Multi-Product Exporters:

Diversification and Micro-Level Dynamics

Leonardo Iacovone

Beata S. Javorcik

The World Bank
Development Research Group
Trade Team
September 2008

Abstract

Recent developments in trade theory, especially research on multi-product firms, have not been matched by similar progress on the empirical front. This paper aims to fill this gap by presenting a novel set of stylized facts on firm-product dynamics observed during an export boom. This exercise is possible thanks to a unique firm-product level dataset covering about 85 percent of Mexican industrial output for the period 1994–2003. The main findings are as follows. First, there is a substantial degree of product turnover at the firm-product level in response to declining trade costs. Second, "core competencies"—the fact that firms have a cost

advantage or greater expertise at manufacturing some of their products—are the main driver of firms' decision to introduce or drop export products. Third, new exporters tend to "start small" in terms of both values and number of exported products. Fourth, even if the expansion in the number of exported products played a role in stimulating Mexican exports, the growth in volume of pre-existing products was the main driver of the export boom. Finally, the introduction of new export products is preceded by a surge in investment. These findings are in line with many, but not all, predictions of recent theoretical work.

This paper—a product of the Trade Team, Development Research Group—is part of a larger effort in the department to understand how export drivers of exports grow. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted at Liacovone@worldbank.org and Beata.Javorcik@economics.ox.ac.uk.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

MULTI-PRODUCT EXPORTERS: DIVERSIFICATION AND MICRO-LEVEL DYNAMICS*

Leonardo Iacovone[†] and Beata S. Javorcik[‡]

*The authors are grateful to Gerardo Leyva and Abigail Durán for granting us access to INEGI data at the offices of INEGI in Aguascalientes under the commitment of complying with the confidentiality requirements set by the Mexican Laws. Special thanks go to all INEGI employees who provided assistance and answered our questions, in particular to Gabriel Romero, Alejandro Cano, Araceli Martinez, Armando Arellanes, Ramon Sanchez, Otoniel Soto, Candido Aguilar, Adriana Ramirez. The author are also thankful to Alan Winters, Bernard Hoekman and participants of the World Bank trade seminar for their useful comments. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the view of the World Bank, its Executive Directors or the countries they represent.

[†]University of Sussex and World Bank, 1818 H Street, NW; Washington, DC, 20433, USA. Email: Liacovone@worldbank.org

[‡]University of Oxford and CEPR, Department of Economics, Manor Road Building, Manor Road, Oxford OX1 3UQ, UK. Email: beata.javorcik@economics.ox.ac.uk

1 Introduction

Micro-foundations of growth have increasingly attracted attention of economists interested in comprehending the process of structural change and development (Hausmann and Rodrik 2003). Economists have realized that understanding how micro-heterogeneity affects macro responses is crucial in order to devise effective policies for promoting growth (Bartelsman and Doms 2000, Tybout 2000). The international trade literature has been at the forefront of this movement thanks to various groundbreaking contributions that allowed for incorporation of firm-level heterogeneity into trade models (Melitz 2003, Yeaple 2005, Bernard, Redding, and Schott 2007), innovative empirical studies evaluating firm-level responses to trade reforms (Pavcnik 2002, Trefler 2004, Schor 2004, Fernandes 2007, Harrison 2007), and pioneering work explaining the determinants of geographical expansion of exporters (Eaton, Kortum, and Kramarz 2004b, Eaton, Kortum, and Kramarz 2004a, Eaton, Eslava, Kugler, and Tybout 2007).

More recently the theoretical literature has moved even further by unwrapping firms and incorporating another layer of heterogeneity, namely heterogeneity at the product level (Bernard, Redding, and Schott 2006a, Eckel and Neary 2006, Nocke and Yeaple 2006). These models capture endogenous dynamics across firms (e.g. exporting activities undertaken by some firms versus the exclusive focus on the domestic market by others) as well as within firms (e.g. some products being exported but not others). The aggregate responses to policy changes emerge as a combination of these multiple dynamics.

Yet, due to data constraints, there is little evidence that can corroborate or contradict predictions coming from models of multi-product firms. Do firms indeed adjust the number of products exported in response to changes in trade policy? What about adjusting the volume of exports of each product? Which products are the most affected? Is there a positive or a negative relationship between the intensive margin (i.e., the volume of exports of each product) and the extensive margin (the number of products exported)?¹

Similarly, the dearth of stylised facts at the firm-product levels means that theorists have little guidance in terms of what the appropriate assumptions are. As a consequence, the models vary widely in how they formalize product attributes within a firm and the in-

¹The notable exceptions are studies by (Bernard, Redding, and Schott 2006b) and (Bernard, Redding, and Schott 2006a). The former study is the closest to our paper but its focus is quite different, as it examines production patterns in general. The latter study is primarily a theoretical contribution but includes some empirical results on the link between the intensive and the extensive margins of exports. Both studies are based on the US data.

teraction between product- and firm-level characteristics. For instance, while Bernard, Redding, and Schott (2006a) model firm- and product-specific competencies and Eckel and Neary (2006) assume that how good a firm is at producing a particular product depends on how far this product is from the firm’s core competencies, in Nocke and Yeaple’s (2006) model firms are heterogeneous but products are symmetric.

The objective of this study is to inform the theoretical literature by shedding some light on the firm-product dynamics, particularly in the context of export decisions. We are able to do so thanks to a unique dataset at the firm-product level, covering 85% of Mexican industrial output and several thousands of products during the period 1994-2003. The data give us a window on a period of profound reforms and increasing international integration of Mexico after the introduction of NAFTA. These irreversible trade reforms together with a dramatic exogenous shock, a 300% devaluation of the peso, expanded the access of Mexican firms to the US market and stimulated sharp responses at the firm- and product-level. In fact, the 300% increase in Mexican exports between 1993 and 2002 and growing export diversification in the post-NAFTA period have already been documented by studies relying on aggregated trade statistics (Romalis 2007, Feenstra and Kee 2007).

In the study, we present five main findings. First, we show that multi-product exporters are much less prevalent in Mexico than in the US, which contrasts with the observations of Bernard, Redding, and Schott (2006b).

Second, we document a significant degree of churning at the product level taking place in response to declining trade costs and find evidence suggesting that firms’ decisions to introduce and drop products are influenced by what appear to be their “core competencies”. These observations confirm the predictions of the latest theoretical models (Bernard, Redding, and Schott 2006a, Eckel and Neary 2006) stating that the range of products produced within a firm is another margin of adjustment to changes in trade policies. Moreover, our data support the prediction that exports of core products tend to expand in response to improved access to foreign markets.

Third, we observe that new exporters tend to “start small” in terms of both values and number of exported products. This observation supports the prediction of Rauch and Watson’s (2003) model, in which search costs and information asymmetries lead heterogeneous firms to start small in order to “test” the credibility of the foreign partner. In an environment where firms are heterogeneous and there is incomplete information about the reliability of new trading partners, the seller needs to gain a minimum degree of credibility with the buyer before being requested a large order. For this reason, when the relationship

is initially established the buyer will start with some “trial orders” in order to assess the reliability and quality of the new trading partner.

