Getting Ready: Preparation for Exporting

Preliminary Version - Comments Welcome

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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. In contrast to the existing literature, which concentrates on plant productivity, 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 *conscious* preparation on the part of future or expanding exporters. First, we 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, we 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, 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[1].

Keywords: *Export Diversification, New Exporters, Investment, Multi-product firms*

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1 Introduction

Since Adam Smith economists have argued that integrating a national economy into global markets can be an important stimulus for economic growth. This belief is reflected in the endogenous growth theory which views trade in goods as trade in ideas and knowledge and suggests that trade can be an important engine of growth (Grossman and Helpman 1991). During the 1990s many economists searched for cross-country evidence on the link between trade integration and economic development (Coe and Helpman 1995, Sachs and Warner 1995, Harrison 1996, Keller 1996, Frankel and Romer 1999, Dollar and Kraay 2003). At the same time, policy makers have been increasingly concerned with globalization and, as shown by the multiplication of export promotion programs, have tried to facilitate growth of exports from their countries.

The availability of micro-level data has shifted the focus of research from a macro to a micro perspective. It has stimulated a large literature analyzing the determinants of firm entry into export markets and searching for evidence of learning from exporting. Two ground-breaking studies have demonstrated that the superior performance of exporters can be attributed to the self-selection of the best performers into exporting rather than learning from foreign sales (Clerides, Lach, and Tybout 1998, Bernard and Jensen 1999). Subsequent studies have argued that even though the best performers self-select into exporting there is also some evidence of learning from exporting.[2] The debate has recently been enriched by a theoretical contribution of Constantini and Melitz (2007) who argue that performance upgrading and entry into exporting are a joint decision.[3]

Our study contributes to this debate by examining plant behavior preceding an expansion into foreign markets. In contrast to the existing literature, which concentrates on plant productivity, we focus on domestic unit values of products that will be exported in the future and on plants' investment behavior. Focusing on alternative outcomes allows us to avoid the criticisms of the reliability of productivity measures (see for instance Katayama and Tybout (2003)) and is, in our view, a useful extension of the earlier literature. Unlike the existing studies, we distinguish between plants entering export markets for the first time and current exporters introducing a new export variety, which allows us to shed some light on the relative magnitudes of the fixed costs associated with these two phenomena. Our analysis is possible thanks to a new dataset including information on products produced and exported by about 6,000 Mexican plants during the 1994-2003 period.

Our findings are consistent with conscious preparation on the part of future or expanding exporters. First, we 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, we

[2]For a review of this debate refer to López (2005), Greenaway and Kneller (2007), De Loecker (2007) and Wagner (2007).

[3]This point was also raised by Alvarez and Lòpez (2005) who show that future exporters tend to have higher investment outlays.

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 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. Third, 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 results have implications for modeling a firm's decision to enter export markets and increase the range of exported products. First, they provide evidence in support of a significant fixed cost being associated with the first time entry into export markets, in line with the model of single-product plants proposed by Melitz (2003). Second, they are consistent with the modified version of the Melitz model proposed by Baldwin and Harrigan (2007) where firms compete on the basis of heterogeneous quality as well as unit costs, with high quality and being associated with higher prices and high-quality/high-price goods being exported. Third, our findings suggest that the cost of expansion in the range of exported varieties is much smaller than the cost of the first time-entry, which counters the assumption of the existing theoretical models of multi-product firms that the cost of introduction of the first export variety is identical to the cost of introduction of each subsequent variety (Bernard, Redding, and Schott 2006, Nocke and Yeaple 2006). Fourth, our results support the theoretical argument of Constantini and Melitz's (2007) that upgrading and exporting are a joint decision.

Our findings also carry implications for empirical studies. If investment and export decisions are jointly determined then learning by exporting hypothesis can be tested only in the presence of exogenous shocks that push plants to export. Further, in order to disentangle the effects of *learning to export* from those of *learning by exporting* one needs information on the timing of the decision to enter export markets and not just the moment when the producer starts shipping its products abroad. In conclusion, caution may be needed when assessing the results based on comparison of productivity trends before and after beginning to export.

