Shipping good tequila out: Investment, domestic unit values and entry of multi-product plants into export markets

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Abstract

This study uses Mexican plant-product level data for the 1994-2003 period to examine plant behavior preceding an expansion into foreign markets. A novelty is that we focus on domestic unit values of products that will be exported in the future and on plants' investment behavior. Our findings are consistent with the predictions of the theoretical literature. First, we find that producers who export a particular product variety tend to obtain a price premium for their domestic sales of this variety. Second, we show that manufacturers that will export a particular product in the future experience an increase in the domestic unit value obtained for this variety two years before exporting starts. Interestingly, three years before exporting takes place, their product is indistinguishable in terms of unit values from varieties sold by other producers. This is suggestive of a close link between changes in product attributes and exporting, especially as we find that increases in product unit value coincide with increased investment in physical capital and (to a lesser extent) technology licensing.[1]

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1 Introduction

The link between product quality and international trade has attracted a lot of attention in the economic profession. As far back as half a century ago, Linder (1961) argued that richer countries spend a larger proportion of their income on high quality goods, which is reflected in the composition of their imports and the choice of trading partners. More recently, Sutton (2007) postulated that globalization creates a 'moving window.' It leads to an emergence of a lower bound to quality below which firms cannot sell their products, no matter how low their (local) wage rate is. Trade liberalization shifts upwards the range of quality levels between the maximum and the lower bound. Product quality has also been linked to growth by Hausmann, Hwang, and Rodrik (2007) who argue that countries promoting exports of more "sophisticated" goods grow faster.

The empirical literature documents a wide variation in unit values of exports originating from different countries. Using detailed data on US imports Schott (2004) shows that the average ratio of the highest to the lowest unit value across all U.S. manufacturing imports in 1994 was equal to 24. He further argues that trade specialization happens within rather than between sectors and that the unit values of exports tend to be positively correlated with the level of development. Likewise, Hummels and Klenow (2005) show that rich countries tend to export higher quantities of goods at modestly higher prices, while more labor-abundant countries export higher quantities, but not at higher prices. The link between the country's level of development and unit values of exports is present even within the developing world (Harding and Javorcik 2007).

The economic theory predicts that a significant variation in product unit values should exist not only across but also within countries. More specifically, two strands of the literature give different reasons for why unit values of exported products should exceed unit values of products sold domestically. The first strand goes back to the Alchian and Allen's (1964) "shipping the good apples out" hypothesis. This hypothesis states that presence of a per unit transaction cost lowers the relative price of high quality goods leading firms to ship high quality goods abroad while holding lower quality goods for domestic consumption. In the second strand of the literature, consumers differ in income and hence in willingness to pay for product quality across countries. In a model with heterogeneous plants and quality differentiation, Southern exporters produce higher quality goods for export than for the domestic market in order to appeal to richer Northern consumers (Verhoogen 2008). In such a setting, an improved access to a Northern market will induce quality upgrading in the South.[2]

World Bank, its Executive Directors or the countries they represent.

[2] Other studies focusing on the link between quality and exporting include Baldwin and Harrigan (2007), Bustos (2007) and Constantini and Melitz (2007). They are discussed in more detail in the next section.

Yet there is limited empirical evidence on differences in unit values within the same country. As trade flows within a country are largely unobserved, the Alchian-Allen hypothesis has not been tested formally in a single country setting.[3] Similarly, there is no direct evidence on quality upgrading and exporting.[4]

This study aims to fill this gap in the literature. We use unique plant-product level data from Mexico to compare unit values of domestically sold products with those of current and future export goods. Our data set includes information on 3,396 unique products manufactured by 6,299 plants during the 1994-2003 period, which gives us between 13,751 and 19,314 plant-product observations a year. Focusing on the period of the Mexican export boom stimulated by the North American Free Trade Agreement, which came into effect on January 1, 1994, and the peso devaluation, which took place in December 2004, provides an excellent setting for our exercise. We are able to observe many instances of manufacturers introducing into export markets products that they previously sold only in Mexico. This allows us to focus not only on the comparison between exported and domestically sold goods but also to examine changes in unit values taking place prior to a product being introduced into export markets. If product upgrading is indeed a real phenomenon, this is a setting where it should manifest itself. Another nice feature of our data set is that we are able to link the changes in unit values to plant-level investment behavior.

Our findings are consistent with the predictions of the theoretical literature. First, we show that manufacturers who export a particular product variety tend to obtain a price premium for their domestic sales of this variety.[5] Second, we show that manufacturers that will export a particular product in the future experience an increase in the domestic unit value obtained for this variety two years before exporting starts. Interestingly, three years before exporting takes place, their product is indistinguishable in terms of unit values from varieties sold by other producers. This is suggestive of a close link between changes in product attributes and exporting. Third, we document an increase in investment activity before a new variety is introduced into export markets. This is, however, true only in the

[3]Hummels and Skiba (2004) used detailed data on international trade flows to test a modified version of the hypothesis and found evidence in support of it. They found that doubling shipping costs leads to an 80-141% increase in average unit values of exports, while doubling tariffs reduces average export prices by 146-256%. Using international trade data Baldwin and Harrigan (2007) showed that export unit values are positively related to the distance between trading partners.

[4]There exists, however, some indirect evidence. Alvarez and López (2005) show that future exporters tend to have higher investment outlays. Bustos (2007) documents a link between a fall in Brazilian MERCOSUR tariffs and increases in entry into export markets and technology spending by Argentinian firms. Verhoogen (2008) finds that more productive plants increased the export share of sales, white-collar wages, blue-collar wages, the relative wage of white-collar workers, and ISO 9000 certification more than less-productive plants during the peso crisis period.

[5]We use the term variety and product interchangeably.

case of new exporters indicating 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. Fourth, we find 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.

Our study contributes to the rapidly growing literature started by Clerides, Lach, and Tybout (1998) and Bernard and Jensen (1999) who document the superior performance of exporters in terms of productivity, sales, skill composition of the workforce and capital intensity. These authors conclude that premia enjoyed by exporters in all these dimensions are due to self-selection of best performers into exporting.[6] Our results are more nuanced. While they indicate that products with most desirable attributes (as reflected by their unit values) are exported, the patterns found in the data are suggestive of producers changing the product attributes before beginning to export.

This paper is structured as follows. In next section, we briefly sketch how our empirical analysis is informed by the existing theoretical models. In section 3, we describe the data use. Section 4 discusses our methodology and findings. The last section presents concluding remarks.

2 Related theoretical literature

Studies documenting the superior performance of exporters (Clerides, Lach, and Tybout 1998, Bernard and Jensen 1999) inspired a new literature on the response of heterogeneous firms to globalization, which originated with the contribution of Melitz (2003). Melitz (2003) models firms as heterogeneous in terms of their marginal costs. As a fixed cost is required for accessing export markets, only high productivity firms find it profitable to export. While the model does not explicitly deal with quality, high productivity firms can be viewed as firms producing a higher quality variety at equal cost. Baldwin and Harrigan (2007) extend the work by Melitz (2003) to incorporate product quality. In their model, firms compete based on heterogeneous quality as well as unit costs. The model predicts that more productive firms manufacture higher quality products, whose costs, and corresponding prices, are higher than those of lower quality goods. Nevertheless, because high-quality products appeal to consumers, high-quality/high-price products are more competitive than low-quality/low-price goods.

The theoretical predictions most closely related to our work come from the literature

[6] For a survey of the literature see Greenaway and Kneller (2007).

explicitly modelling the link between product quality and exporting. In the theoretical framework developed by Verhoogen (2008), plants are heterogeneous in productivity and there is a fixed cost to entering the export market, such that only the most productive plants within each industry export, as in Melitz (2003). Goods are differentiated in quality and consumers differ in income, and hence in willingness to pay for product quality, across countries, such that a given Southern country exporting plant produces higher quality goods for export than for the domestic market. An increase in the incentive to export in a developing country generates quality upgrading.[7] Another contribution in this literature comes from 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.