Fourth, we show that introduction of new export varieties follows a surge in investment. This finding is consistent with the predictions of the theoretical contribution of Constantini and Melitz (2007) who build on the work of Melitz (2003) and develop a model which incorporates a joint decision to upgrade product quality and enter export markets. Their model shows that the anticipation of future liberalization induces firms to innovate ahead of liberalization and thus also ahead of their anticipated, but yet unrealized, entry into export market.

Finally, we quantify the relative magnitudes of three margins through which the adjustment to trade policy changes takes place: (i) firm entry into (exit from) export markets; (ii) changes in the volume of existing export products undertaken by established exporters; and (iii) adjustments to the range of export products at the firm level. While all three margins play an important role, changes in the volume of existing exports account for most of the adjustment in the volume of exports.

We are confident that these results can inform and stimulate further development of the theory of international trade in various directions. They can be particularly useful to theoretical work aiming to unbundle the firm. They can also inform models of search costs and exporting. Finally, these results can be useful to theorists interested in the link between investment and exporting and the debate on learning to export versus learning from exporting.

Additionally, our findings can be informative to policy makers and researchers interested in the link between the structure of a country’s exports and growth (see an emerging literature started by Hausmann, Hwang, and Rodrik (2007)). Understanding the dynamics of introducing new export products at the firm level constitutes the first step in understanding how a country can upgrade its export structure and what policies, if any, can stimulate this process. Our observation that entry into export markets and introduction of new export products by established exporters are preceded by an increase in investment suggest that policies lowering the cost of investment may trigger an export boom. Our finding that developing country exporters are different from developed country exporters indicates that export promotion policies that are successful in the industrialized world may not be the most appropriate ones in a developing country context. Finally, our observation that export discoveries are quickly adopted by the firm’s competitors may suggest a possible role for policy in supporting such discoveries, as outlined by Hausmann and Rodrik (2003).

This paper is structured as follows. The next section describes the data. In the third section, we unbundle the firm and present a series of stylized facts based on firm-product level information. The following section documents product heterogeneity within a firm. In section five, we show a set of stylized facts consistent with recent trade models characterized by information asymmetries, trust and search costs. Then we present some novel findings on export discovery and decompose the Mexican export boom using our micro-level data. Finally, the conclusions on the implications of these stylised facts close the paper.

2 Data

Our analysis is based on firm-product-level data from the *Encuesta Industrial Mensual* (EIM) and the *Encuesta Industrial Anual* (EIA) administered by the *Instituto Nacional de Estadística Geografía e Informática* (INEGI) in Mexico.

The Encuesta Industrial Anual is an annual industrial survey that covers about 85% of Mexican industrial output, with the exception of “maquiladoras.” The EIA was originally started in 1963 and then expanded in subsequent years, with the last expansion taking place in 1994 after the 1993 census. In our analysis, we use the information for the 1993-2002 period.

The unit of observation is a plant described as “*the manufacturing establishment where the production takes place.*” Each plant is classified in its respective class of activity (*clase*) based on the basis of its principal product. The *clase* or class of activity is equivalent to the 6-digit level CMAP (Mexican System of Classification for Productive Activities) classification.

The post-1993 EIA includes 6,867 plants spread across 205 classes of activity. The sampling framework is based on the 1994 industrial census. In each of the selected 205 *clases* the survey samples the largest firms until the coverages reaches 85% of the sectoral output. In sectors with fewer than 20 plants, all entities are surveyed. Moreover, all plants with more than 100 employees are automatically included in the sample.

The Encuesta Industrial Mensual (EIM) is a monthly survey that is collected by INEGI

to monitor short-term trends and dynamics. The survey has been run in parallel with the EIA and has covered the same plants. The EIM panel is available for the period 1994-2004 covering 205 *clases*. The principal difference with EIA is its periodicity (being this monthly instead of yearly) and its data content. The EIM contains the following revenue-related variables: total production, net sales and export sales. Plants are asked to report both values and quantities for each product produced, therefore an implicit product unit value can be calculated.

Particularly valuable for our purpose is the fact that the EIM collects information at the plant-product level. Information on 3,396 unique products is included in the survey.² Each *clase* contains a list of possible products, which was developed in 1993 and remained unchanged during the entire period under observation. For instance, the *clase* of *distilled alcoholic beverages* (identified by the CMAP code 313014) lists 13 products: gin, vodka, whisky, liquors, coffee liquors, liquor “habanero”, “rompope”, prepared cocktails, prepared from agave, brandy, rum, table wine, alcohol extract for liquor preparation. The *clase* of *small electrical appliances* contains 29 products, including vacuum cleaners, coffee makers, toasters, toaster oven, 110 volt heaters and 220 volt heaters (within each group of heaters the classification distinguishes between heaters of different sizes: less than 25 liters, 25-60 liters, 60-120 liters, more than 60 liters). These examples illustrate the narrowness of product definitions and the richness of micro-level information available in our dataset.

We aggregate monthly EIM data into annual observations. Because the information is collected at the plant level, we also aggregate the information at the firm level using specific multi-plant firm identifiers.³ In the case of multi-plant firms with different plants producing the same product, the figures are aggregated into one product.⁴ Nominal values are converted into real terms using price deflators provided by Banco de Mexico for intermediate inputs, investment, wages, etc. The details of data cleaning procedures are described in Iacovone (2008). We supplement the EIM data with information on other aspects of firm operations available from EIA, including investment in physical assets, investment in R&D and investment in technology acquisition.

The number of firms in the sample varies between 5,495 in 1994 and 3,883 in 2003 (see

²For comparison, the study by Bernard, Redding, and Schott (2006b) using US data is based on approximately 1,800 product codes.

³This information is normally not part of the EIM, however in 2005 a special study was done and the data identifying the multi-plant firms can be linked to the year 2003.

⁴As most Mexican firms have only a single plant, conducting the analysis at the plant-level would lead to similar results. In fact in the EIM there are 5,265 single plants firms and 473 multi-plants ones, with the latter owning in average 3 plants each.

Table 1), which corresponds to 6,299 and 4,626 plants in 1994 and 2003, respectively. Between 1,467 and 1,907 firms are engaged in exporting. The decline in the number of firms during the period under analysis is due to firm exit. In the paper, we refer to each firm-product combination as a product variety. Table 1 shows that the number of sold varieties ranges from 18,092 in 1994 to 12,675 in 2003, while the number of exported varieties expands from 2,743 in 1994 to 3,199 in 2003, reaching the peak of 4,098 in 1998. The summary statistics for all variables are reported in Table 2.

Table 1: Number of firms and products

Year	No of firms		No of products	
	All	Exporting	Sold	Exported
1994	5495	1406	18092	2743
1995	5273	1665	18056	3384
1996	4989	1824	16982	3830
1997	4776	1907	16093	4021
1998	4591	1857	15534	4098
1999	4437	1722	15028	3820
2000	4297	1666	14343	3647
2001	4152	1550	13765	3431
2002	3998	1478	13304	3243
2003	3883	1467	12675	3199

Notes: Firm-level data, based on firm identifier from 2003

Table 2: Summary statistics

	Mean	No. of obs.
<i>Investment (all firms - thousands 1994 pesos)</i>	1666.11	47169
<i>Investment (only investing firms - thousands 1994 pesos)</i>	2490.81	32188
<i>Export Ratio (all firms, in percentage)</i>	6.90	67980
<i>Export Ratio (only exporters, in percentage)</i>	25.12	18842
<i>Number of varieties sold</i>	2.96	52962
<i>R&D (all firms - thousands 1994 pesos)</i>	113.4	59777
<i>R&D (only investing firms - thousands 1994 pesos)</i>	232.11	6070
<i>Technological transfers (all firms - thousands 1994 pesos)</i>	228.8	58554
<i>Technological transfers (only investing firms - thousands 1994 pesos)</i>	1492.2	8978

3 A look inside the firm

In this section, we take a look inside the firm, compare Mexican exporters to their American counterparts and describe some dynamics at the product level.