Finally, our paper has some policy implications. If the self-selection into export markets is a conscious decision and requires preparation in terms of additional investment, policies that tilt the perceived benefits of exporting or reduce the fixed costs of entry into foreign markets can be helpful in facilitating emergence of new exporters. Lowering the marginal costs of exporting by, for instance, increasing access to foreign markets is likely to both benefit current exporters and to stimulate new entry into export markets. [4]

This paper is structured as follows. In next section, we briefly sketch how our empirical analysis

[4] The results of the structural model of Das, Roberts, and Tybout (2007) based on Colombian data indicate that lowering marginal costs may be more effective at stimulating export response than subsidizing entry costs because incumbent exporters are able to respond better and with larger export volumes than small new exporters. A study of the Irish system of grants by Görg and Strobl (forthcoming) suggests that such grants helped firms that were already exporting but were not very effective at helping non-exporters to enter international markets.

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

Our analysis is motivated by the recent advances the theoretical literature modeling firm-level responses to globalization. This literature originated with the contribution of Melitz's (2003) who models firms as heterogeneous in terms of their marginal costs. As there is a fixed cost required to access export markets, only more productive firms find it profitable to export. Subsequent work by Yeaple (2005) models firms as choosing from a set of competing technologies and a set of workers with heterogeneous skills which, combined with international trade costs, gives rise to firm heterogeneity in equilibrium. A contribution by Bernard, Redding, and Schott (2007) incorporates firms heterogeneous in terms of productivity into a Ricardian trade model.

Recognizing that product quality is one of the often cited determinants of the firm's ability to export, Baldwin and Harrigan (2007) incorporate product quality into the Melitz (2003) model. In their model, they allow firms to compete based on heterogeneous quality as well as unit costs and predict 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. Quality also plays a crucial role in Verhoogen's (forthcoming) model with heterogenous plants and quality differentiation where more productive plants produce higher-quality goods than less productive plants and pay higher wages to maintain a higher-skilled workforce. Higher-quality products sell at higher prices and enter export markets. Finally, (Sutton 2007) presents a model where firms, no matter how low their marginal costs, are unable to export unless they reach a certain quality threshold. Improvements to quality can be made by incurring "fixed and sunk costs".

Another strand of trade models with heterogeneous firms takes into account the fact that firms may produce multiple products. These models incorporate the idea that there is a fixed cost associated with exporting and assume that this cost is constant across products introduced into the export market. In other words, the cost of introducing the first product into the export market is the same as the cost of introducing the nth export product. While some models assume that products manufactured by the same firm are symmetric (Nocke and Yeaple 2006), others postulate that firms are better at producing products that are closer to their "core competencies" and thus there is heterogeneity at the product-level within the same firm (Bernard, Redding, and Schott 2006, Eckel and Neary 2006). In these models, quality does not play any role as in the traditional Melitz's (2003) model.

Building on Melitz (2003), Constantini and Melitz (2007) recently developed a model which incorporates a joint decision to upgrade product quality and enter export markets. Similarly, Bustos (2005) expands Melitz's (2003) model by allowing firms to pay an extra fixed cost to introduce a new technology that reduces the marginal cost. In these models, emergence of new export opportunities (e.g., signing a regional trade agreement) induces firms to upgrade and invest in order to take advantage of export opportunities. What is more important for our study is that these models explicitly establish a link between investment driven upgrading and exporting.

Motivated by the theoretical literature, our empirical analysis focuses on product-plant level data and examines product characteristics and plant behavior in the years preceding entry into export markets. The goal of our study is not to test the above mentioned theories, but rather to shed some light on how well some of their assumptions and predictions match the available data.[5] We believe that this exercise will be useful in guiding the future modeling work.