Other studies relating technology choices to exporting include Yeaple (2005) and Bustos (2007). In the model developed by Yeaple (2005), firms competing in a monopolistically competitive industry are identical when born but are free to choose between alternative technologies, which differ in their productivity and costs, and are free to hire workers who vary in their skill on a perfectly competitive labor market. Firm heterogeneity arises because firms endogenously choose to employ different technologies and then systematically hire different types of workers. A reduction in trade costs increases the incentive for firms to adopt the new, lower unit cost technology. Bustos (2007) expands Melitz's (2003) model by allowing firms to pay an extra fixed cost to introduce a new technology that reduces their marginal cost. In these models, emergence of new export opportunities (e.g., signing a regional trade agreement) induces firms to invest in order to take advantage of export opportunities.

Our empirical analysis focuses on three predictions of the theoretical literature. First, we ask whether product varieties destined for exports tend to have higher unit values than goods sold on the Mexican market. Second, we search for evidence of product upgrading taking place in anticipation of exporting after the introduction of NAFTA and in the aftermath of the peso crisis. NAFTA is a particularly interesting case to consider, as during the period under study the US gradually lowered its tariffs on Mexican exports and did so following a schedule established in advance. Thus this exactly the setting considered in the Constantini and Melitz (2007) framework. Third, we examine the link between the patterns of investment in physical capital, technology purchases, R&D outlays and exporting. Our analysis is possible thanks to a uniquely detailed data set, which is the issue to which we turn next.

[7] The impact varies by plant type. Initially more productive plants increase exports and produce a greater share of higher quality goods relative to initially less productive plants in the same industry.

3 Data

In our analysis, we use data from the Mexican Monthly Industrial Survey (EIM) merged with the Mexican Yearly Industrial Survey (EIA). The former source includes information on the values and quantities of monthly production, sales and exports. The latter source contains information on various plant characteristics, such as investment, intermediate inputs, R&D expenditures, plant's age, etc. Both surveys include the same plants and cover about 85 percent of Mexican industrial output during the period 1994-2003.[8]

For each 6-digit code (*clase*) in the Mexican Industrial Classification System (CMAP), the EIM survey form includes a list of possible products. This list was developed in 1993 based on the industrial Census and was kept unchanged during the entire period under consideration. There are 3,396 unique products included in the survey. Product categories are quite narrow. 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 ovens, 110 volt heaters and 220 volt heaters (and 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.

After data cleaning, described in Appendix A, our sample includes between 6,299 and 4,626 plants in 1994 and 2003, respectively. The decrease in the number of plants is due to plant exit from the market. Our sample includes 19,314 plant-product observations in 1994. This number declines to 13,751 by 2003. During the same time period, the number of exported varieties expands from 2,743 to nearly 3,200, reaching a peak of 4,269 varieties in 1998 (see Table 1). The dynamic expansion of Mexican exports during the period under study[9] and the availability of detailed micro-level data make the Mexican case an extremely interesting one to study.

In addition to standard plant-level data, the EIA survey includes details of plant-level activities associated with production upgrading, such as investment in physical assets,

[8]The surveys do not include *maquiladoras.*

[9]While the total world exports grew by 75% between 1993 and 2002, Mexican exports increased by 300%.

R&D expenditure and technology purchases. This feature of the dataset makes it particularly suitable to examine plant-level activities previously to begin exporting. All summary statistics are presented in Table 4.

These data sources are supplemented with information on Mexican tariffs imposed on imports from NAFTA countries (from Secretaría de Economía) and US MFN and NAFTA tariffs.[10] The figures pertain to HS 8-digit sectors and we match them with 6-digit CMAP codes.

4 Empirical analysis

The purpose of our empirical analysis is to consider three questions: (i) is there evidence suggesting that export products tend to have higher unit values than varieties sold domestically? (ii) do we observe changes in product unit values taking place prior to exporting? (iii) do the changes in unit values taking place prior to exporting coincide with increased investment activity?

Our analysis proceeds in two steps. First, we focus on plant-product level information and examine patterns in unit values. Second, we consider plant level data and shift our attention to the link between investment patterns and exporting. But before we discuss our empirical exercise, let us motivate the analysis with some anecdotal evidence.

4.1 Anecdotal evidence

During a visit to Mexico in August 2007, we interviewed an executive from a leading Mexican company producing fruit and vegetable juices. When asked what it takes for a company like his to become an exporter, the executive pointed to "quality, quality and quality". According to the executive, the first dimension of quality relevant to exporting is bringing the product up to the level which satisfies foreign sanitary and phytosanitary standards, which tend to be higher in industrialized countries (in this case the United States) than in Mexico.

The second dimension of quality is appealing to the tastes of foreign consumers. Consumers in the U.S. (which is the major export market for this producer) demand higher-quality/higher-price products than the average Mexican buyer. For instance, they prefer juices closer in taste to fresh juices than products from concentrates. The company recently

[10] These figures were kindly provided to us by John Romalis.

invested in a new technology to produce such juices. They were first sold domestically targeting higher-end Mexican consumers and subsequently they were introduced in the export market. The decision to introduce such juices was made with an export market in mind as the company recognized that the local market for such a high-end product is quite limited.

The third dimension of quality relevant to juice producers is packaging. While Mexican consumers prefer cartons, US buyers have a preference for plastic and glass containers. In the juice industry, package attractiveness plays a very important role. To improve the quality of its packaging, the company opted for a new technology where export-destined containers are covered with sleeves on which product labels are printed, as this produces a more attractive appearance than printing directly on a container.

Further, the executive pointed out that all the changes mentioned require increased outlays on physical capital and technology licensing.

Finally, the interviewee mentioned that extra effort and investment are required not only to introduce a product into export markets but also to maintain exports. For instance, the company in question maintains several offices in the US monitoring recent developments in the market and actions of its competitors. Company staff attends courses abroad in order to keep informed about latest innovations and be able to respond to actions of competitors and changes in market expectations.

A similar example, the case of Volswagen during the 1990s, is discussed in Verhoogen (2008). The article illustrates how the car manufacturer undertook substantial investment into upgrading the assembly line and started manufacturing a much more sophisticated version of the previously produced car: the "new beetle." This car was primarily destined for export markets (i.e., the US) but it also sold on the domestic market reaching high-end Mexican consumers. The appearance of the "new beetle" on the Mexican market changed the composition the Volkswagen product mix within a single product category. In fact, the price of the "new beetle" was more than double that of the "old beetle." In our data set, this change would be observed as an increase in the unit price of Volkswagen's domestic sales of "beetles."

If this anecdotal evidence can be generalized to other sectors, it has several implications for our study. First, it suggests, in line with the theoretical predictions, that we should observe a product being upgraded before its introduction into export markets. This upgrading can take the form of switching from a low unit value product to a high unit value variety or it may mean that a high unit value variety is introduced and sold alongside the old low unit value variety (within the same product category). In the case of the juice producer, the premium juice was introduced to the high-end Mexican market before its exports began. This change should be visible as an increase in unit values of juices sold domestically in the years prior to the juice exports.

Second, the anecdotal evidence suggests that entry or expansion into export markets requires additional investment in physical capital and technology. According to the interviewee, investments needed for first-time entry are larger than those required for an introduction of an additional export variety. For instance, once you invested in complying with sanitary norms and procedures, the introduction of a new product requires only following the same procedures but no additional information gathering or certification. Third, it suggests that continuation of exports requires some investment. Thus we should observe that even exporters who are not introducing new export varieties tend to invest more than non-exporters.

4.2 Evidence from unit value premiums

If Mexican producers modify products that will be introduced into foreign markets in the future, this change in product attributes should be reflected in the unit values of the product sold in the domestic market.[11] While unit values are often used as a measure of quality (see for instance Hallak (2006)), they may also capture other dimensions of product characteristics more loosely linked to quality (e.g., improved packaging keeping the product fresh for a longer period of time, new small snack-size packets targeting school children, etc.). Thus in our data, an increase in the domestic unit value of a given product is consistent with upgrading of the product quality, other changes in product characteristics that make the product more desirable or a compositional change within the product category towards higher quality or more desirable products.[12]

To examine differences between export- and domestic-market-oriented products and to search for evidence of changes in product attributes prior to exporting, we estimate a simple regression where the dependent variable is the logarithm of the unit value of product p sold in Mexico by producer i at time t (see equation 1). Unit values are obtained by dividing the value of domestic sales of product p by producer i by the quantity sold.

[11] This will be true only to the extent the varieties intended for future export markets are sold domestically. If a new production line is introduced just to serve the needs of foreign customers, no change will be observed. This possibility should work against us finding an effect in the data.