3.1 Most firms export few products

Only a minority of Mexican firms export, and those exporting tend to concentrate on few products. As illustrated in the top panel of Table 3, only about a quarter of firms were engaged in exporting in 1994. In the aftermath of the Peso crisis and the introduction of NAFTA, the percentage of exporting firms increased to one-third in 1997, but by 2003 it returned to the initial level. What’s more interesting, however, is that 80% of exporting firms sell abroad only one or two products, and only about 10% of firms send five or more products to foreign markets (see the bottom panel of Table 3). This contrast with the bipolar distribution of exporters in developed countries. For instance, according to Bernard, Redding, and Schott (2006b), while 58% of American exporters rely on one or two export products, over a quarter of them send five or more products abroad (see Table 5). It appears that in Mexico during the period under study the importance of firms exporting one or two products declined somewhat relative to those exporting a larger number of products.

Table 3: Most firms export few products

Years	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	% of firms									
do not export	75.96	71.53	68.8	67.38	68.23	70.56	71.52	73.5	74.73	74.92
export	24.04	28.47	31.2	32.62	31.77	29.44	28.48	26.5	25.27	25.08
No. of export products										
1	62.23	60.48	59.52	58.65	57.26	57.10	57.09	57.74	58.37	57.14
2	17.55	18.30	17.53	18.30	18.07	17.36	18.61	17.17	16.78	17.98
3	7.95	7.87	8.78	9.17	9.47	9.51	9.13	9.47	9.14	9.97
4	4.12	4.50	5.00	5.03	4.69	5.81	4.74	5.17	5.26	4.90
5	2.58	2.53	2.69	2.61	2.86	2.85	3.65	2.83	3.17	3.15
6	1.91	2.46	2.15	1.56	2.27	1.87	1.51	1.89	1.90	1.63
7	1.29	1.33	1.15	1.04	1.01	1.39	1.51	2.11	1.54	1.99
8	0.79	0.49	0.83	1.16	1.45	1.56	1.26	0.83	1.03	0.68
9	0.42	0.60	0.67	0.58	0.91	0.51	0.74	0.72	0.95	1.04
≥10	1.21	1.40	1.76	1.90	2.05	2.00	1.83	2.08	1.82	1.59
Total	100	100	100	100	100	100	100	100	100	100

Notes: Includes single- and multi-plant firms

3.2 In contrast to the US, most Mexican exports come from single-product exporters

The majority of Mexican exports come from firms that export a small number of products. In Table 4, we group firms based on the number of products they sell abroad

and present the share of total exports accounted for by each group. It is striking that firms exporting a single product account for over a third of total exports, and firms exporting one or two products for over a half. Firms exporting five or more products are responsible for less than a quarter of total exports.

Table 4: Most exports come from firms exporting few products

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
No. of export products	Export share									
1	41.62	34.29	35.02	35.06	33.37	33.6	33.36	35.01	33.16	36.64
2	20.82	22.41	19.56	18.01	18.31	18.34	19.91	14.83	16.98	15.75
3	8.48	12.3	12.88	12.17	15.2	11.53	11.12	11.89	13.27	14.63
4	8.15	11.1	9.82	9.82	6.6	10.58	10.01	11.32	10.46	9.51
5	7.65	4.59	5.23	5.29	6.97	7.96	8.36	7.5	8.1	6.33
6	2.44	4.23	5.27	3.32	4.17	2.92	2.22	4.62	4.07	4.32
7	4.62	3.27	2.73	3.39	2.07	3.53	4.19	3.45	3.04	3.02
8	1.85	0.61	1.58	2.33	2.43	2.7	1.79	1.25	2.01	1.32
9	1.49	1.78	1.78	2.54	5.43	2.64	2.36	4.62	4.08	3.52
≥ 10	2.88	5.42	6.13	8.09	5.47	6.19	6.68	5.51	4.82	4.95
Total	100	100	100	100	100	100	100	100	100	100

Notes: Includes single- and multi-plant firms

This result contrasts sharply with the findings of Bernard, Redding, and Schott (2006b) for the US where firms exporting five or more products account for 98% of total exports (see Table 5).

Table 5: Multi-product exporters in the US

No of export products	Share of firms	Share of exports
1	42.2	0.4
2	16.4	0.5
3	9.3	0.5
4	6.2	0.6
≥ 5	25.9	98

Source: Bernard, Redding, and Schott (2006b)

3.3 Intense churning at the product level

A relatively stable average number of export varieties at the firm level hides a lot of churning at the product level, as many firms introduce new export products, drop existing ones or do both imultaneously. Table 6 shows a remarkable stability in the average number of exported products at the firm level, even in a period of profound changes as the one under analysis. A stable pattern can be observed among both new and established exporters.

Table 6: Averages are stable at the firm level

Year	Average No. of Exported Products		
	All	New Exporters	Existing Exporters
1994	1.95		
1995	2.03	1.49	
1996	2.10	1.67	2.33
1997	2.11	1.56	2.29
1998	2.21	1.64	2.33
1999	2.22	1.62	2.29
2000	2.19	1.37	2.29
2001	2.21	1.34	2.32
2002	2.19	1.37	2.29
2003	2.18	1.48	2.29
Total	2.14	1.55	2.30

Notes:

Only include exporters

Calculated at firm-level (single- and multi-plant).

New exporters are defined as firms that begin exporting at t .

From existing exporters we exclude firms that begin to export in both in t and $t - 1$.

Existing exporters are those exporting since $t - 2$.

However, as depicted in Figures 1 and 2 these averages hide a lot of churning at the product level. The combined number of the newly introduced export varieties and the dropped varieties is equal to about 20% of the total number of exported varieties. Between 10 and 20% of exporters active in any given year introduce new export products, a marginally smaller percentage drops existing products, and a much smaller, but still not negligible, number of firms simultaneously introduce and drop export products. Product churning takes place in all sectors but it is the most prevalent in textiles, garments and leather as well as in wood products. The smallest extent of churning is observed in mineral based industries (see Figure 3).

Figure 1: Product churning at the firm level

Figure 2: Product churning at the firm level

Figure 3: Product varieties churning - Sectoral Differences

While the international trade literature has examined the patterns of introduction and discontinuation of export products and contrasted changes at the “extensive margin” and “intensive margins” using national trade statistics (Hummels and Klenow 2005, Besedes and Prusa 2006, Besedes and Prusa 2007, Venables and Evenett 2002), export churning at the firm level has not been documented before. To the best of our knowledge, this is the first study to uncover a very high degree of export product churning within firms. Our finding is in line with Bernard, Redding, and Schott (2006b) who document a similar pattern for products produced and sold (in general) in the US.⁵

Product churning within the firm has recently attracted a lot attention among theorists who suggested various explanations for this phenomenon. In particular, a theoretical contribution by Bernard, Redding, and Schott (2006a) puts forward the hypothesis that product churning is due to firm-level managerial capabilities interacting with product-firm level idiosyncratic expertise. Eckel and Neary (2006) build a model of multi-product firms characterized by core competencies and cannibalization effects among products. In both models, the range of products produced and exported responds to changes in trade

⁵They find product switching to be *frequent, widespread and influential* in determining both firm and aggregate outcomes.

policies.