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, exports, employment of blue collar workers and employment of white collar workers at the plant-product level. 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.[6]

For each 6-digit code (*clase*) in the Mexican Industrial Classification System (CMAP), the EIM survey form includes a list of possible products.[7] 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 B, our sample includes between 6,299 and 4,626 plants

[5]Table 1 in Appendix A summarizes some relevant predictions from these theoretical models and the principal results emerging from our empirical analysis.

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

[7]This list was developed in 1993 based on the industrial census and was kept unchanged during the entire period under consideration.

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 3). The dynamic expansion of Mexican exports during the period under study[8] 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, R&D expenditure and technology purchases. This feature of the dataset makes it particularly suitable to examine plant-level activities associated in preparation for exporting. All summary statistics are presented in Table 5.

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.[9] The figures pertain to HS 8-digit sectors and we match them with 6-digit CMAP codes.

4 Empirical analysis

The literature on learning to export and learning by exporting (reviewed by Greenaway and Kneller (2007)) focuses almost exclusively on plant productivity, usually measured as the total factor productivity (TFP).[10] However, the total factor productivity may be a poor measure of performance. As Katayama and Tybout (2003) argue, substitution of the data on sales revenues, depreciated capital spending and real input expenditure for information on the physical quantities of output, capital and intermediate inputs, which is commonly done by researchers, may lead to confounding higher productivity with higher markups. Such TFP estimates have little to do with technical efficiency and product quality, but they are likely to be correlated with policy shocks and managerial decisions in misleading ways. TFP measures are even more problematic in the case of multi-product plants. This is not to say that studies focusing on TFP are not useful, but rather than there is a need for a complementary approach considering alternative outcomes and activities.

Therefore, in response to the shortcomings of the TFP measure, our study will first consider a different outcome, namely, unit values of products sold on the domestic market in the period preceding their exports. Then we will focus on inputs into production upgrading (investment, spending on

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

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

[10]Notable exception are Alvarez and Lòpez (2005) who document that firms build up their capital stocks prior to entry into foreign markets and Bustos (2005) who documents technological upgrading in response to the expansion in market opportunities.

R&D and technology acquisition) rather than the outcome of upgrading (productivity).

The information we obtained during an interview with a leading Mexican juice producer illustrates the process we intend to capture in our analysis. The company executive confirmed that introducing a new product into export markets requires significant preparations. 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 than products from concentrates. The company recently introduced such juices targeting higher-end Mexican consumers and subsequently started selling them in export markets. All export products must be in compliance with sanitary and phytosanitary requirements of the destination country. 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. 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.

The interviewee also pointed out that 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.

Similarly, the case of the Volswagen during the 1990s, discussed in Verhoogen (forthcoming), shows 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 that we should observe product upgrading before the product's 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.

4.1 Evidence from unit value premiums

If Mexican producers upgrade products they intend to introduce 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] It is important to stress that an increase in the domestic unit value of a given product is consistent with upgrading of the product quality or a compositional change within the product category towards higher quality products.[12]

To check for evidence of upgrading 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. To take into account changes in product p's domestic unit value, the equation includes product-year fixed effects. 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] We present four specifications with clustering of standard errors either on plant-product, plant, product or no clustering at all.

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

The results presented in table 7 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. What's even more interesting for the purposes of this

[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) or may simply expand the production volume of higher quality juices while maintaining the production volume of lower quality juices unchanged.

[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.

study 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 7) 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 and one year before is statistically significant in two of four specifications.

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 8, 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 argument that future exporters consciously change the attributes of their products *in preparation* for entry into export markets.

