of export contraction.

The cross-decade version of the decomposition (next-to-last line of table 1) shows that the cumulative effects of entry and exit were nonetheless substantial. Gross entry contributed 47 percent (31.3 percentage points) of total growth, and would have implied 61.5 percentage points of growth if entrants exported as much as the average firm at the beginning of the period. (A calculation like the one above indicates that by the end of this period these firms exported about half as much as the average firm at the beginning.) Similarly, the gross exit of firms would have implied a contraction of exports of 53.9 percentage points if those firms exported as much as the average firm of the beginning of the period. However, the average sales of exiting firms were about 25 percent of the beginning of period average, implying a net contraction of exports due to gross exit of 13.9 percentage points.

[6] The average size of entrants relative to incumbents is

$$\frac{\frac{\sum_{j\in EN^{t-1,t}} x(j,t)}{NEN^{t-1,t}}}{\overline{x}(t-1)} = \frac{\overline{x}(t-1) * NEN^{t-1,t} + \sum_{j\in EN^{t-1,t}} (x(j,t) - \overline{x}(t-1))}{\overline{x}(t-1) * NEN^{t-1,t}} = 1 + \frac{(5)}{(4)}$$

where in the last equality (4) and (5) refer to numbers of columns in Table 1.

In sum, 8% of the average year-to-year growth in exports is explained by year-to-year net entry. This number is small despite vigorous turnover among exporters because firms that have just begun to export or are about to stop exporting typically sell relatively little. On the other hand, as we further discuss in section 5 below, firms that enter foreign markets and survive more than a year are typically able to rapidly expand. Thus, net entry over the course of the sample period accounts for one quarter of the cumulative total export expansion, while gross entry explains about half of total growth. Below, we further explore and emphasize the importance of gross entry for long run export growth.

4.2 Individual Destinations

Figure 4 shows annual averages of this decomposition for the ten most popular destination markets (on a transaction basis, see the notes to the figure for greater detail on the classification of destinations). Note that exports to some countries, particularly the Dominican Republic, grew phenomenally while, as discussed above, exports to the European Union languished. Furthermore, with the exception of Panama, where there was little growth but much entry, high growth appears to be associated with more exporter turnover, as well as more net entry. And with the exception of Europe, continuing firms explain a large part of the variation in growth rates across destinations. Thus, although markets are heterogeneous, some general patterns explain the behavior of exports to most destinations. In particular, while net entry contributes positively to export growth, pairwise continuers explain most of it.

4.3 Differences in Size: Gibrat's Law Fails

Gibrat's Law holds that the growth rate of a firm is independent of its size. To what extent does Colombian export growth obey the law? To address this issue we next decompose the growth rate of continuing firms into quintile-specific components. More precisely, we decompose the contribution of continuing exporters in equation (1) as:

$$\frac{\sum_{j \in CN_n^{t-1,t}} [x_n(j,t) - x_n(j,t-1)]}{\sum_{j \in CN_n^{t-1,t}} [x_n(j,t-1) + x_n(j,t)]/2}$$

$$= \sum_{q=1}^{5} \left(\frac{\sum_{j \in CN(q)_n^{t-1,t}} [x_n(j,t-1) + x_n(j,t)]/2}{\sum_{j \in CN_n^{t-1,t}} [x_n(j,t-1) + x_n(j,t)]/2} \right) \left(\frac{\sum_{j \in CN(q)_n^{t-1,t}} [x_n(j,t) - x_n(j,t-1)]}{\sum_{j \in CN(q)_n^{t-1,t}} [x_n(j,t-1) + x_n(j,t)]/2} \right)$$

where $CN(q)_n^{t-1,t}$ denotes the set of firms that sold in both period $t-1$ and period t that were in the qth quintile according to their sales in market n in period $t-1$ (with the $t-1$ quintile defined regardless of whether firms went on to sell in period t or not). The first term in parentheses is the share of quintile q in total sales (obviously declining in q). The second is the growth rate of sales by that quintile.