[12] For instance, a juice producer may be increase the quality of the juice produced (e.g., by using higher quality ingredients or better technology), may introduce a new type of packaging or may simply expand the production volume of higher quality juices while maintaining the production volume of lower quality juices unchanged.

$$\texttt{Log(Domestic unit value)}_{pit} = \beta_1\texttt{Before Exporting}_{pit} + \beta_2\texttt{Exported}_{pit} + \alpha_{pt} + \epsilon_{pit} \quad (1)$$

To take into account changes in the average domestic unit value of product p the equation includes product-year fixed effects. These fixed effects control, for instance, for differences in the average price of pencils and bicycles. They also take into account differences between the two products in terms of price inflation.

To compare the unit values of products that will be or are currently exported by their manufacturers to the unit values of the same product sold by manufacturers that do not export, the model includes two indicator variables. The first one takes on the value of one if producer i exports product p at time t, and zero otherwise. The second one takes on the value of one if producer i will exports product p at time $t+1$ or $t+2$, and zero otherwise.[13] Note that because of the presence of product-year fixed effects, the indicator variables capture a premium associated with current (or future) export products. In other words, they indicate how their prices differ from the average price in the same product category sold in Mexico in the same year.

To take into account potential correlation between standard errors, we present four specifications of the model with clustering of standard errors either on plant-product, plant, product or no clustering at all.

The results presented in Table 5 indicate that products that are both sold domestically and exported by their manufacturers have on average a 11% higher unit value than the same products sold in Mexico by manufacturers that do not export. This is in line with the theoretical prediction that higher quality products are destined for export markets. What's even more interesting is that this premium is observed already before the manufacturer starts exporting. Products that will enter export markets have a 7% higher unit value in the two years preceding exports. The difference between pre- and post-exporting premium is statistically significant.

A more careful look at the timing of the changes (see the lower panel of the Table 5) suggests that the increase in the premium is gradual: from 6% two years before exporting to 8% one year before and 11% in the exporting period. The difference between the premium two years and one year before is statistically significant in two of four specifications.

[13]For instance, if producer i starts exporting widgets in 2000, the dummy will be equal to 1 in 1998 and 1999 and to 0 in all other years.

Extending the analysis to three years before the product's introduction into export markets suggests that changes to the domestic unit values take place only during the two years prior to exporting, and not earlier. As evident from Table 6, there is no domestic unit value premium three years before the product's introduction into export markets as the coefficient on the dummy variable is not significantly different from zero in three of four regressions (the coefficient is statistically significant only in the case without clustering of standard errors). The coefficients on the other dummy variables suggests that a positive and statistically significant unit value premium appears two year before exports take place and gradually increases over time. This is an important point because it eliminates the possibility that products manufactured by future exporters exhibit some *intrinsic initial* differences. It also consistent with the theoretical prediction that in response to a decline in trade costs (taking place in this case thanks to NAFTA), future exporters will change the attributes of their products before entry into export markets.

It is also interesting to note that increases in domestic unit values continue after the entry into export markets. Figure 1 below illustrates the trajectory of domestic unit value premium from the three years prior to exporting to the post-entry periods. It confirms that three years prior to exporting ($t-3$), no statistically significant premium is observed. A positive premium appears two years before exports start ($t-2$) and increases at $t-1$. It remains pretty much unchanged in the year of entry into exporting, and then it experiences another boost in the following year ($t+1$).[14]

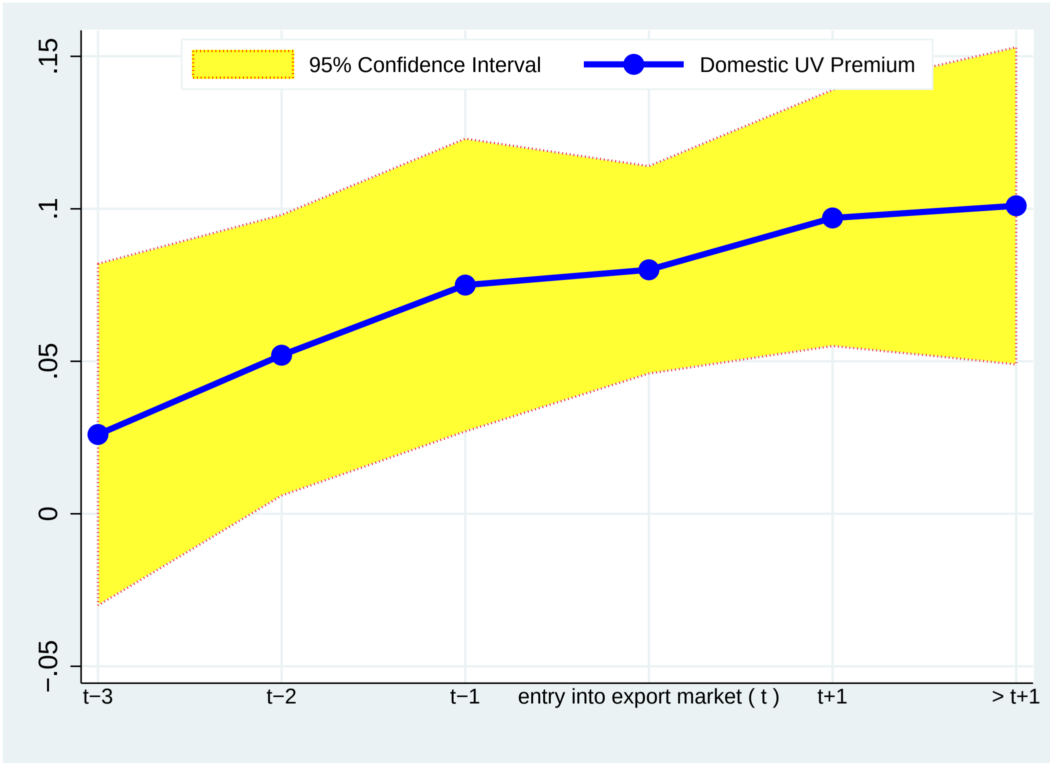
Given that the observed unit values may be capturing not only product attributes, either real or perceived by consumers, but may also reflect market power of the producer, next we add proxies intended to capture the latter effect. We control for the producer's market power in several ways. First, we include the lagged value of sales of product p by producer i, which given the presence of product-year fixed effects, should approximate producer i's market share in product p. Second, we use the lagged total sales at the plant level allowing for the possibility that the relevant market power is at the plant rather than the product level. Finally, we add plant-level markup, calculated as the difference between total sales and total costs, divided by total sales.[15] As illustrated in Table 7, adding these controls does not change our conclusions, but we confirm that unit values may partially reflect producer's market power.

The evidence presented thus far is suggestive of manufacturers upgrading their products before introducing them into export markets. If there is indeed a conscious upgrading taking place then we should observe that domestic unit values respond to previous in-

[14] These results come from a model estimated on a sample excluding products exported in 1994. Significance levels are based on standard errors corrected for clustering at the product level.

[15] In this way, we implicitly approximate marginal costs with average costs.

Figure 1: Evolution of domestic unit value premium when entering export markets



vestment in physical capital, R&D or technology transfers. To examine this question, we add to equation 1 characteristics of the product's manufacturer. In addition to lagged spending on physical capital, R&D and technology licensing, we control for the lagged share of white collar workers in total employment and the share of exports in total production at the plant-level. While we are aware of the pitfalls of measuring productivity in multi-product firms, we control for TFP as it is the key variable of interest in the existing literature focusing on the characteristics of exporters (see the survey by Greenaway and Kneller (2007)). TFP is calculated as an index following Aw and Roberts (2001). We also control for the plant size using lagged employment and the number of products sold. All controls with the exception of export share enter in the log form.

The results, presented in Table 8, indicate that unit values of products sold in Mexico respond positively to previous investment in physical capital, R&D spending and outlays on technology acquisition. We also find a positive correlation between lagged TFP, share of skilled workers, export ratio and firm size proxied by the total employment. Our earlier results on pre- and post-exporting premium remain unchanged.

As our data constitute an unbalanced panel, we may be concerned that plant exit could be influencing our results. To confirm that this is not a substantial problem, in the top panel of Table 9 we add to the model a dummy which takes on the value of one if the plant will be exiting the sample in the following year, and zero otherwise. While the results suggest that plants exiting next period exhibit a negative unit value premium (of about 2.5%), our conclusions with respect to future export products remain unchanged.