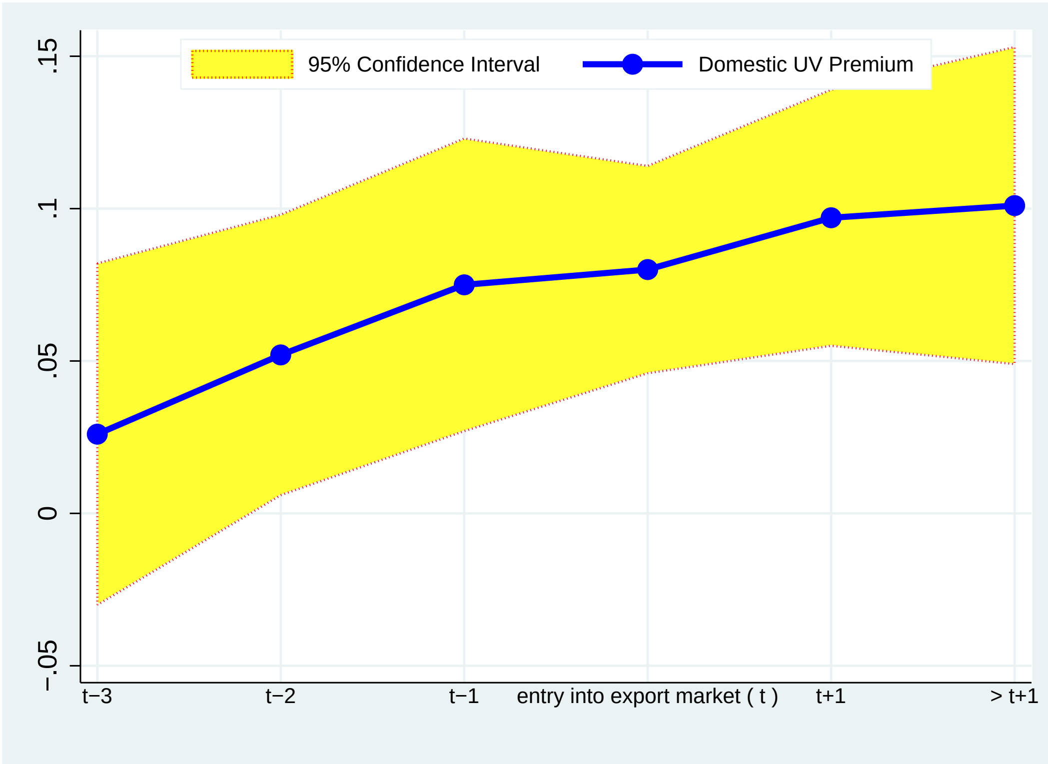
It is also interesting to note that increases in domestic unit values continue after the entry into export markets. Figure 1 illustrates the trajectory of domestic unit value premium from the three years prior to exporting to the post-entry periods. It confirms that three years prior to exporting ($t-3$), 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 9, adding these controls does not change our conclusions, but we confirm that unit values may partially

[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



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 investment 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. 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 10, 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 11 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 11 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 12, 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 robustness check, we

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

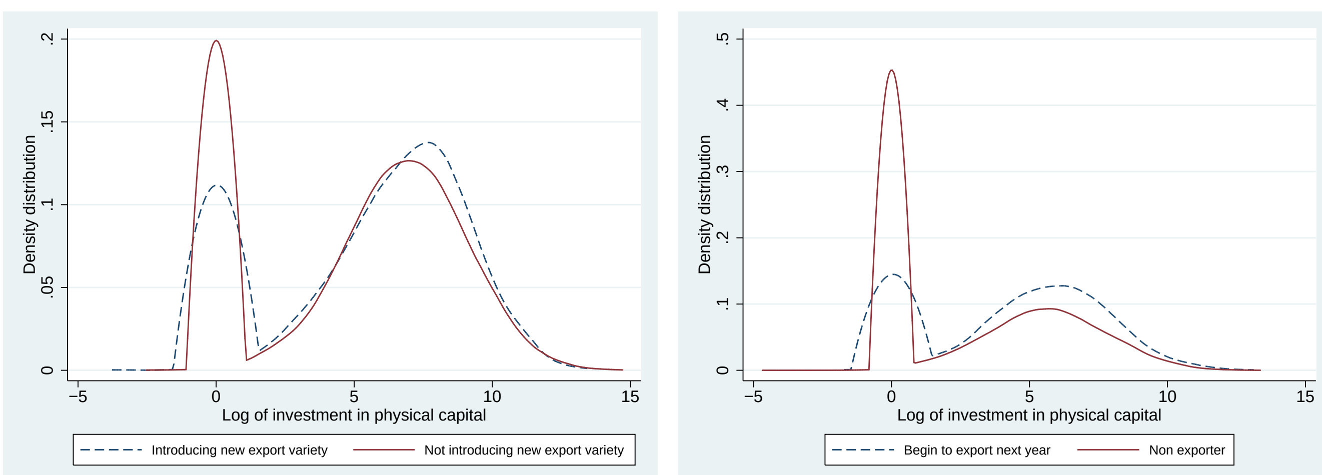
restrict our sample to domestic varieties and those entering export markets for the first time during the period under analysis. As evident from tables in Appendix D, this change has no effect on the estimated coefficients.