Table 2 presents the quintile-specific growth rates that correspond to the right-hand side component in the product above. Quintile 1 includes those firms whose exports in year $t-1$ fell above the 80^{th} percentile in that year, quintile 2 includes firms between the 60^{th} and 80^{th} percentile, and so on. For comparison purposes, Table 2 also reports quintile-specific growth rates inclusive of those firms that exited in the following year, and quintile-specific mean exports. Panel A does the analysis for total exports year by year while Panel B presents annual averages taken over individual destinations.[7] Panel C presents the decompositions for

[7] In order to calculate quintiles we limited ourselves to destinations with at least five exporters.

the ten most popular destinations.

All three panels of table 3 imply a major departure from Gibrat's Law: Sales growth is systematically higher among firms in the low-sales quintiles, even when exit is taken into account. Remarkable is the huge growth in sales of continuing firms in the fifth quintile. This quintile is always the fastest growing. Nevertheless, because firms in this quintile initially sell so little, their contribution to overall growth is trivial. Sales of firms in the first quintile for each destination grow by less than the overall growth rates of continuing firms. Even among these larger exporters, taking into account exit substantially lowers overall growth.

One explanation for this differential growth across quintiles is that firms face increasing resistance to foreign market penetration as their exports grow. Sustaining growth may be difficult because exporters encounter capacity constraints, because their foreign demand elasticities fall as they expand, or because the return per dollar expenditure on advertising drops as their market penetration increases (as in Arkolakis, 2006).

Alternatively, it may be that new exporters go through a learning period during which their buyers try them out on a very limited scale (Rauch and Watson, 2003). Buyers may be learning about sellers' business practices and products, while sellers learn about the reliability of their potential partners and the scope for future sales. Once this exploration process has played out, firms either terminate their exporting relationship or experience a surge in orders.[8]

Panel C of Table 2 allows us to investigate the distribution of sales across the different destinations. We observe higher growth for firms in the low-sales quintiles, compared with the high-growth ones, for all destinations. However, there are some interesting differences across

[8] This process is analogous to models of passive learning where, at the start of operations, there is resolution upon entry of *ex ante* uncertainty about profitability (see e.g., Jovanovic, 1982).

markets. The small growth of total exports to the EU relative to other destinations is only replicated by the first quintile. Moreover, while the EU exhibits no important differences with respect to the US in quintiles 2 through 4, in the fifth quintile exports to the EU actually show much larger growth than those to the US.

Figure 5 plots (on a log scale) the ratio of each quintile's sales relative to the sales of the third quintile. For exports to the United States and Europe, sales by the first quintile are remarkably larger than those by the third quintile, much more so than for other destinations. This result contrasts with Eaton et al. (2004), who find remarkable similarity in the sales distributions of French exporters across destinations.

We also explore how firms move from one quintile to another. Table 3 reports year-to-year transitions across quintiles, defined in terms of firms' total sales (across all destinations). Each element of the matrix reports the probability that a firm in the quintile corresponding to the column in year $t-1$ transits into the quintile corresponding to the row in year t, with entry from not exporting and exit from exporting added possibilities. We define the population of firms as those that exported at least once during the 1996-2005 sample period. (There are, of course, many more firms selling in Colombia that never exported over our sample period while, at the same time, many of the firms in our population did not exist in all sample years.) Only firms in the top two quintiles face more than half a chance of staying in their quintile or higher. Only those in the top three quintiles face more than half a chance of surviving. At the same time, of those firms that didn't export in period $t-1$ but did export in period t, one in three start in the fifth percentile, but a surprising one in six start in the second percentile.

Table 4 fleshes out the potential link between size on entry and longevity of the firm in

exporting. The bottom row reports the fraction of entrants in each quintile in year of entry. A third of entrants start in the smallest (fifth quintile) while 4 percent begin in the top one. The elements in the matrix report the probability that a firm that entered in the quintile in the column transits into the quintile in the row the following year. Only sellers in the top quintile face a higher probability of continuing than of exiting. Hence initial first year sales are an excellent indicator of survival. Nevertheless, about 10 percent of firms that enter in the fifth quintile transit into quintiles with more sales by the following year.