3.4 Intensive and extensive margin are positively correlated

In this subsection, we decompose export growth at the firm level into two dimensions: the extensive margin (i.e., degree of diversification measured by the number of export varieties) and the intensive margin (i.e., scale of exports measured by the average export value per variety). We find that the *extensive and intensive margin are positively correlated, as growing exporters expand simultaneously the number of export products and the average export sales per product*. Figure 4 illustrates this relationship graphically.

Theoretical predictions on the relationship between the extensive and the intensive margin depend on the model’s assumption. In Bernard, Redding, and Schott (2006a), the existence of a common managerial ability at the firm level leads to a positive correlation between the extensive and the intensive margin. In their model, the efficiency with which a firm produces a given product is determined by the firm-specific managerial ability and product-specific competencies. Therefore, a firm with a higher managerial ability tends to produce a larger set of products with higher volumes of each because, *ceteris paribus*, it is better at producing each product than a firm with a lower managerial ability. Bernard, Redding, and Schott (2006a) do not take into account the possibility of diseconomies of scope or the possibility that products may be substitutes and therefore raising the production volume of one product increases competition faced by other products.

In contrast to Bernard, Redding, and Schott (2006a), the existence of diseconomies of scope in Nocke and Yeaple (2006) and the presence of cannibalization effects in Eckel and Neary (2006) generate a negative correlation between the extensive and the intensive margin. In Nocke and Yeaple (2006), firms with a better managerial ability expand their scope, which makes it harder for a manager to control efficiently the various productive processes or marketing lines. As diseconomies of scope kick in, a firm expanding its scope becomes less efficient at producing each individual product, which generates the negative correlation between extensive and intensive margin. In Eckel and Neary (2006), the inclusion of cannibalization effects generates an incentive for multi-product firms “to restrict the output of each variety beyond the familiar own-price effect” which implies that “other things equal a multi-product firm produces less of each good.” This strategic incentive generates a negative correlation between extensive and intensive margin as a firm producing more products will be producing a bit less of each one of them than a firm with a more restricted product scope.

As illustrated in Figure 4, our findings seem to be more consistent with positive correlation between the extensive and the intensive margin predicted by the model of Bernard, Redding, and Schott (2006a), though after a point the relationship between extensive and intensive margin becomes flat.

Figure 4: Correlation between intensive and extensive margin (All firms)

4 Not all products are equal within the firm: evidence on product heterogeneity

When modeling multi-product firms one of the first assumption to be made is whether or not there is heterogeneity among products within the same firm. One can model heterogeneous firms producing multiple products as being equally good at each one of products. Or one can assume that firms have product-specific competencies and produce some products more efficiently than others. In this section, we will use the firm-product data to shed some light at which of these assumptions appears to be supported by the empirical evidence.

4.1 Core products

Firms expanding their exports tend to focus on their “core products.” The literature emphasizing heterogeneity at the product level (Bernard, Redding, and Schott 2006a, Eckel and Neary 2006) predicts that a decline in export costs will induce firms to

asymmetrically expand their export products with their “core products” being the most responsive to new export opportunities.

This prediction is confirmed in our dataset, which covers a period of a significant decline in export costs faced by Mexican firms. To show this, we calculate the rank of export varieties (in terms of their export value) within each firm in each period t . Then we calculate the rank of export varieties in terms of the increase in their export value between time t and $t + 1$. The correlation between the two ranks is 0.67 for firms exporting at least two varieties and 0.63 for firms exporting three or more varieties. In Table 7, we demonstrate that this positive correlation holds if we regress the rank of the export expansion between t and $t + 1$ on the importance (i.e. rank) of the variety at time t , controlling for year and firm fixed effects. Both of these observations suggests that Mexican exporters tend to expand the most their most important export products.

Table 7: Expanding exporters focus on core products

<i>Explained variable</i>	<i>Rank of expansion of export product</i>
Rank of Export Product (lagged)	0.3*** (.011)
Year FE	Yes
Firm FE	Yes
Robust SE	Yes
R-Squared	.44
No. Obs.	14,118

This pattern is confirmed by the transition matrix presented in Table 8. The table shows that the most important export variety (in terms of export value) at time t is in 62% of cases also the variety with the largest increase in the export value in the next period. For the second most important variety, this probability is only 47%, while for the fifth largest variety it goes down to 17%.

4.2 Fringe products

Products that appear more distant from core competencies are more likely to be dropped from export markets. The existence of product heterogeneity is confirmed when analyzing products that are more likely to be dropped from export markets. In fact, while exports of the most important varieties tend to expand, exports of the least important

Table 8: Expanding exporters focus on core products

Rank of expansion between t and t+1	Rank of product in t				
	1	2	3	4	5
1	62.31	47.25	34.08	23.01	17.03
2	23.87	37.91	33.69	27.06	23.09
3	7.4	9.59	20.67	22.55	22.63
4	3	2.91	6.49	17.05	17.26
5	1.42	1.12	2.23	5.05	13.37
6	0.85	0.55	1.45	3.06	3.66
7	0.49	0.32	0.68	1.3	1.6
8	0.28	0.12	0.34	0.69	0.8
9	0.21	0.17	0.29	0.15	0.34
10	0.16	0.06	0.1	0.08	0.23
Total	100	100	100	100	100

Note:

The rank of a product within firm is based on the value of product exports at time t.

The rank of export expansion within firm is based on the absolute increase in the value of product exports between t and t+1.

Only firms exporting more than one product are included in the sample.

varieties are more likely to be discontinued. We show this in Table 9 by regressing an indicator variable equal to one if a firm discontinues exports of a given product in a given time period, and zero if the variety continues to be exported, on the lagged importance of the variety. The importance is proxied by the value of the variety’s exports, the share of the variety in the firm’s total exports, and the number of years of experience in exporting the variety. We control for year fixed effects and cluster standard errors at the firm level. The regression is estimated as a probit model. While in the first two specifications, we include all export varieties, in models (4) and (5) we focus only on export varieties introduced after 1994 by both new and incumbent exporters, because only for these varieties we are able to define the “tenure” (i.e. years of experience in exporting). In all specifications, we find that less important varieties are more likely to be dropped from export markets. As a robustness check (not reported to save space), we also test a linear probability model with firm-product fixed effects and confirm that a product that becomes less important, as measured by exports share or export value, is also more likely to be dropped.

This observation is consistent with the assumption of product heterogeneity made by theoretical models of Bernard, Redding, and Schott (2006a) Eckel and Neary (2006). It suggests that firms may possess product-specific competencies and thus can produce some products more efficiently (*core products*) than others (*fringe products*).