Not all products that enter export markets continue being exported in the subsequent years. To check whether this phenomenon could be influencing our results, we include in the model a dummy taking on the value of one if product p produced by manufacturer i at time t will exit the export market at time t+1, and zero otherwise. We also include a dummy for exiting plants, mentioned above, as some of the exits from the export market will be due to plants ceasing to operate. The results presented in the middle panel of Table 9 indicate that products that will stop being exported in the future tend to have lower domestic unit values even after controlling for plant exit in the future. In the case of recently introduced export products, a potential interpretation is that these are low-price/low-quality products whose producers received a trial export contract but were unable to fulfill the expectations of foreign customers or unable to withstand competition. In the case of "older" export products this may suggest that Mexican producers of low quality goods competing mainly on prices are unable to withstand competition on international market. As before, we find that future exiting plants tend to have lower domestic unit values. Our other results are unchanged by this additional control.

Finally, in the bottom panel of the same table, we demonstrate that our results are robust to restricting our attention to a balanced sample where we exclude all exiting plants.

In Table 10, we express the dependent variable in terms of first differences rather than levels. The explanatory variables remain the same. As before, we include a full set of product-year fixed effects to allow for differences in unit value fluctuations across products. The results indicate that products that are both sold in Mexico and exported by their manufacturers experience higher increases in unit values relative to the same products sold by domestically-oriented producers. The results also demonstrate an increase in unit values taking place in two years preceding the introduction of the product to export markets by its manufacturer. The magnitudes of pre- and post-exporting increase are not significantly different from each other. When we focus on the exact timing of changes, we find a statistically significant coefficient for two years before and the post-exporting period. However, the tests indicate that there is no statistically significant difference between the increases in unit values two years before, one year before and during the exporting period.

In the above regressions, we lumped together varieties sold domestically with varieties entering export markets and varieties that are exported throughout the period.[16] In a

[16]Note that all of the varieties considered are sold in Mexico because our dependent variable is the unit

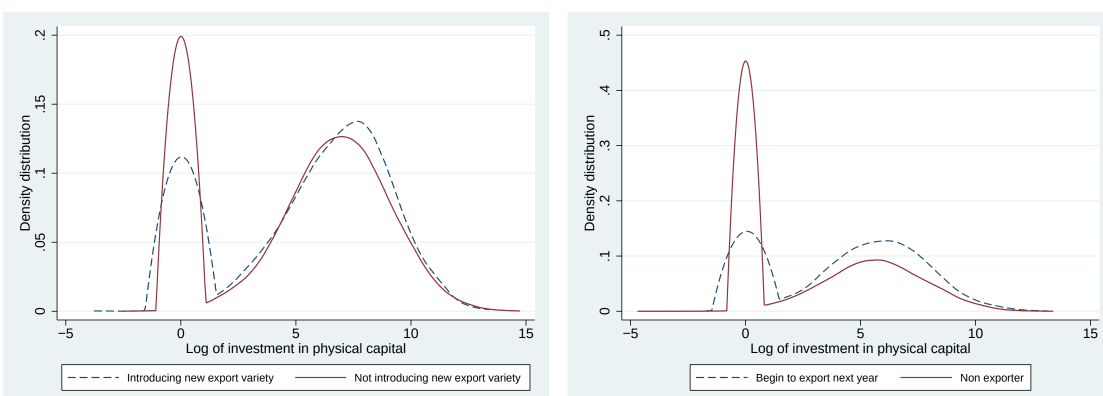
robustness check, we restrict our sample to domestic varieties and those entering export markets for the first time during the period under analysis. As evident from Tables 17 - 20 in Appendix C, this change has no effect on the estimated coefficients.

We have not paid much attention in our discussion to the direction of causality. This is because our aim is to document an association between changes in unit values and exporting rather than to pin down the direction of causality. Having said this, our finding of future export products carrying no domestic price premium three years before entry into export markets and then gradually acquiring it is quite suggestive of conscious preparation for exporting. This is particularly likely in the light of NAFTA creating new export opportunities in the US market and the peso crisis making Mexican products more competitive. This view will be reinforced in the next section which shows that the introduction of a product into export markets is preceded by an increase in investment in physical capital.

4.3 Evidence on upgrading before exporting

Having documented pre-exporting premium in unit values and shown that unit values respond positively to investment in tangible and intangible assets, the next logical step in our analysis is to look for changes in plant's investment behavior preceding the introduction of a product into the export markets.

Figure 2: Preparation to export



(a) Exporters introducing a new export variety next year vs exporters not doing so

(b) Non-exporters vs future exporters

We start by plotting the distribution of real investment (in log) for (i) exporters that will introduce a new export variety in the next period and (ii) exporters that will not do so but will continue exporting. We find that the former group is more likely to have a positive

value of local sales.

investment. 77% of plants in the former group invest in physical assets, as opposed to 71% in the latter group (see the spike around zero in Figure 3(a) and the summary statistics in Table 2). Moreover, among those investing, exporters that will introduce a new export variety next period tend to invest a larger amount.

The differences in the investment pattern are even more pronounced when we compare non-exporters to producers that will start exporting next year (see Figure 3(b)).[17] While 70% of future exporters invest in physical assets, this is true of only half of producers that will remain non-exporters next period (see Table 2).

As the patterns observed in these figures could be capturing differences between industries (if, for instance, more exporters were found in capital-intensive industries) or differences in plant sizes (if, for instance, larger manufacturers were more likely to become exporters), next we examine the link between export decisions and past investment using the regression analysis. We do so in two ways. First, we estimate a probit model with the dependent variable is equal to one if manufacturer i introduces at least one new export variety at time t and zero otherwise. As the standard probit model does not lend itself well to inclusion of fixed effects and the random-effect probit requires that the plant effects be uncorrelated with the regressors which is unlikely to be true in this case, our second specification takes the form of a linear probability model with plant fixed effects.[18]

The variables of interest are investment in physical capital, R&D spending and outlays on technology acquisition.[19] All three variables are expressed in 1994 pesos.[20] The variables enter in the logarithmic form and are lagged one period. We expect a positive relationship between investment in physical and intangible assets and the introduction of a new export variety.

We control for a number of plant characteristics. We proxy for the plant's size with the log of employment and the log of the number of products sold. We include the log of the plant's age. To capture some aspects of plant's performance we include the share of white

[17] Non-exporters are defined as plants not exporting during the past two years.

[18] Such a specification was used by, for instance, Bernard and Jensen (2004). As a robustness check we also estimate this model using conditional logit with plant fixed effects. Our main conclusions are robust to this specification. The results are available upon request.

[19] Investment in physical capital includes acquisition of machinery and equipment, buildings and infrastructure, transport equipment and other fixed assets whose productive existence is longer than one year. Investment in technology acquisition includes payment for patent use, technical assistance, engineering services and business services. Investments in R&D includes all internal spendings to improve process and products except those for control and prevention of pollution.

[20] R&D spending and outlays on technology acquisition are deflated using the CPI provided by Banco de Mexico, while investment in physical capital are separately deflated using specific deflators for each type of assets kindly provided by Banco de Mexico.

collar workers in total employment and the ratio of plant's exports to its total production. In additional specifications, the latter variable also enters as a square and a cube. In the baseline specification, we will not control for plant's productivity, later we will do so using labor productivity (log of the real value added per worker),[21], and then we will employ the log of the TFP index. All of the explanatory variables, except for the age, enter the model as one period lags. We expect that better performing and larger plants will have a higher probability of introducing new export products.

We also control for changes in the trade policy. We include the change in the US tariffs imposed on imports from Mexico and the change in the US MFN tariffs. Controlling for both allows us to capture the preference margin enjoyed by Mexican exporters. We control for the change in Mexican tariffs imposed on imports from NAFTA to proxy for access to imported inputs. Both models include year fixed effects which will absorb economywide shocks. The probit specification includes region and industry (2-digit) fixed effects.

The summary statistics are presented in Table 4 and a description of variables used is in Table 3.