4.4 Interaction Across Markets

Table 5 provides a similar decomposition as Table 1 for the 10 most popular destinations. Going beyond Table 1, however, it distinguishes continuing exporters, entrants, and exiters according to their participation in other markets in the same year (t) or previous year ($t-1$). Specifically, for continuing firms, we separate firms that sell only in market n from those that sell in other markets as well in year t. We separate firms that enter market n into "old" entrants, who exported to some other country in $t-1$, and "new" entrants who exported nowhere in $t-1$. Similarly, we classify firms that exit from exporting to n into firms that continue exporting in t to some other destination, and those that drop exporting altogether. See the Table notes for the precise definitions. Since we report averages across years the figures don't obey exactly the identity equivalent to (1).

Among continuing firms, those selling in multiple markets represent a much larger share of total sales, especially in less popular markets. This pattern is consistent with Eaton et al.'s (2007) model, in which firms with low marginal costs or highly appealing products reach

more export markets, and sell relatively large volumes in those markets where less efficient exporters are also present. There does not appear to be any systematic difference between the growth of sales of firms selling to multiple markets and just that particular market; in some markets the former grow much rapidly, while in others the opposite is the case.

New entrants are particularly important, relative to entrants that were already selling in other markets, in those countries that represent the largest shares of exports: the US, the EU, Venezuela, Ecuador, and Panama.[9] For other destinations, such as the Dominican Republic, this pattern is reversed. Because they tend to export much more, however, entry by experienced exporters tends to contribute much more to growth in all destinations.

It is also the case that, for popular destinations, firms that cease exporting altogether are more numerous than firms that exit that market but continue exporting elsewhere, while the opposite is true for the average destination. Taken together, these patterns suggest that countries are attractive as proving grounds for new exporters either if they offer a relatively large and diversified consumer base (the US and the EU), or they are relatively easy to access (Venezuela, Ecuador, and Panama). Other destinations seem to be visited mostly by firms that export elsewhere.

4.5 Numbers, Revenues, and Size

We saw in the growth decompositions that large numbers of firms enter or exit each destination market every year. We now examine these entering and exiting firms in more detail, distinguishing those that are present for only one year from those that remain for longer periods. Table 6 reports, for each year in our sample that is not an endpoint, data on firms

[9] Jointly, these countries capture over 70 percent of Colombian merchandise exports.

that: (i) enter exporting, (ii) continue exporting, (iii) exit from exporting, and (iv) export for just one year. Entry and exit are defined differently from above, where we were just referring to pairwise entry and exit (i.e., entry and exit defined over $t-1$ and t). With the pairwise definitions above, a firm that exports only in year t is considered as entering in that year and exiting in the following year, and it is not treated differently from other firms that export for longer periods. Here we differentiate single-year exporters from firms that start exporting and keep doing so for at least an additional year, and from firms that exit after having exported for at least two consecutive years. More specifically, entrants in year t are now firms that not only: (i) did not export in $t-1$ and (ii) exported in t, but (iii) must export in $t+1$ as well. Exiters in t must (i) export in $t-1$, (ii) export in t, and (iii) not export in $t+1$. Continuers must not only (i) export in $t-1$ and (ii) export in t, as above, but (iii) export in $t+1$ as well. The remaining firms, those that exported in t but not in $t-1$ or $t+1$ are what we call "single year" exporters. As mentioned, they would have been included with both entering and exiting firms in our pairwise definitions above.

The top panel of Table 6, looking across exporters to any destination, presents the numbers of such firms for each year. The middle panel presents the total value of their exports while the bottom panel reports mean exports per firm, which is the ratio of the corresponding number in the middle panel to the corresponding number on the top panel.

Starting with the counts, Table 6 confirms that single year exporters are very common.[10] It further shows that the total number of exporting firms varies over the period substantially, dropping from 10,517 in 1996 to a trough of 6,765 firms in 1999 (a year of deep recession),

[10]This high exit rate among first-year exporters is consistent with Besedes's (2006) findings using 10-digit product level data on U.S. exports.

rising back to 11,720 by the end of the period. This volatility was due to single year exporters and, to a lesser extent, exiting firms. The number of entering and continuing firms exhibits smaller fluctuations around trend growth. The second panel shows, as was suggested by Table 1, that continuing firms provide the bulk of exports for all the years.