Finally, we may be interested in whether there is any diffence in pre-exporting unit value trajectories of products manufactured by future entrants into export markets and existing exporters. To shed some light on this question, we add to the model an interaction between the pre-exporting period dummy and a dummy for the producer being an exporter (of some other product) at time t. We also include the latter dummy on its own. We do so for all pre-exporting periods. A significant coefficient on the interaction would suggest that trajectories differ between the future first-time exporters and existing exporters. However, the results presented in table 13 show that this is not the case. While existing exporters tend to have higher domestic unit values on their other (non-exported) products, the basic patterns of upgrading of future export products remain unchanged.

4.2 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 investment. 77% of

local sales.

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 6). 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 6).

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.

To make our results comparable to those in the existing literature, 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 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

[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.

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 tariff imposed on imports from Mexico and the change in the US MFN tariff. Controlling for both allows us to capture the preference margin enjoyed by Mexican exporters. We control for the change in Mexican tariff 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 5 and a description of variables used is in table 4.

The results of our baseline model, reported in table 14, 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 it. Age and the share of white collar workers does 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, which itself is not statistically significant (see table 15).

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 two groups differs because the cost of first 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 17, is that only new exporters undertake investment in preparation for the introduction of a new export product. 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.

[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.

In the case of existing exporters, there is no evidence of investment undertaken in preparation for expanding 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 6 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 16. 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 17 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 18). The results of the linear probability model are consistent with *conscious preparation* for future exporting which starts 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 preparation on the part of existing exporters.

5 Concluding Remarks

This study uses Mexican plant-product level data for the 1994-2003 period to examine plant behavior preceding an expansion into foreign markets. Its contribution to the existing literature is threefold. First, it presents evidence consistent with *conscious* preparation on the part of future or expanding exporters. Second, it does so in a novel way by considering domestic unit values of products that will be exported in the future as well as investment behavior with respect to physical assets, R&D and technology acquisition. Third, by distinguishing between first-time entry into foreign markets and the subsequent expansion in the number of exported varieties it sheds light on the differences in fixed costs associated with the two phenomena.

Our findings can be summarized as follows. First, we 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 of exporting. Second, we 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 indicating that the cost of the first-time entry into foreign markets is higher than the cost of subsequent expansion in the number of exported varieties. Third, 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 results have implications for the theoretical models of multi-product firms as well as for empirical studies focusing on learning to and learning from exporting.