The results of our baseline model, reported in Table 11, suggest that the introduction of a new export variety is preceded by investment in physical assets. This effect is positive and statistically significant in both probit and the linear probability model. It is present when we do not include the past productivity and when we control for labor productivity. Technology acquisition is positive and statistically significant only in one specification. R&D outlays do not appear to matter for future introduction of export products. As for the other control variables, we find that past exporting experience matters, though the effects differ between the two specifications. Larger firms are more likely to export, though this effect is significant only in the probit, as in the linear probability model plant fixed effects are likely to be capturing the size effect. Age and the share of white collar workers do not appear to matter. All models indicate that a decline in the US tariff is associated with the a greater probability of a new product being introduced to export markets, while the other tariffs do not appear to be important. Our conclusions are confirmed in specifications controlling for the lagged total factor productivity, rather than value added per worker. The total factor productivity itself is not statistically significant (see Table 12).

In our analysis, we have lumped together two different types of plants introducing new export products: existing exporters adding one more product to their export portfolio and producers entering foreign markets for the first time. It is likely that the behavior of these

[21] Value added is measured using the difference between the sales and material inputs. It is deflated using 6-digit level PPI provided by Banco de Mexico.

two groups differs because the cost of first time entry into a new market may be higher than the cost of a mere expansion of the export product range. Therefore, we re-estimate our models splitting the sample into these two groups.

Our principal finding from the results reported in Table 13 is that the positive relationship between investment and subsequent emergence of a new export product holds only in the subsample of new exporters, where the coefficient on investment in physical capital is positive and statistically significant at the one percent level in both probit and the linear probability model.

In the case of existing exporters, no statistically significant link is detected between investment and expansion of the range of export products. This finding could be explained by the possibility, mentioned in our anecdotal evidence, that keeping up exports of existing products may also require investment. Thus, another way of interpreting our results is that there is little difference between the investment required to keep up existing exports and investment required to introduce an additional export variety. Recall that Table 2 showed that 77% of exporters introducing a new variety invested in physical capital, as opposed to 71% of exporters not introducing a new export product. In contrast, only 51% of non-exporters made such investments. Additional support for the hypothesis that investment is needed in order to mantain a product's competitiveness on export markets is given by Table 14. The probit results in the table indicate a negative correlation between the probability that a product is retired from the export market and producer's investment in the previous two years.

Another interesting result emerging from Table 13 refers to the role of improved access to foreign markets. The coefficient on the change in US tariffs is negative and significant indicating that plants in sectors experiencing larger tariffs cuts in the US are more likely to introduce new export varieties. The magnitude of the marginal effect (not reported in the table) for existing exporters is larger than that for new exporters, indicating that plants already present in the export markets are more sensitive to changes at the margin than new exporters. Finally, we find that changes to Mexican tariffs as well as changes to the US MFN tariffs have no impact on the probability of introducing new export varieties.

Next, we expand our baseline specifications by adding the second lag of investment (see Table 15). The results of the linear probability model suggest that increased investment activity takes place two years before entering foreign markets. Both the coefficient on the first and the second lag of investment are positive and statistically significant. As before, we find no evidence of increased investment on the part of existing exporters.

Finally, to check the plausibility of our findings we compare the values of investment and subsequent exports of a product newly introduced into foreign markets. We find that on average the export revenue obtained in the first year of exporting is about 5.6 times as large an the value of investment made in the two years preceding product introduction into exports markets. In the case of export revenue obtained during the first three years, this ratio increases to 43 (see Table 16).

5 Concluding Remarks

Motivated by the theoretical literature, this study uses Mexican plant-product level data for the 1994-2003 period to compare unit values of export-oriented and domestic-market-oriented products. Our findings are consistent with the predictions of the theoretical literature. First, we find that producers who export a particular product variety tend to obtain a price premium for their domestic sales of this variety. This finding is in line with Alchian and Allen's (1964) "shipping the good apples out" hypothesis and the predictions of Verhoogen's (2008) model that Southern exporters produce higher quality goods for export than for the domestic market in order to appeal to richer consumers in Northern countries.

Second, we show that manufacturers that will export a particular product in the future experience an increase in the domestic unit value obtained for this variety two years before exporting starts. Interestingly, three years before exporting takes place, their product is indistinguishable in terms of unit values from varieties sold by other producers. This is suggestive of a close link between changes in product attributes and exporting, especially as we find that increases in product unit value coincide with increased investment in physical capital and (to a lesser extent) technology licensing. These findings support the conclusions of Constantini and Melitz (2007) whose model predicts 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.

These findings are not only consistent with the predictions of theoretical models but they also confirm the patterns of behaviors mentioned during our interviews with Mexican entrepreneurs who pointed towards product quality and investment as key determinants of entry into export markets.

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A Appendix: Data Appendix

The Encuesta Industrial Anual (EIA) is an annual industrial survey that covers the Mexican manufacturing sector, 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. The post-1993 EIA includes 6,867 plants spread across 205 classes of activity. 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 based on the basis of its principal product. The class of activity is equivalent to the 6-digit level CMAP (Mexican System of Classification for Productive Activities) classification.

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 principal difference with EIA is its periodicity (being this monthly instead of yearly) and its data content. The EIM panel is available for the period 1994-2004 covering 205 CMAP.

The EIM contains the following revenue-related variables: total production, net sales, export sales, employees split between white and blue collars. Plants are asked to report the values and quantities, therefore an implicit average unit value can be calculated. However, this is not the case for all the observations. In fact for about 10-15% of the observations we have missing quantity values. Values and quantities are reported at the plant-product level. As only the principal products are reported, there are two "residual categories," namely "otros desechos y subproductos" and "otros productos no genericos". The weight of these products is negligible for most of firms (i.e. less than 2% in average).

In the EIM, as in the yearly industrial survey (EIA), plants can be tracked through time thanks to their identifiers. Based on these identifiers EIA and EIM can be merged.

Table 1: Number of plants and products

Year	No of plants		No of products	
	All	Exporting	Sold	Exported
1994	6299	1586	19314	2857
1995	6070	1880	19284	3526
1996	5786	2061	18229	3989
1997	5572	2161	17325	4186
1998	5400	2106	16761	4269
1999	5255	1967	16226	3962
2000	5118	1914	15522	3796
2001	4952	1780	14924	3555
2002	4782	1696	14404	3357
2003	4626	1691	13751	3323

Table 2: Investment patterns

	Invest	Not invest	Total No. of plants
All plants	60%	40%	54816
Exporters	72%	28%	15671
Exporter that will introduce new export variety	77%	23%	1911
Exporter that will not introduce new export variety	71%	28%	13760
Non exporters	51%	49%	27369
Non exporters that will begin to export	70%	30%	1066
Non exporters that will not begin to export	50%	50%	26303

Notes:
Non exporters are plant not exporting in t and t-1.

Table 3: Variables description

Variable Name	Description
Number of workers	Total number of workers (white collars and blue collars)
Share of white collars workers	Ratio of white collars to total number of workers
Age	Years of experience since setup
R&D Investment	Expenses in in-house research and development
Investment in technological transfers	Expenses to acquire technology (patents, engineering services, consultancy, etc.)
US Tariff	US tariffs applied to Mexican products agreed under NAFTA
Investment	Investment in fixed assets: machineries, buildings, transport equipments
TFP Index	Index of total factor productivity
Export Ratio	Ratio of deflated export sales to total deflated sales
Import Ratio	Ratio of deflated imported intermediate inputs to total deflated inputs used
Number of varieties sold	Number of varieties sold in a given year (both domestically and abroad)
US-MFN Tariff	US tariffs applied to any imported products not benefetting from preferential treatment
MX Tariff	Mexican tariffs applied to US and Canadian products agreed under NAFTA

Table 4: Summary statistics

	Mean	**No. of obs.**
Investment (all plants, in thousands of 1994 pesos)	1666.11	47169
Investment (only investing plants, in thousands of 1994 pesos)	2490.81	32188
TFP index	1.75	55099
Export Ratio (all plants, in%)	6.90	67980
Export Ratio (only exporters, in%)	25.12	18842
Number of varieties sold	2.96	52962
Number of workers	207.95	57414
Share of white collar workers, in %	31.63	55865
Age	25.49	43253
R&D Investment (all plants, in thousands of 1994 pesos)	113.4	59777
R&D Investment (only investing plants in thousands of 1994 pesos)	232.11	6070
Investment in technological transfers (all plants in thousands of 1994 pesos)	228.8	58554
Investment in technological transfers (only investing plants, in thousands of 1994 pesos)	1492.2	8978