Table 9: Product dropping

	(1)	(2)	(3)	(4)	(5)
Log Export Value	-.212*** (.005)		-.192*** (.005)		-.147*** (.006)
Share of Product in Total Exports		-.736*** (.028)	-.478*** (.028)		-.534*** (.035)
Log Years of Export Experience				-.206*** (.010)	-.146*** (.010)
Year FE	Yes	Yes	Yes	Yes	Yes
Clustered (firm-level) SE	Yes	Yes	Yes	Yes	Yes
No. Obs.	32,217	32,217	32,217	15,367	15,367

Notes

The dependent variable is equal to one if producer p discontinues exporting product i at time t , and zero otherwise.

All explanatory variables are lagged one period.

5 Information asymmetries, trust and search costs

Recent theoretical (Rauch and Watson 2003) and empirical contributions (Besedes and Prusa 2006) points towards the importance of information asymmetries, trust and search costs as crucial determinants of trade patterns. In this section, we compare some of the implications of these models with descriptive statistics and stylised facts emerging from the analysis of Mexican firm-product level data.

5.1 New exporters start small . . .

Firms entering foreign markets for the first time start small in terms of the number of exported varieties and the export volume. This is illustrated in Figure 5 which relates the average number of export varieties to the firm's experience in export markets.⁶ The year when a firm begins to export is identified by zero on the X-axis. As illustrated with the dashed line, new exporters begin their sales in foreign markets with one or two export varieties (1.7 varieties on average). Two years later the average number of exported varieties increases to 2. The total number of varieties sold by the firm (continuous line) increases slightly in the year the firm enters foreign markets and remains stable afterwards. This suggests that most firms enter foreign markets by introducing varieties already sold

⁶New exporters are defined as firms which were not exporting in the previous year and are exporting in the current one

domestically. New exporters also start small in terms of export volume. Figure 6 indicates that first-year exports account for only a small fraction of the firm's total sales. The volume of exports increases in subsequent years, though less than firm's total sales.

Figure 5: New exports start small - number of products (all firms)

Figure 6: New exports start small - values (all firms)

These findings fits well with the theoretical model of Rauch and Watson (2003) and the recent evidence based on disaggregated trade statistics presented by Besedes and Prusa (2006). In Rauch and Watson's (2003) model, search costs and information asymmetries lead heterogeneous firms to start small in order to "test" the credibility of the foreign partner. In an environment where firms are heterogenous and there is incomplete information

about the reliability of new trading partners, the seller needs to gain a minimum degree of credibility with the buyer before being awarded a large order. For this reason, when the relationship is initially established the buyer will start with some “trial orders” in order to assess the reliability and quality of the new trading partner.

5.2 Firms start exporting by introducing into foreign markets a variety they already sell at home . . .

New exporters not only start small but also start by exporting varieties that they are already selling on the domestic market. As evident from the last column of Table 10, in about 68 to 89% of cases (depending on the year considered), firms decide to enter foreign markets with a variety that have previously sold domestically. Only a minority of firms start their exporting activity with a variety they have not previously produced.

Table 10: Firms tend to enter export markets with varieties they have previously sold at home

Year	No. of new exporters	Firms starting to export	
		No. of new exporters starting with a product previously sold domestically	%
1995	602	539	89.5
1996	460	401	87.2
1997	358	310	86.6
1998	225	180	80.0
1999	166	113	68.1
2000	163	145	89.0
2001	124	107	86.3
2002	120	99	82.5
2003	219	171	78.1
Total	2437	2065	84.7

5.3 . . . while existing exporters are more likely to introduce export product not sold before at home

Experienced exporters are more likely than new exporters to introduce into export markets varieties not previously sold domestically. Table 11 shows that in nearly one-third of cases, experienced exporters introduce to export markets a variety

they have not previously sold in Mexico.⁷ It is plausible that foreign customers request their Mexican partners to widen the assortment of exported goods or that active exporters introduce new export items in response to new business opportunities they have spotted while being active in foreign markets.

Table 11: Existing exporters introducing products not previously sold

Year	Firms introducing new export product		
	No. of experienced exporters	No. of exporters introducing export product previously sold domestically	% %
1995	470	352	74.9
1996	539	348	64.6
1997	470	313	66.6
1998	474	313	66.0
1999	315	217	68.9
2000	263	189	71.9
2001	243	167	68.7
2002	189	148	78.3
2003	207	155	74.9
Total	3170	2202	69.5

Notes:

The second and third column refer to number of firms.

Experienced exporters are defined as those in the second or later year of their exporting activity.

5.4 Exports of new varieties are larger in volume if the variety has not been previously sold at home

When introducing into export markets a product not previously sold in Mexico, firms start with a larger volume of exports in absolute terms as well as relative to domestic sales. In fact, when we analyze the average volume of exports for newly introduced export products by splitting them into two groups depending on whether or not they were previously sold in Mexico by the firm we find that products not sold domestically before tend to have a larger volume of exports: on average 12 million of pesos (in 1994 currency) relative to 6.5 million pesos for the other group. Similarly, varieties not previously sold at home have a larger export share (see Figure 7). On average, 43% of production is exported in the case of varieties not previously sold relative to 13% in the other group.

⁷We define experienced exporters those firms that are in their second or later year of exporting activity.

Figure 7: Comparing export ratios of new export products (only firms introducing a new export product).

We can also illustrate this stylised fact with a simple regression described by equation 1. The dependent variable (Y_{ift}) is the ratio of export value to total sales of variety i sold by firm f operating in industry j at time t . Recall that we refer to the same products exported by different firms as being distinctive varieties, thus the dependent variable is at the firm-product level. The variable of interest is an indicator equal to one if the variety introduced in export markets at time t was already sold domestically by the exporting firm at $t - 1$, and zero otherwise.

$$Y_{ift} = \beta_0 + \delta \text{ Product sold on domestic market}_{ift-1} + \alpha_t + \alpha_j + \mu_{it} \quad (1)$$

The results, presented in Table 12, confirm our earlier observations. The estimated coefficient (δ) is negative and statistically significant suggesting that varieties that are introduced in foreign markets tend to have a lower export volume if they were previously produced for the domestic market.

Table 12: Regression results

DEP VAR	export ratio	log of real export value
Dummy product	-0.26***	-0.76***
already sold	(0.012)	(.093)

Notes:

Only includes newly introduced export products.

Regressions at firm-product level.

Regressions include both year and industry FE.

Robust standard errors in parentheses.

5.5 Foreign firms export higher quality varieties than domestic ones

A comparison of unit values of export varieties introduced by foreign and domestic firms indicates that foreign companies tend export higher quality varieties.

In Figure 8, we graph the density distribution of the prices of newly introduced exports normalized by the mean price of already exported goods within the same product category. We distinguish between products introduced by domestic firms (dashed line) and by foreign firms (continuous line).⁸ We find that the distribution pertaining to foreign firms is shifted to the right, suggesting that when a foreign firm introduces a new export product it is more likely to be of higher quality (i.e., higher unit value) than when a domestic firm does so. The intuition emerging from the Figure 8 is confirmed by the Table 13.

Table 13: Export prices of new export products normalised to the sectoral mean of reference group: Foreign firms vs Domestic firms

	percentiles					
	10th	25th	50th	75th	90th	mean
Domestic Firms	0.29	0.55	0.90	1.30	2.02	1.07
Foreign Firms	0.21	0.55	0.94	1.63	2.68	1.25

Notes:

Baseline reference group is experienced exporters.