As shown in the third panel, continuing firms export the most per firm by a huge amount. Note that exports per continuing firm have not grown, but have fluctuated around US$ 3 million. The growth in total exports of continuing firms, and therefore most aggregate growth, has been overwhelmingly at the extensive margin of continuing firms although, as documented earlier, net entry contributed several percentage points to growth during 2003-2005. Both the number of continuing exporter firms and the total amount they exported rose about 50 percent over the period, while exports per continuing firm remained stable.

Entering and exiting firms have been similar in size to each other, small, and volatile year to year. Single year exporters have been much smaller still. Several interpretations are available for the fact that so many firms are jumping into and out of foreign markets, earning little revenue while they are in. One is that sunk entry costs are quite modest for a large fraction of producers. Given that other studies have found significant entry costs for many firms (Roberts and Tybout, 1997a; Das et al., 2007), this interpretation further suggests that the costs of "testing the waters" may be substantially less than the cost of locking in major exporting contracts. Such a two-tiered entry cost structure is implied by Rauch and Watson's (2003) model of international matching between buyers and sellers. An alternative (and not necessarily competing) interpretation is that firms undergo serially-correlated productivity or product quality shocks. Those that experience a sequence of very favorable draws find that

exporting is very profitable, and they persistently do so on a large scale. In contrast, those with draws just sufficient to induce them to export do so on a small scale, and frequently experience shocks negative enough to bump them out of foreign markets altogether. This is the mechanism used by Das et al. (2007) to explain patterns of exporter turnover and sales heterogeneity.[11]

Table 7 presents the results for individual destinations, averaging across the ten most popular. While the numbers are scaled down the overall picture is very similar.

5 Analysis by Cohort

From Table 1 we saw that entering firms made only a very small contribution to export growth in the year of entry, although gross entry explained almost half of growth over the full eight year period. To examine the connection between the small year-to-year effect and the large long-term effect we investigate the role that entrants play as their cohort ages, as surviving members acquire experience in foreign markets.[12] In doing so, we come closer to characterizing the "life cycle" of an exporting episode, getting a better sense of what would happen to export sales if new firms faced higher barriers to initiating foreign operations.

[11] Another dimension underlying the pattern of export entry which may be of relevance, and is left for future research, is whetherthe firm is linked with a multinational corporation that may have partially sunk some of the costs associated with distribution and product placement associated with penetration of new markest. The evidence in Kugler (2006) shows that in other important dimensions such as productivity, scale, skill intensity and capital intensity, multinational affiliate manufacturing plants display higher averages than domestically owned ones.

[12] Brooks (2006) performs a similar analysis using Colombian plant-level data.

Table 8 presents data on the activity of firms that enter in a particular year t over the remaining years of our sample. A firm is assigned to cohort t if the first report of an export transaction by that firm over our whole period of study occurs in year t. We don't know what firms did before 1996 but, for comparison purposes, we report firms present in 1996 as if they belonged to a "1996" cohort. Hence figures for this "cohort" should be interpreted very differently, as they combine firms starting to export in 1996 and survivors from previous cohorts.

In parallel with Tables 6 and 7 the top panel reports the number of firms, the middle panel the total exports of these firms, and the bottom panel the consequent average exports per firm. Note first that the survival rate among first-year exporters is typically around one-third, and in some cases is much lower. Thus an enormous "weeding out" occurs in the year of entry.[13]

Interestingly, however, the survival rate typically rises substantially after the first year to .8 or .9, except in the last year in the sample, when it is much lower across all cohorts. Thus firms that make it through the first year are much more likely to survive to the end of the period. This finding is consistent with learning on both sides of the market, as discussed above.

Turning to total sales, those of firms that were present in 1996 remain quite stable at about US$ 10 billion until the last two years, when they grew substantially, in parallel with total exports. At the end of the period their exports still accounted for 76 percent of total foreign sales. On the other hand, post-1996 entrants gain market share relative to the 1996 cohort in most years, and account for 47 percent of the expansion in total exports between 1996 and

[13]This result was of course implied by the large number of one-year exporters discussed above.

2005, as was also seen in Table 1.[14] Different cohorts grow at different rates, however. Some (such as the 1998 cohort) are slow to blossom, while others (such as the 2000 cohort) establish themselves quickly.