B Appendix: Tables

Table 5: Unit value premium and exporting

	(1)	**(2)**	**(3)**	**(4)**
Before Export	0.071***	0.071***	0.071***	0.071**
(1 or 2 years)	(0.012)	(0.017)	(0.015)	(0.022)
Exported	0.106***	0.106***	0.106***	0.106***
	(0.005)	(0.011)	(0.007)	(0.016)
R2	.9	.9	.9	.9
N	130170	130170	130170	130170
Test $b_1 = b_2$	.003	.03	.02	.07

	(1A)	**(2A)**	**(3A)**	**(4A)**
2 Years Before Export	0.063***	0.063***	0.063**	0.063**
	(0.016)	(0.018)	(0.020)	(0.022)
1 Year Before Export	0.080***	0.080***	0.080***	0.080***
	(0.016)	(0.018)	(0.021)	(0.022)
Exported	0.106***	0.106***	0.106***	0.106***
	(0.005)	(0.011)	(0.007)	(0.016)
R2	.9	.9	.9	.9
N	130170	130170	130170	130170
Test $b_1 = b_2$	.43	.04	.52	.05
Test $b_1 = b_3$	.01	.01	.03	.03
Test $b_2 = b_3$	.11	.12	.20	.19
Clustered SE	*No*	*plant-product*	*plant-year*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.

Table 6: Unit value premium and exporting: Annual premiums

	(1)	**(2)**	**(3)**	**(4)**
3 Years Before Export	0.036*	0.036	0.036	0.036
	(0.020)	(0.023)	(0.026)	(0.028)
2 Years Before Export	0.063***	0.063***	0.063**	0.063**
	(0.016)	(0.018)	(0.020)	(0.022)
1 Year Before Export	0.082***	0.082***	0.082***	0.082***
	(0.017)	(0.019)	(0.022)	(0.024)
Exported	0.107***	0.107***	0.107***	0.107***
	(0.005)	(0.011)	(0.007)	(0.016)
r2	.9	.9	.9	.9
N	120849	120849	120849	120849
Clustered SE	*No*	*plant-product*	*plant-year*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*
Test equality of coefficients				
test b_1=b_2	.29	.08	.4	.08
test b_1=b_3	.08	.01	.17	.01
test b_1=b_4	.001	.002	.01	.01
test b_2=b_3	.42	.08	.5	.07
test b_2=b_4	.01	.01	.03	.03
test b_3=b_4	.15	.16	.25	.22

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.

Table 7: Unit value premium and exporting: Controlling for market power

	(1)	(2)	(3)	(4)
Before Export (1 or 2 years)	0.071**	0.055**	0.063**	0.084***
	(0.022)	(0.023)	(0.023)	(0.024)
Exported	0.106***	0.085***	0.095***	0.126***
	(0.016)	(0.015)	(0.016)	(0.020)
Log Product Sales (lagged)		0.025***		
		(0.004)		
Log Real Plant Sales (lagged)			0.027***	
			(0.005)	
Markup (lagged)				0.001***
				(0.000)
r2	.9	.91	.909	.909
N	130170	105171	102610	89800
Test $b_1 = b_2$	0.07	0.13	0.11	0.04
Clustered SE	*product*	*product*	*product*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.

Table 8: Unit value premium and exporting: Additional controls

	(1)	**(2)**	**(3)**	**(4)**
Before Export (1 or 2 years)	0.043***	0.043**	0.043**	0.043*
	(0.013)	(0.019)	(0.016)	(0.023)
Exported	0.061***	0.061***	0.061***	0.061***
	(0.006)	(0.012)	(0.008)	(0.014)
Export Ratio (lagged)	0.001***	0.001**	0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
Log No. Sold Products (lagged)	-0.001	-0.001	-0.001	-0.001
	(0.005)	(0.010)	(0.006)	(0.014)
Log TFP (lagged)	0.042***	0.042***	0.042***	0.042***
	(0.003)	(0.005)	(0.004)	(0.006)
Log No. Employees (lagged)	0.027***	0.027***	0.027***	0.027***
	(0.002)	(0.005)	(0.003)	(0.006)
Ratio of White Collars (lagged)	0.470***	0.470***	0.470***	0.470***
	(0.011)	(0.025)	(0.021)	(0.056)
Log Investment in R&D (lagged)	0.007***	0.007***	0.007**	0.007**
	(0.001)	(0.002)	(0.002)	(0.002)
Log Investment in Tech. Transf.	0.012***	0.012***	0.012***	0.012***
(lagged)	(0.001)	(0.002)	(0.001)	(0.002)
Log Investment (lagged)	0.002**	0.002**	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
r2	.915	.915	.915	.915
N	89870	89870	89870	89870
Test $b_1 = b_2$	.20	.33	.31	.40
Clustered SE	*No*	*plant-product*	*plant-year*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.

Table 9: : Unit value premium and exporting: Controlling for plant and product exit

	(1)	(2)	(3)	(4)
Before Export (1 or 2 years)	0.070***	0.070***	0.070***	0.070**
	(0.012)	(0.017)	(0.015)	(0.022)
Exported	0.106***	0.106***	0.106***	0.106***
	(0.005)	(0.011)	(0.007)	(0.016)
Future Exiting Plant	-0.025**	-0.025**	-0.025*	-0.025**
	(0.009)	(0.009)	(0.014)	(0.010)
r2	.9	.9	.9	.9
N	130170	130170	130170	130170
Test $b_1 = b_2$	0.003	0.03	0.02	0.07
	(1A)	**(2A)**	**(3A)**	**(4A)**
Before Export (1 or 2 years)	0.071***	0.071***	0.071***	0.071**
	(0.012)	(0.017)	(0.015)	(0.022)
Exported	0.111***	0.111***	0.111***	0.111***
	(0.005)	(0.012)	(0.007)	(0.017)
Future Exiting Product (from export)	-0.031**	-0.031**	-0.031**	-0.031**
	(0.010)	(0.013)	(0.013)	(0.013)
Exiting Plant (from sample)	-0.018**	-0.018**	-0.018	-0.018*
	(0.009)	(0.009)	(0.013)	(0.010)
r2	.9	.9	.9	.9
N	130170	130170	130170	130170
Test $b_1 = b_2$	0.001	0.02	0.01	0.04
	(1B)	**(2B)**	**(3B)**	**(4B)**
Before Export (1 or 2 years)	0.077***	0.077***	0.077***	0.077***
	(0.012)	(0.018)	(0.016)	(0.023)
Exported	0.105***	0.105***	0.105***	0.105***
	(0.005)	(0.012)	(0.008)	(0.016)
r2	.901	.901	.901	.901
N	104765	104765	104765	104765
Test $b_1 = b_2$	0.02	0.10	0.08	0.16
Clustered SE	*No*	*plant-product*	*plant-year*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.
In models (1B)-(4B) we exclude firms that exit during the sample and use a balanced panel

Table 10: Unit value premium and exporting: First differences

	(1)	**(2)**	**(3)**	**(4)**
Before Export	0.014***	0.014***	0.014**	0.014**
(1 or 2 years)	(0.004)	(0.004)	(0.005)	(0.005)
Exported	0.010***	0.010***	0.010***	0.010***
	(0.002)	(0.001)	(0.002)	(0.002)
R2	.4	.4	.4	.4
N	104356	104356	104356	104356
Test $b_1 = b_2$	.43	.44	.50	.47

	(1A)	**(2A)**	**(3A)**	**(4A)**
2 Years Before Export	0.021***	0.021**	0.021**	0.021**
	(0.006)	(0.006)	(0.007)	(0.007)
1 Year Before Export	0.009	0.009	0.009	0.009
	(0.005)	(0.006)	(0.006)	(0.006)
Exported	0.010***	0.010***	0.010***	0.010***
	(0.002)	(0.001)	(0.002)	(0.002)
R2	.4	.4	.4	.4
N	104356	104356	104356	104356
Test $b_1 = b_2$	.13	.16	.19	.20
Test $b_1 = b_3$	.10	.11	.16	.15
Test $b_2 = b_3$	.74	.76	.78	.77
Clustered SE	*No*	*plant-product*	*plant-year*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.