Calculated at firm-product-level.

6 Export discovery

6.1 There is a lot of export discovery

*We find evidence of frequent export discoveries taking place in the aftermath of NAFTA and the Peso crisis.*⁹ In fact, 1,587 of 5,607 (or 28%) newly introduced export varieties are products that were not exported by any firm in the dataset in the previous period. An increase in the number of products exported by Mexico in the post-NAFTA period is also detectable in aggregate trade statistics and has been documented

⁸We classify as foreign firms that had some foreign participation in 1994, which is the first year of our sample. Unfortunately, we do not have such data for later years, so most likely we are underestimating the number of foreign firms. Thus some scepticism about this conclusion is warranted, even if the advantage is that focusing only on the first year of the sample makes the “foreign ownership” attribute exogenous.

⁹Recall that NAFTA came into effect on January 1, 1994 and the Peso crisis took place in December 1994. The period under analysis in this study is 1995-2003.

Figure 8: Export Product Price Distribution normalised to mean of baseline group

by Feenstra and Kee (2007). Interestingly export discoveries appear to be more frequent in the immediate period after the devaluation (see Table 14). This is probably the result of the contraction of the domestic market and the increased incentives to experiment with new export products as a consequence of the devaluation and the enhanced access to the US generated by NAFTA.

Table 14: New Export Products and Export Discoveries

Year	New Export Product	New Discovery	Discovery Ratio
1995	1072	352	.33
1996	999	319	.32
1997	828	253	.31
1998	699	172	.25
1999	481	97	.20
2000	426	100	.23
2001	367	101	.28
2002	309	80	.26
2003	426	113	.27
Total	5607	1587	.28

Notes:

Export discovery is defined as a newly introduced export variety that was not exported by any firm in the dataset in the previous period.

6.2 All types of firms are responsible for export discoveries

Experienced and new exporters, domestic and foreign firms are equally responsible for export discoveries. Somewhat surprisingly, we do not detect much of a difference between experienced and new exporters in terms of their propensity to engage in export discovery. While 30% of the new export products introduced by experienced exporters constituted an export discovery, a very similar ratio (27%) is found among new exporters (see Table 15). This stylised fact casts some doubt on the importance of exporting as a learning channel, as in the presence of learning from exporting we would expect experienced exporters to be more likely to engage in export discovery.

Similarly, we fail to detect any difference between foreign and domestic firms in terms of their propensity for export discovery (see Table 15).

Table 15: Introduction of new export products and export discovery: Different types of firms

	New Exporters	Existing Exporters	Domestic Firm	Foreign Firm
New Export Discovery	27%	30%	29%	29%
New Export Product Not Discovery	73%	70%	71%	71%

6.3 Fast diffusion of export discoveries

Knowledge of export discoveries tends to diffuse fast. Once a firm has introduced an export product previously not exported by any other firm, other firms follow. On average, a discovery is simultaneously introduced by more than one firm (that is, between one and two firms introduce a product that is an export discovery). For approximatively half of the new discoveries, an additional firm starts exporting the same product in the following year. The same happens one year later. However, three years after the discovery takes place the rate of diffusion slows down but continues until at least the eighth year which is the longest time period our sample allows us to consider (see Table 16).

Table 16: Diffusion of export discoveries

Year	Average no. of firms exporting	Average value of exports (by product)	% increase in export of new discovery
1	1.4	3835	
2	1.5	6241	163%
3	1.7	7831	125%
4	1.7	8263	106%
5	1.6	6993	85%
6	1.5	6420	92%
7	1.3	6315	98%
8	1.3	7657	121%

Notes:

It includes only clases that have more than 20 active firms.

It includes only discoveries done in 1995 and 1996.

6.4 Firms undertake new investments in preparation for exporting

Introduction of new export products tends to be preceded by investment in physical assets and technology acquisition. This is visible in Figure 9(a) where we graph the average investment level in the years before and after a firm introduces a new export variety. The year of introduction is identified as year zero on the X-axis. We observe an increase in investment outlays in the two-year period before a new export variety is introduced. After the introduction, the level of investment registers a slight decline. A similar pattern is observed in the case of investment in technology acquisition (see Figure 9(b)). Interestingly, we find no evidence of increased R&D activity being undertaken in preparation for exporting (see Figure 9(c)). If anything, our data suggests that R&D increases after the introduction of a new export variety.

These results are in line with Iacovone and Javorcik (2008) who find econometric evidence consistent with preparation on the part of future or expanding Mexican exporters. First, Iacovone and Javorcik (2008) show that plants that will export a particular product variety in the future experience an increase in the domestic unit value obtained for this variety two years before exporting starts. This is suggestive of changes in product attributes taking place in preparation for exporting. Second, they document an increase in investment activity before a new variety is introduced to export markets. This is, however, true only in the case of new exporters suggesting that the cost of the first-time entry into foreign markets may be higher than the cost of subsequent expansion in the number of exported varieties. Third, they identify that investment preceding entry into export markets is spent on physical assets or technology acquisition, though the latter result is less robust. No statistically significant relationship is detected for spending on R&D activities.

Figure 9: Trends around introducing a new export variety

(a) Investment

(b) Technology Transfers Investment

(c) R&D Investment

Our observations are also consistent with findings based on Chilean firm-level data which show that firms build up their capital stocks before entering export markets (Alvarez and López 2005, Emami Namini and López 2006).

These observations are also compatible with anecdotal evidence obtained during an interview with a leading Mexican juice producer. The company executive confirmed that introducing a new product into export markets requires significant preparations and investment outlays. Consumers in the U.S. (which is the major export market for this producer) demand higher-quality/higher-price products than the average Mexican consumer. For instance, they prefer juices closer in taste to fresh juices to products from concentrates. The company recently acquired a new technology and introduced such juices targeting higher-end Mexican consumers and subsequently started selling them in export markets. Moreover, all export products must be in compliance with sanitary and phytosanitary requirements of the destination country which again may require changes to the production process. Furthermore, exports may also require different type of packaging. For instance, while Mexican consumer prefer cartons, US buyer have a preference for plastic and glass containers. In the juice industry, package attractiveness plays a very important role. This

particular company introduced a new packaging technology with an eye on export markets. Export-destined containers are covered with sleeves on which product labels are printed, as this produces a more attractive appearance than printing directly on packaging. Finally, as supplying a large export market requires a large production scale, the company opted for introducing higher-speed machines to reach the necessary export volume. Introducing all of these changes involves a large amount of investment in physical capital and some technology acquisition.

Interestingly, as evident from Figure 10 the same pattern of investment is observed if we focus only on *experienced exporters*, i.e., firms currently exporting but introducing an additional export product. Before the introduction of a new export product, we observe an increase in investment in physical assets. This finding is consistent with the “*existence of fixed costs of entering export markets that are specific to individual products, such as costs of market research, advertising and conforming to foreign regulatory standards*” modelled by (Bernard, Redding, and Schott 2006a).