In terms of exports per firm, size jumps substantially after the first year. Hence, even though many firms drop out after the first year, total exports by the cohort do not fall accordingly. As of 2005, firms that exported in 1996 remained over four times larger than those in any entering cohort. But older cohorts are not always larger than younger ones. The 2000 cohort has the most exports per firm among entering firms.

Table 9 reports results of a similar exercise for the ten most popular destinations; results for the average destination (among the ten most popular ones) are reported. The overall patterns are similar although, across these individual destinations, the 2001 rather than the 2000 cohort stands out as the most successful among entrants, while the 1998 cohort looks closer to average. Also, post-1996 entrants play a more important role in the most popular destinations, accounting for 70 percent of the export expansion by 2005.

To summarize, in the aggregate or within individual markets, firms that exported in the first sample year (1996) remain more numerous 10 years later than any but the most recent cohort. These long-time exporters continue to be the largest, both in total export sales and in exports per firm. Nonetheless, post-1996 entrants account for roughly half of the total expansion in exports over the sample period. Although each wave of entering firms exhibits very high attrition rates within a year of their appearance, those new exporters that survive this initial shakedown are very likely to thrive. Cohorts differ in their performance over the years, with leapfrogging in size occurring. The heterogeneity in export growth conditional on

[14] They account for 100 percent of the expansion between 1996 and 2003.

survival suggests that, among firms attaining the threshold profitability of operating in a new destination, there is a wide variety in export performance thereafter.[15]

6 Cross-Market Dynamics

We now use transition matrices to characterize cross-market patterns of entry and exit in more detail. Table 10 breaks our sample into firms that sell to different numbers of destination markets: none, one, two, three to five, and so on, and then documents year-to-year transition frequencies between the categories. Again, we define the population of firms to be those that exported at least once during the 1996-2005 sample period. The bottom row of Table 10 reports the fraction of firms in each cell at the beginning of the period. Note that the modal number of destination markets is zero, with the frequency of firms selling to multiple markets declining in the number of markets.[16]

The main part of Table 10 reports the frequency with which firms assigned to the column categories in year $t-1$ transited to the various row categories in year t. The columns thus sum to 100. As expected, non-exporters almost always enter a single market when they initiate foreign sales, and when firms add or subtract markets, they are more likely to do so gradually than in large clumps. This pattern is consistent with the model developed in Eaton et al. (2007), augmented to allow for serially correlated productivity shocks.

While transition matrices are typically diagonal dominant, note that firms selling to one destination are more likely to drop out of exporting than to continue exporting. Here again,

[15] Irarrazabal and Opromolla (2006) provide a dynamic model of entry into export markets, based on Luttmer (2006), that captures some of these elements qualitatively.

[16] This result parallels what Eaton et al. (2004) found in a cross-section of French firms.

we are picking up the high failure rates among first-year exporters. A similar, albeit more muted, pattern appears among firms selling to two destinations. A member of this group is more likely to drop down to one, or to drop out of exporting altogether, than to continue selling to two or more. Only firms selling to three or more destinations are more likely to stay where they are or move up. The most stable firm types are the non-exporters and those selling to 10 or more destinations.

Applying the transition matrix over and over again to an arbitrary initial allocation of firms across the cells gives the ergodic distribution implied by the transition matrix. Doing so 1000 times (by which point the distribution of cells had converged) yields an ergodic distribution very close to the initial one given in the bottom row.

We can also look at transitions across various groups of destinations. We first assign destinations to three groups: the United States, neighbors (Venezuela and Ecuador), and others. We then look at the various combinations of these groups. We create cells of these different combinations and, as above, include a cell for not exporting in year $t-1$, conditional on exporting in some year of our sample period. Table 11 reports the groups and the transitions between them.

The bottom row of Table 11 reports the initial frequency of firms in the different cells. No destinations is most common, followed by "others," "neighbors," and the United States. Notable is the lack of overlap between firms selling to the United States and firms selling to neighbors. The transition matrix is highlighted to show transitions between cells involving the same number and different number of destination categories.