Table 11: New export products and investment behavior

	probit (1)	linear FE (2)	probit (3)	linear FE (4)
Log Investment (lagged)	0.018***	0.001*	0.015***	0.001**
	(0.00)	(0.00)	(0.00)	(0.00)
Log Investment in R&D (lagged)	-0.004	-0.001‡	-0.008	0.001‡
	(0.01)	(0.00)	(0.01)	(0.00)
Log Investment in Tech. Transf. (lagged)	0.005	0.002	-0.000	0.002*
	(0.00)	(0.00)	(0.00)	(0.00)
Log Value Added Lab. Prod. (lagged)			0.051***	-0.005*
			(0.01)	(0.00)
Export Ratio (lagged)	0.003***	-0.003***	0.018***	-0.010***
	(0.00)	(0.00)	(0.00)	(0.00)
Export Ratio^2 (lagged)			-0.001‡***	0.001‡***
			(0.00)	(0.00)
Export Ratio^3 (lagged)			0.001‡***	-0.001‡***
			(0.00)	(0.00)
Log N. Sold Products (lagged)	0.390***	0.002	0.379***	0.005
	(0.02)	(0.01)	(0.02)	(0.01)
Ratio of White Collars (lagged)	0.042	0.037*	-0.023	0.036
	(0.06)	(0.02)	(0.06)	(0.02)
Log No. Employees (lagged)	0.079***	-0.003	0.081***	0.002
	(0.01)	(0.00)	(0.01)	(0.01)
Log Age	0.013	-0.020	0.014	-0.023
	(0.02)	(0.02)	(0.02)	(0.02)
Δ US Tariff	-0.024***	-0.005***	-0.024***	-0.005***
	(0.01)	(0.00)	(0.01)	(0.00)
Δ US-MFN Tariff	-0.017*	-0.001‡	-0.017*	-0.000
	(0.01)	(0.00)	(0.01)	(0.00)
Δ MX Tariff	0.003	-0.001	0.002	-0.001
	(0.01)	(0.00)	(0.01)	(0.00)
N	33656	33656	32920	32920

Notes:
The dep. var. is equal to 1 if plant introduces a new export variety, and 0 otherwise.
Industry, region and year fixed effects are included in the probit while plant and year fixed effects in the linear model.
Robust standard errors displayed in parentheses.
* significant at 10%; ** at 5%; *** at 1%.
‡ indicates that the absolute value of the coefficient is smaller than .001.

Table 12: New export products and investment behavior: Controlling for TFP

	probit (1)	linear FE (2)
Log Investment (lagged)	0.018***	0.001*
	(0.00)	(0.00)
Log Investment in R&D (lagged)	-0.006	0.001‡
	(0.01)	(0.00)
Log Investment in Tech. Transf. (lagged)	0.004	0.002*
	(0.00)	(0.00)
Log TFP (lagged)	0.020	-0.002
	(0.02)	(0.00)
Export Ratio (lagged)	0.016***	-0.010***
	(0.00)	(0.00)
Export Ratio^2 (lagged)	-0.001‡***	0.001‡***
	(0.00)	(0.00)
Export Ratio^3 (lagged)	0.001‡***	-0.001‡***
	(0.00)	(0.00)
Log No. Sold Products (lagged)	0.377***	0.004
	(0.02)	(0.01)
Ratio of White Collars (lagged)	-0.006	0.039
	(0.06)	(0.02)
Log No. Employees (lagged)	0.081***	-0.002
	(0.01)	(0.01)
Log Age	0.007	-0.022
	(0.02)	(0.02)
Δ US Tariff	-0.025***	-0.005***
	(0.01)	(0.00)
Δ US-MFN Tariff	-0.016*	-0.001‡
	(0.01)	(0.00)
Δ MX Tariff	0.004	-0.001
	(0.01)	(0.00)
N	32562	32562

Notes:
The dep. var. is equal to 1 if plant introduces a new export variety, and 0 otherwise.
Industry, region and year fixed effects are included in the probit while plant and year fixed effects in the linear model.
Robust standard errors displayed in parentheses.
* significant at 10%; ** at 5%; *** at 1%.
‡ indicates that the absolute value of the coefficient is smaller than .001.

Table 13: New export products and investment behavior: New vs expanding exporters

	Entry into exporting		Adding a new export variety	
	probit	linear FE	probit	linear FE
	(1)	(2)	(3)	(4)
Log Investment (lagged)	0.030***	0.002***	0.007	0.002
	(0.01)	(0.00)	(0.01)	(0.00)
Log Investment in R&D (lagged)	0.006	0.001	-0.015**	-0.001‡
	(0.01)	(0.00)	(0.01)	(0.00)
Log Investment in Tech. Transf.	0.025***	0.002	-0.003	0.001
(lagged)	(0.01)	(0.00)	(0.01)	(0.00)
Log TFP (lagged)	0.009	0.001‡	-0.043	-0.002
	(0.02)	(0.00)	(0.03)	(0.01)
Log No. Sold Products (lagged)	-0.083***	0.017**	1.010***	-0.058**
	(0.02)	(0.01)	(0.03)	(0.03)
Ratio of White Collars (lagged)	-0.030	0.023	-0.044	0.043
	(0.08)	(0.02)	(0.10)	(0.06)
Log No. Employees (lagged)	0.113***	0.014**	-0.044**	-0.006
	(0.02)	(0.01)	(0.02)	(0.01)
Log Age	0.059**	0.004	-0.065**	-0.014
	(0.02)	(0.02)	(0.03)	(0.05)
Δ US Tariff	-0.023**	-0.004***	-0.052***	-0.008**
	(0.01)	(0.00)	(0.02)	(0.00)
Δ US-MFN Tariff	-0.016	0.002	-0.021	-0.001
	(0.01)	(0.00)	(0.01)	(0.00)
Δ MX Tariff	-0.001	-0.001‡	0.020	0.001
	(0.01)	(0.00)	(0.02)	(0.00)
Export Ratio (lagged)			-0.005***	-0.004***
			(0.00)	(0.00)
Export Ratio^2 (lagged)			0.001‡**	0.001‡***
			(0.00)	(0.00)
Export Ratio^3 (lagged)			-0.001‡	-0.001‡**
			(0.00)	(0.00)
N	20752	20752	11810	11810

Notes:
In columns (1) and (2) the dep. var. is equal to 1 if a plant begins to export at t, and 0 otherwise. The sample includes only plants not exporting at t-1 and t-2.
In columns (3) and (4) the dep. var. is equal to 1 if a plant introduces a new export variety, and 0 otherwise. The sample includes only plants already exporting at t-1.
Industry, region and year fixed effects are included in the probit, while plant and year fixed effects in the linear probability model.
Robust standard errors displayed in parentheses.
* significant at 10%; ** at 5%; *** at 1%.
‡ indicates that the absolute value of the coefficient is smaller than .001.

Table 14: Determinants of product exit from export markets

	(1)	(2)	(1A)	(2A)
Log Investment (lagged)	-0.032***	-0.024***	-0.018**	-0.009
	(0.005)	(0.006)	(0.006)	(0.006)
Log Investment (lagged 2 years)		-0.013**		-0.011*
		(0.006)		(0.006)
Log N. Sold Products (lagged)	0.332***	0.328***	0.394***	0.391***
	(0.037)	(0.042)	(0.040)	(0.045)
Export Ratio (lagged)	-0.003***	-0.005***	-0.005***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Log TFP (lagged)	-0.060*	-0.082**	-0.104***	-0.079**
	(0.035)	(0.033)	(0.031)	(0.034)
Log No. Employees (lagged)	-0.218***	-0.211***	-0.206***	-0.203***
	(0.021)	(0.024)	(0.023)	(0.026)
Ratio of White Collars (lagged)	-0.431***	-0.607***	-0.412***	-0.524***
	(0.111)	(0.128)	(0.124)	(0.140)
Log Investment in R&D (lagged)	-0.018**	-0.015*	-0.012	-0.013
	(0.008)	(0.008)	(0.008)	(0.009)
Log Investment in Tech. Transf.(lagged)	-0.004	-0.003	-0.001	0.002
	(0.006)	(0.007)	(0.006)	(0.007)
N	24202	18905	21460	16909
Industry FE (6 digits)	*Yes*	*Yes*	*Yes*	*Yes*
Location FE	*Yes*	*Yes*	*Yes*	*Yes*
Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is one if a product is exported in t and will exit export markets in t+1, and zero otherwise.
Robust standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
In models (1A)-(2A) we exclude plants that exit during the sample and use a balanced panel.