Figure 10: Trends around introduction of new export variety by experienced exporters

(a) Investment

(b) Technology Transfers Investment

(c) R&D Investment

However, the costs of introducing an additional export variety seem to be smaller than the costs of first time entry into export markets. This is clearly visible from the descriptive

statistics presented in Table 17. The figures presented there indicate that while the difference between exporters and non-exporters in terms of frequency of their investments is substantial as only 51% non-exporters invest in physical capital while more than 70% of exporters invest, the difference between exporters introducing a new export product and those that do not do so is much smaller (71% versus 77%).

But there is an alternative explanation which says that the relatively small difference in investment behavior between exporters keeping the range of their products constant and those introducing new export varieties stems from the need to invest in order to maintain exports. As the interviewed executive of a juice producing company pointed out, keeping up exports of existing products is not automatic and requires effort and investment. For instance, the company in question maintains several offices in the US monitoring recent developments in the market and actions of competitors. Company staff attends courses abroad in order to keep informed about latest innovations in order to be able to respond to actions of competitors and changes in market expectations.

Table 17: Investment frequency: Different types of firms

Type of firms	% of firms investing
Domestic Firms	51%
Exporters not introducing new variety	71%
Exporters introducing new variety	77%

The positive link between investment and introduction of new export products is consistent with the predictions of the theoretical literature. For instance, Constantini and Melitz (2007) develop a model which incorporates a joint decision to undertake additional investment and enter export markets. Their model shows that the anticipation of future liberalization induces firms to innovate ahead of liberalization and thus also ahead of their anticipated, but yet unrealized, entry into export market. Other studies relating technology choices to exporting include Yeaple (2005), Bustos (2007) and Verhoogen (2008). In the model developed by Yeaple (2005), firms competing in a monopolistically competitive industry are identical when born but are free to produce with technologies that differ in their characteristics. A reduction in trade costs increases the incentive for firms to adopt the new, lower unit cost technology. A model by Bustos (2007) allows firms to pay an extra fixed cost to introduce a new technology that reduces the marginal cost. In Verhoogen's (2008) work, Southern firms invest in quality upgrading to match the taste for quality exhibited by richer Northern consumers. In all these models, lowering of trade barriers in export markets induces firms to invest in order to take advantage of export opportunities.

7 Export decomposition

While the extensive margin played a role in the post-NAFTA Mexican export boom, export expansion was mostly driven by changes in the intensive margin. Entry of new exporters was important only in the immediate aftermath of the Peso devaluation. Introduction of new varieties by established exporters played only a limited role. After the introduction of NAFTA and the Peso devaluation Mexico experienced an impressive expansion of its exports, particularly those directed to the US market. While the total world exports grew by 75% between 1993 and 2002, Mexican exports increased by 300%. To shed light on the principal determinants of the Mexican export boom we decompose the export change into six components: (i) increase in exports of varieties previously exported (expansion of the intensive margin),¹⁰ (ii) introduction of new export varieties by existing exporters (expansion of the extensive margin),¹¹ (iii) entry of new firms into export markets, (iv) discontinuation of exports of particular varieties (contraction of the extensive margin), (v) contraction of export volume of existing export varieties (contraction of the intensive margin), (vi) firms exiting export markets. We perform this decomposition on a the subsample of plants present in the dataset during the whole period.¹²

As illustrated in Figure 11, the principal finding is the importance of the movement along the intensive margin. In all years considered, increases in the intensive margin accounted for most of the expansion in exports. However, changes to the extensive margin were also not negligible and appear to have been influential throughout the period, while entry of new exporters was relevant only in the post-devaluation years. It is also interesting to note that even while exports of some products were booming, exports of others were experiencing a contraction, some export products were dropped and some firms exited the export market. Even on the contraction side, the intensive margin was much more important than the extensive margin.

Next we consider the relationship between the extensive and the intensive margin at the firm level. We follow Bernard, Redding, and Schott (2006a) and examine (i) the correlation between a firm's total exports and the number of product exported; and (ii) the link between a firm's total exports and the average exports per exported product. More specifically, we estimate the following regressions:¹³

¹⁰Recall that the term variety refers to a firm-product combination. Thus in this context expansion of the intensive margin refers to a firm expanding the volume of exports of the variety it was exporting in the previous period

¹¹Here we are referring to cases where a firm starts exporting a product it was not exporting in the previous period, though other firms may or may not have exported this product

¹²Using unbalanced panel does lead to very similar conclusions.

¹³Because firm i total export (X_i) is equal to the sum of the individual export products (x_{ij}) we can

Figure 11: Export Decomposition

Notes:
 Based on balanced panel
 EIM, INEGI (Aguascalientes)

$$\text{Log}(N_{ft}) = \alpha_0 + \alpha_1 \text{Log}(Exports_{ft}) + \epsilon_1 \quad (2)$$

$$\text{Log}(\bar{Exports}_{ft}) = \beta_0 + \beta_1 \text{Log}(Exports_{ft}) + \epsilon_1$$

where N_{ft} is the log number of varieties exported by firm f at time t , $Exports_{ft}$ stand for firm f 's total exports at time t and $\bar{Exports}_{ft}$ denotes the average exports per variety exported by firm f at time t . When total firm exports increase, α_1 captures the percentage contribution from the number of products (the extensive margin), holding constant average exports per product (the intensive margin). Similarly, β_1 captures the percentage contribution of the intensive margin, holding constant the extensive margin.¹⁴

The results of the first regression are reported in Table 18 and are qualitatively similar to those obtained by Bernard, Redding, and Schott (2006a).¹⁵ There are, however, two important differences. First, while Bernard, Redding, and Schott (2006a) focus on production in general, we consider exports. Second, the coefficient found for Mexico is much smaller than the coefficient of between .23 and .28 found in the US sample. In conclusion, bearing in mind the difference in data used, we find that *the importance of the extensive margin is not negligible for Mexican firms but appears smaller than for US firms*.

Table 18: Importance of extensive margin in export growth

	ols (1)	weighted ols (2)
Log Tot Exports	.110*** (.0004)	.06*** (.003)
Constant	.02*** (.0003)	3188*** (512)
N	67980	67980

Our results are consistent with a growing literature analyzing the relative importance of extensive versus intensive margin in determining export growth using aggregate trade statistics. These studies, with differences in their approaches and focus, seem to point toward the fact that “extensive margin” plays an especially crucial role for more advanced

rewrite the total output, $X_i = N_i \bar{x}_i$, as the product of the average exports per product ($\bar{x}_i = \frac{1}{N_i} \sum x_{ij}$) and the number of exported products (N_i). From these relationships we can immediately derive the equations 2.

¹⁴Note that we think of these regressions as describing correlations rather than aiming to establish a direction of causality.

¹⁵We do not need to report the results of the second regression as we know that α_1 is equal to $1 - \beta_1$.

countries while movement along the “intensive margin” seems to be mayor driver of exports in developing countries (Besedes and Prusa 2007, Felbermayr and Kohler 2006, Helpman, Melitz, and Rubinstein 2007, Hummels and Klenow 2005, Romalis 2007, Schott 2004, Venables and Evenett 2002).

8 Conclusions

In this paper, we analyze the micro-dynamics and decisions of multi-product exporters at the most disaggregated level. Relying on a unique dataset covering most of Mexican industrial output and thousands of products, we study the responses and behaviors of multi-product exporters in a period of profound reforms and integration with the US economy. We present a set of novel stylised facts that we hope will help to move forward the theoretical efforts to understand how multi-product heterogenous firms respond to reforms and globalization.