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A Appendix: Theory

Table 1: Predictions from theoretical models

	Single- or multi-products	**Price and exports**	**Fixed cost to start exporting**	**Fixed costs to expand range**
Melitz (2003)	single	lowest cost lowest price firms export	yes	n.a.
Baldwin and Harrigan (2007)	single	high cost→quality lowest quality-adjusted price firms export	yes	n.a.
Verhoogen (forthcoming)	single			
Bernard, Redding, and Schott (2006)	multiple	lowest cost lowest price firms export	yes	equal to fixed initial cost
Eckel and Neary (2006)	multiple	lowest cost lowest price firms export	no	no
Nocke and Yeaple (2006)	multiple	lowest cost lowest price firms export	no	equal to fixed initial cost
Constantini and Melitz (2007)	single	lowest cost lowest price firms export	yes	n.a.
Bustos (2005)				
Our empirical results	*data on multi-products plants*	*find increase in domestic price before exporting*	*support existence of fixed costs*	*support fixed cost of expansion lower than cost of initial entry*

B 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 *clases* and for the period 1987-1995 covering 129 *clases*. The overlapping is justified by the need of being able to link the different panels.

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) as showed by table 2.

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 2: Weight of residuals varieties for sold products

variable	**mean**	**p50**	**p90**	**p95**	**p99**
Sold Products	.012	0	.023	.080	.270
Exported Products	.012	0	0	.067	.333
Produced Products	.012	0	.022	.08	.27

Source:

Table 3: 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 4: 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 5: 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

Table 6: Firms investing

	Invest	Not invest	Total No. of plants
All plants	60%	40%	54816
Exporters	72%	28%	15671
Stable exporters	73%	27%	11583
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:
Stable exporters are those plants exporting in t, t-1 and t+1.
Non exporters are plant not exporting in t and t-1.

C Appendix: Regressions results

Table 7: Upgrading before starting to export - LHS in level

	(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 Years 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 8: Upgrading before starting to export - LHS in level

	(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 Years 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 9: Upgrading before starting to export: Controlling for market power - LHS in level

	(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 10: Upgrading before starting to export - LHS in level

	(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 11: Upgrading before starting to export: controlling for exiting plants and exiting products - LHS in level

	(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
	(1B)	**(2B)**	**(3B)**	**(4B)**
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
	(1A)	**(2A)**	**(3A)**	**(4A)**
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 (1A)-4(A) we exclude firms that exit during the sample and use a balanced panel

Table 12: Upgrading before starting to export - LHS in first difference

	(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 Years 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 13: Upgrading before starting to export: New Vs Existing Exporters - LHS in level

	(1)	**(1A)**
Before Export (1 or 2 years)	0.071**	0.049**
	(0.022)	(0.025)
Before Export X Plant exports another product		-0.005
		(0.035)
Exported	0.106***	0.128***
	(0.016)	(0.018)
Plant exports another product		0.114***
		(0.017)
r2	.9	.9
N	130170	130170

	(2)	**(2A)**
2 Years before exporting	0.063**	0.047*
	(0.022)	(0.025)
2 Years Before X Plant exports another product		-0.015
		(0.038)
1 year before exporting	0.080***	0.051*
	(0.022)	(0.027)
Plant exports another product		0.114***
		(0.017)
1 Year Before X Plant exports another product		0.003
		(0.038)
Exported	0.106***	0.128***
	(0.016)	(0.018)
r2	.9	.9
N	130170	130170

	(3)	**(3A)**
3 years before exporting	0.036	-0.016
	(0.028)	(0.033)
3 Years Before X Plant exports another product		0.094
		(0.058)
2 year before exporting	0.063**	0.047*
	(0.022)	(0.025)
2 Years Before X Plant exports another product		-0.012
		(0.039)
1 year before exporting	0.082***	0.057**
	(0.024)	(0.029)
1 Year Before X Plant exports another product		-0.010
		(0.038)
Exported	0.107***	0.128***
	(0.016)	(0.017)
Plant exports another product		0.111***
		(0.016)
r2	.901	.901
N	120849	120849

Notes:
The dependent variable is the log of unit value of an individual variety.
Standard errors clustered on product-level are listed in parentheses.
"*Plant exports some other product*" is a dummy which takes on the value of one if plant i exports a product other than p at time t, and zero otherwise.
*** denotes significant at 1%, ** at 5%, * at 10%.