Table 15: New export products and investment behavior: Two-year lags

	probit (1)	linear FE (2)
All plants		
Log Investment (lagged)	0.018***	0.001**
	(0.00)	(0.00)
Log Investment (lagged 2 years)	0.003	-0.001‡
	(0.00)	(0.00)
Log Investment in R&D (lagged)	-0.006	0.001‡
	(0.01)	(0.00)
Log Investment in Tech. Transf. (lagged)	0.003	0.002*
	(0.00)	(0.00)
N	29892	29892
Entry into exporting		
Log Investment (lagged)	0.030***	0.002***
	(0.01)	(0.00)
Log Investment (lagged 2 years)	0.012*	0.001*
	(0.01)	(0.00)
Log Investment in R&D (lagged)	0.011	0.001
	(0.01)	(0.00)
Log Investment in Tech. Transf. (lagged)	0.022***	0.002
	(0.01)	(0.00)
N	18957	18957
Adding a new export variety		
Log Investment (lagged)	0.007	0.002
	(0.01)	(0.00)
Log Investment (lagged 2 years)	-0.004	0.001
	(0.01)	(0.00)
Log Investment in R&D (lagged)	-0.018**	-0.001
	(0.01)	(0.00)
Log Investment in Tech. Transf. (lagged)	-0.002	0.001
	(0.01)	(0.00)
N	10935	10935

Notes:
See table 13 for notes
All specifications include the same regressors as table 13.

Table 16: Relative magnitudes of investment and export revenue from new products

	Exports value in year 1 divided by investments 1 and 2 years before	**Exports value in years 1 and 2 divided by investments in 1 and 2 years before**	**Exports value in years 1 and 2 and 3 divided by investments in 1 and 2 years before**
median	1.5	2.8	4.1
mean	5.6	13.7	42.7
	Exports value in year 1 divided by investments 1 year before	**Exports value in years 1 and 2 divided by investments in 1 year before**	**Exports value in years 1 and 2 and 3 divided by investments in 1 year before**
median	2.3	4.3	6.4
mean	3.9	7.6	15.5

Notes: The exports values refer to the periods after a firms begin to exports, e.g. year 1 meaning 1 year after beginning to export. The investments refer to the period before beginning to export, e.g. 1 year before meaning 1 year before beginning to export.

C Appendix: Robustness checks

Table 17: Unit value premium and exporting

	(1)	**(2)**	**(3)**	**(4)**
Before Export	0.070***	0.070***	0.070***	0.070**
(1 or 2 years)	(0.012)	(0.017)	(0.015)	(0.022)
Exported	0.109***	0.109***	0.109***	0.109***
	(0.006)	(0.012)	(0.008)	(0.017)
R2	.9	.9	.9	.9
N	115724	115724	115724	115724
Test $b_1 = b_2$	.002	.01	.01	.02

	(1A)	**(2A)**	**(3A)**	**(4A)**
2 Years Before Export	0.079***	0.079***	0.079***	0.079***
	(0.016)	(0.018)	(0.021)	(0.022)
1 Year Before Export	0.062***	0.062***	0.062**	0.062**
	(0.016)	(0.018)	(0.020)	(0.022)
Exported	0.109***	0.109***	0.109***	0.109***
	(0.006)	(0.012)	(0.008)	(0.017)
R2	.9	.9	.9	.9
N	115724	115724	115724	115724
Test $b_1 = b_2$	.47	.07	.56	.10
Test $b_1 = b_3$	.01	.004	.03	.01
Test $b_2 = b_3$	.07	.05	.16	.08
Clustered SE	*No*	*plant-product*	*plant-year*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
We exclude from sample varieties that are exported throughout the entire period.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.

Table 18: Unit value premium and exporting: Annual premiums

	(1A)	**(2A)**	**(3A)**	**(4A)**
3 Years Before Export	0.040**	0.040*	0.040	0.040
	(0.020)	(0.023)	(0.026)	(0.028)
2 Years Before Export	0.063***	0.063***	0.063**	0.063**
	(0.016)	(0.018)	(0.020)	(0.022)
1 Year Before Export	0.079***	0.079***	0.079***	0.079***
	(0.017)	(0.019)	(0.022)	(0.024)
Exported	0.109***	0.109***	0.109***	0.109***
	(0.006)	(0.012)	(0.008)	(0.017)
R2	.9	.9	.9	.9
N	106403	106403	106403	106403
Test $b_1 = b_2$	.38	.15	.49	.16
Test $b_1 = b_3$	.13	.04	.24	.03
Test $b_1 = b_4$	.001	.002	.01	.004
Test $b_2 = b_3$	.48	.13	.57	.12
Test $b_2 = b_4$	.006	.005	.03	.01
Test $b_3 = b_4$	.09	.08	.19	.10
Clustered SE	*No*	*plant-product*	*plant-year*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
We exclude from sample varieties that are exported throughout the entire period.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.

Table 19: Unit value premium and exporting: Additional controls

	(1)	**(2)**	**(3)**	**(4)**
	b/se	b/se	b/se	b/se
Before Export	0.040**	0.040**	0.040**	0.040*
(1 or 2 years)	(0.013)	(0.019)	(0.016)	(0.023)
Exported	0.064***	0.064***	0.064***	0.064***
	(0.007)	(0.013)	(0.009)	(0.015)
Export Ratio	0.001***	0.001**	0.001***	0.001**
(lagged)	(0.000)	(0.000)	(0.000)	(0.001)
Log No. Sold Products	-0.004	-0.004	-0.004	-0.004
(lagged)	(0.005)	(0.011)	(0.006)	(0.015)
Log TFP	0.042***	0.042***	0.042***	0.042***
(lagged)	(0.003)	(0.005)	(0.004)	(0.006)
Log No. Employees	0.032***	0.032***	0.032***	0.032***
(lagged)	(0.002)	(0.005)	(0.004)	(0.006)
Ratio of White Collars	0.453***	0.453***	0.453***	0.453***
(lagged)	(0.011)	(0.025)	(0.021)	(0.053)
Log Investment in R&D	0.008***	0.008***	0.008**	0.008**
(lagged)	(0.001)	(0.002)	(0.002)	(0.003)
Log Investment in Tech. Transf.	0.011***	0.011***	0.011***	0.011***
(lagged)	(0.001)	(0.002)	(0.002)	(0.002)
Log Investment	0.002**	0.002*	0.002	0.002
(lagged)	(0.001)	(0.001)	(0.001)	(0.001)
r2	.916	.916	.916	.916
N	80447	80447	80447	80447
Test $b_1 = b_2$	.08	.14	.16	.19
Clustered SE	*No*	*plant-product*	*plant-year*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
We exclude from sample varieties that are exported throughout the entire period.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.

Table 20: Unit value premium and exporting: First differences

	(1)	**(2)**	**(3)**	**(4)**
Before Export	0.015***	0.015***	0.015**	0.015**
(1 or 2 years)	(0.004)	(0.004)	(0.005)	(0.005)
Exported	0.011***	0.011***	0.011***	0.011***
	(0.002)	(0.002)	(0.002)	(0.002)
R2	.4	.4	.4	.4
N	92251	92251	92251	92251
Test $b_1 = b_2$	.42	.43	.50	.47

	(1A)	**(2A)**	**(3A)**	**(4A)**
2 Years Before Export	0.020**	0.020**	0.020**	0.020**
	(0.006)	(0.007)	(0.007)	(0.008)
1 Year Before Export	0.011**	0.011*	0.011*	0.011*
	(0.005)	(0.006)	(0.006)	(0.006)
Exported	0.011***	0.011***	0.011***	0.011***
	(0.002)	(0.002)	(0.002)	(0.002)
R2	.4	.4	.4	.4
N	92251	92251	92251	92251
Test $b_1 = b_2$	.24	.29	.31	.33
Test $b_1 = b_3$	.16	.17	.23	.23
Test $b_2 = b_3$	.94	.94	.95	.95
Clustered SE	*No*	*plant-product*	*plant-year*	*product*
Product-Year FE	*Yes*	*Yes*	*Yes*	*Yes*

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors are listed in parentheses.
*** denotes significant at 1%, ** at 5%, * at 10%.
We exclude from sample varieties that are exported throughout the entire period.
For the tests we report the p-values. b_n corresponds to the coefficient of the nth variable as listed in the table.