Our principal results can be summarized as follows. First, we confirm the existence of a substantial degree of churning at product level in response to declining trade costs. Second, the evidence we present support the hypothesis that the decision to expand and drop products is not random as firms appear to focus around their “core products”. Third, we observe that new exporters tend to “start small” in terms of both values and number of exported products. Fourth, we show that even if extensive margin played a role in determining the Mexican export boom, intensive margin was the main driver of this boom. Finally, we illustrate that introduction of new export variety is preceded by a surge in investment.

These findings confirm the importance of the current efforts to “unbundle” the firm and move from firm-level analysis to the more disaggregated firm-product level. They may also be useful to policy makers who try to devise effective policies aimed at stimulating export response in developing countries. Finally in line with the recent literature initiated by Hausmann, Hwang, and Rodrik (2007) stressing the link between export structure and growth, we think that these findings, by contributing to understand more in details the micro-dynamics underpinning export responses, can help to understand more in general the determinants of growth.

References

- ALVAREZ, R., AND R. A. LÓPEZ (2005): “Exporting and firm performance: evidence from Chilean plants,” *Canadian Journal of Economics*, 38(4), 1384–1400.
- BARTELSMAN, E. J., AND M. DOMS (2000): “Understanding Productivity: Lessons from Longitudinal Microdata,” *Journal of Economic Literature*, 38(3), 569–594.
- BERNARD, A. B., S. REDDING, AND P. K. SCHOTT (2006a): “Multi-Product Firms and Trade Liberalization,” CEP Discussion Papers dp0769, Centre for Economic Performance, LSE.
- BERNARD, A. B., S. J. REDDING, AND P. K. SCHOTT (2006b): “Multi-Product Firms and Product Switching,” NBER Working Papers 12293, National Bureau of Economic Research.
- (2007): “Comparative Advantage and Heterogeneous Firms,” *Review of Economic Studies*, 74(1), 31–66.
- BESEDES, T., AND T. J. PRUSA (2006): “Product differentiation and duration of US import trade,” *Journal of International Economics*, 70(2), 339–358.
- (2007): “The Role of Extensive and Intensive Margins and Export Growth,” NBER Working Paper 13628, National Bureau of Economic Research.
- BUSTOS, P. (2007): “Multilateral Trade Liberalization, Exports and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinean Firms,” Mimeo, CREI and Universitat Pompeu Fabra.
- CONSTANTINI, J. A., AND M. J. MELITZ (2007): “The Dynamics of Firm-Level Adjustment to Trade Liberalization,” Mimeo, Princeton University.
- EATON, J., M. ESLAVA, M. KUGLER, AND J. TYBOUT (2007): “The Margins of Entry into Export Markets: Evidence from Colombia,” Mimeo, New York University.
- EATON, J., S. KORTUM, AND F. KRAMARZ (2004a): “An Anatomy of International Trade: Evidence from French Firms,” Mimeo, New York University.
- (2004b): “Dissecting Trade: Firms, Industries, and Export Destinations,” *The American Economic Review*, 94(2), 150–154.
- ECKEL, C., AND J. P. NEARY (2006): “Multi-Product Firms and Flexible Manufacturing in the Global Economy,” CEPR Discussion Paper 5941, Centre for Economic Policy Research.
- EMAMI NAMINI, J., AND R. A. LÓPEZ (2006): “Random versus conscious selection into export markets: Theory and empirical evidence,” Mimeo, University of Indiana.

- FEENSTRA, R., AND H. L. KEE (2007): “Trade Liberalisation and Export Variety: A Comparison of Mexico and China,” *The World Economy*, 30(1), 5–21.
- FELBERMAYR, G. J., AND W. KOHLER (2006): “Exploring the Intensive and Extensive Margins of World Trade,” *Review of World Economics (Weltwirtschaftliches Archiv)*, 127(4), 642–674.
- FERNANDES, A. M. (2007): “Trade policy, trade volumes and plant-level productivity in Colombian manufacturing industries,” *Journal of International Economics*, 71(1), 52–71.
- HARRISON, A. (ed.) (2007): *Globalization and Poverty*. University of Chicago Press.
- HAUSMANN, R., J. HWANG, AND D. RODRIK (2007): “What You Export Matters,” *Journal of Economic Growth*, 12(1), 1–25.
- HAUSMANN, R., AND D. RODRIK (2003): “Economic development as self-discovery,” *Journal of Development Economics*, 72(2), 603–633.
- HELPMAN, E., M. MELITZ, AND Y. RUBINSTEIN (2007): “Estimating Trade Flows: Trading Partners and Trading Volumes,” NBER Working Papers 12927, National Bureau of Economic Research.
- HUMMELS, D., AND P. J. KLENOW (2005): “The Variety and Quality of a Nation’s Exports,” *American Economic Review*, 95(3), 704–723.
- IACOVONE, L. (2008): “Exploring Mexican Firm-Level Data,” Mimeo, University of Sussex.
- IACOVONE, L., AND B. S. JAVORCIK (2008): “Shipping Good Tequila Out: Investment, Domestic Unit Values and Entry of Multi-Product Plants into Export Markets,” Mimeo, University of Oxford.
- MELITZ, M. J. (2003): “The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity,” *Econometrica*, 71(6), 1695–1725.
- NOCKE, V., AND S. YEAPLE (2006): “Globalization and Endogenous Firm Scope,” PIER Working Paper Archive 06–015, Penn Institute for Economic Research, Department of Economics, University of Pennsylvania.
- PAVCNIK, N. (2002): “Trade Liberalization, Exit, and Productivity Improvement: Evidence from Chilean Plants,” *Review of Economic Studies*, 69(1), 245–76.
- RAUCH, J., AND J. WATSON (2003): “Starting Small in an Unfamiliar Environment,” *International Journal of Industrial Organization*, 21, 1021–1042.

- ROMALIS, J. (2007): “NAFTA’s and CUSFTA’s Impact on International Trade,” *The Review of Economics and Statistics*, 89(3), 416–435.
- SCHOR, A. (2004): “Heterogenous productivity response to tariff reduction. Evidence from Brazilian manufacturing firms,” *Journal of the European Economic Association*, 75(2), 373–396.
- SCHOTT, P. K. (2004): “Across–Product versus Within–Product Specialization in International Trade,” *Quarterly Journal of Economics*, 119(2), 647–678.
- TREFLER, D. (2004): “The Long and Short of the Canada-U.S. Free Trade Agreement,” *American Economic Review*, 94(4), 870–895.
- TYBOUT, J. R. (2000): “Manufacturing Firms in Developing Countries: How Well Do They Do, and Why?,” *Journal of Economic Literature*, 38(1), 11–44.
- VENABLES, A., AND S. EVENETT (2002): “Export Growth in Developing Countries: Market Entry and Bilateral Trade Flows,” Mimeo, University of Bern.
- VERHOOGEN, E. A. (2008): “Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector,” *Quarterly Journal of Economics*, 123(2).
- YEAPLE, S. R. (2005): “A simple model of firm heterogeneity, international trade, and wages,” *Journal of International Economics*, 65(1), 1–20.