The fact that the numbers in any row are quite different across columns implies that a

firm's probabilities of moving into different markets depend upon its current market position. For example firms in the "neighbors" group are much more likely to move into "neighbors and others" than firms in the "others" market are. More generally, the "neighbors" cell offers the greatest promise of launching into a larger number of destination groups (with frequency .1, compared with .08 for others and the United States). On the other hand, the first row indicates that firms are most likely to drop out of exporting from the US cell, followed closely by the "others" cell. A non-trivial fraction of firms selling to more than one destination also drop out from exporting by the following period. The cell containing neighbors and the United States is the least stable, offering the greatest chance of launching into the cell with all three groups but also the greatest chance of dropping down to zero or one destination. This path dependence may reflect differences in the types of products that are exported to different destinations, destination-specific threshold costs for exporters breaking into new markets (which create incentives to stay put), or some combination of both factors.

The "others" category in Table 11 pools some very heterogeneous countries. To give a more detailed picture of trade with countries in this residual group, Table 12 breaks countries falling under this "others" heading into two subgroups: (i) non-neighbor Latin American countries and (ii) the EU and the rest of the world (ROW). (OECD countries dominate the second category.) We had seen in Table 11 that the "neighbors" category showed the greatest probability of diversifying into more markets; Table 12 shows that this expansion occurs mainly by entering other countries in Latin America. Moreover, while it is as likely that in $t-1$ that a firm exports solely to the neighbors category as it is that it exports to other destinations in Latin America, the two categories differ in that the "neighbors" column shows

higher probability of both continuing exporting and diversifying into new markets. Firms that sell only to other Latin American destinations in $t-1$ stop exporting in t with probability 0.64, compared to 0.56 for firms that export only to the neighboring destinations. Also, moving to the rows of "Neighbors, LA" or "Neighbors, USA, LA" occurs with probability 0.07 for firms that start selling only to neighbors, compared to 0.04 for those that start in the "LA" only column.

Once a firm exports to both neighbors and other Latin American destinations, it enjoys a 24 percent chance to expand further to reach an OECD destination while firms that sell only to neighbors or only to other countries Latin America are very unlikely to do so. Thus, while neither neighbors nor Latin America stand alone as "stepping stones," jointly they often constitute the first two rungs to climb in the ascent to reach either the US and other OECD countries.

A similar exercise (not reported) was conducted separating the EU rather than Latin America from others. The results show that very few Colombian firms sell to the EU, and that it is an unlikely destination for an initiate. At the same time, the few firms that sell only to the EU are less likely to increase their groups of destinations and are most likely, among single group exporters, to drop out of exporting. These patterns trace at least partly to the fact that the EU has remained a stagnant market from the perspective of Colombian firms.

7 Summary

Each year, large numbers of new Colombian exporters appear in foreign markets. Most drop out by the following year, but a small fraction survive and grow very rapidly. Thus, while

the entering cohort in any given year makes a trivial contribution to total export sales, its contribution over a longer period is significant. Indeed, over the course of a decade almost half of the total growth in Colombian merchandise exports was attributable to firms that were not initially exporters. One interpretation of this pattern is that new exporters and their potential buyers undergo a period of learning about one another. As the uncertainty is resolved, exporters either expand their sales substantially or abandon the particular market.

While aggregate export levels are primarily accounted for by big established firms, there is an apparently important role of experimentation and selection. As explained above, entry is important to export growth. In fact, the panel data shed light on the life-cycle of exporters by showing that new exporters upon survival of the first year are crucial to growth. While other studies have found significant entry costs into export markets by individual firms, our finding of substantial short-lived entry suggests that the costs of shipping small volumes to new destinations are relatively small for many firms. Those costs may be viewed as part of the larger cost of establishing lucrative long-term export contracts. This two-tiered entry cost structure is consistent with learning in export markets by both buyers and sellers.

There appear to be dominant geographic expansion and contraction paths that firms follow as they add or subtract foreign destinations. Neighboring markets appear to act as stepping stones for other Latin American markets. Once firms have successfully penetrated both neighboring and other Latin American destinations, they are more likely to reach larger OECD markets (including the US and EU), but not vice versa. These patterns may well reflect demand mix effects, or market sizes and distances, as formalized in Eaton et al. (2007). But they may also reflect learning processes at work and regional differences in the mix of products

demanded. That is, success in smaller markets may provide a signal that the expected payoff of testing the waters in larger markets exceeds the sunk costs.

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