Table 14: Explaining horizontal diversification - All plants baseline model

	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 15: Explaining horizontal diversification - All plants baseline model with TFP

	probit	linear FE
	(1)	(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.	0.004	0.002*
(lagged)	(0.00)	(0.00)
Log TFP (lagged)	0.020	-0.002
	(0.02)	(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)
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)
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 16: Product exiting from export markets - Investment matters

	(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 17: Explaining horizontal diversification - new vs expanding exporters baseline model

	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. (lagged)	0.025***	0.002	-0.003	0.001
	(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 18: Explaining horizontal diversification

	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 17 for notes
All specifications include the same regressors as table 17.

D Appendix: Other regressions - Robustness checks

Table 19: Upgrading before starting to export - LHS in level

	(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 20: Upgrading before starting to export - LHS in level

	(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 21: Upgrading before starting to export - LHS in first difference

	(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.

Table 22: Upgrading before starting to export - LHS in level

	(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.

E Appendix: Controlling for Plant Fixed Effect

We rewrite our model as including a dummy "Improvement Before Export" which takes on the value of one in the year before the product starts being exported and continues to be equal to one in subsequent years. The dummy is equal to zero two years prior to exporting as well as in the earlier periods. One can think of this dummy as intended to capture a permanent shock to the unit value that takes place one year prior to exporting (and stays on for thereafter).

$$\text{Improvement Before Export}_{pit} = \begin{cases} 1 & \text{if product p will be exported in } t+1 \text{ or entered export markets at } t \text{ or earlier} \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

Our new model also includes a dummy for product p being exported by producer i at time t and plant-product fixed effect μ_{pi} (see equation 3 below) as well as product-year fixed effect (α_{pt}). Next we subtract from equation 3 its lagged version (i.e., equation 4. This allows us to eliminate the plant-product fixed effect, obtaining equation 5. Note that the first difference in "Improvement Before Export" is nothing more than our dummy "1 Year Before Export" used in table 12. Thus, equation 5 demonstrates how the results from table 12 can be interpreted as differencing out plant fixed effects.

$$\begin{aligned} \text{Log(Domestic unit value)}_{pit} &= \beta_1 \text{Improvement Before Export}_{pit} + \beta_2 \text{Improved While Exported}_{pit} \\ &\quad + \alpha_{pt} + \mu_{pi} + \epsilon_{pit} \end{aligned} \tag{3}$$

$$\begin{aligned} \text{Log(Domestic unit value)}_{pit-1} &= \beta_1 \text{Improvement Before Export}_{pit-1} + \beta_2 \text{Improved While Exported}_{pit} \\ &\quad + \alpha_{pt-1} + \mu_{pi} + \epsilon_{pit-1} \end{aligned} \tag{4}$$

$$\begin{aligned} \Delta\text{Log(Domestic unit value)}_{pit} &= \beta_1 \left(\text{Improvement Before Export}_{pit} - \text{Improvement Before Export}_{pit-1}\right) + \\ &\quad + \beta_2 \left(\text{Improved While Exported}_{pit} - \text{Improved While Exported}_{pit-1}\right) \\ &\quad + \alpha_{pt} - \alpha_{pt-1} + \epsilon_{pit} - \epsilon_{pit-1} \end{aligned} \tag{5}$$

$$\Delta\text{Log(Domestic unit value)}_{pit} = \delta_1 (1 YearBeforeExport)_{pit} + \delta_2 Exported_{pit} + \tilde{\alpha}_p t + \tilde{e}_{pit} \tag{6}$$

To illustrate this point in a simple way, table 23 gives a numerical example of plant i that begins exporting product i in 1997.

year	exported product	improvement before export$_t$	improvement before export$_{t-1}$	Δimprovement before export$_t$
1994	0	0		
1995	0	0	0	
1996	0	1	0	1
1997	1	1	1	0
1998	1	1	1	0
1999	1	1	1	0
2000	1	1	1	0

Table 23: Example