DISCUSSION PAPER SERIES

No. 8926

GETTING READY: PREPARATION FOR EXPORTING

Leonardo Iacovone and Beata Javorcik

INTERNATIONAL TRADE AND REGIONAL ECONOMICS

Centre for Economic Policy Research

www.cepr.org

Available online at: **www.cepr.org/pubs/dps/DP8926.asp**

ISSN 0265-8003

GETTING READY: PREPARATION FOR EXPORTING

Leonardo Iacovone, World Bank
Beata Javorcik, Oxford University and CEPR

Discussion Paper No. 8926
April 2012

Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820
Email: cepr@cepr.org, Website: www.cepr.org

CEPR Discussion Paper No. 8926

April 2012

ABSTRACT

Getting Ready: Preparation for Exporting*

This study examines developments at the plant-product level preceding an expansion into foreign markets. It relies on very detailed Mexican data for 1994-2004, a period of liberalization in US trade policy vis a vis Mexico, mandated by the North American Free Trade Agreement. Our approach is novel in that we focus on quality, proxied by domestic price premium, of current and future export products. Our findings are consistent with quality upgrading taking place in preparation for entry into export markets. We show that manufacturers who export a particular product variety tend to obtain a price premium for their domestic sales of this variety. Consistently with the hypothesis of quality upgrading before exporting, we find evidence that this premium emerges exactly one year before a variety starts being exported. We find no evidence of upgrading after entering export markets. Our IV estimates suggest that the changes in the price premium are driven by the anticipated cuts in US tariffs and are particularly pronounced among producers exhibiting better performance in the initial period.

JEL Classification: F10 and F15
Keywords: exporting, Mexico, NAFTA, plant-product level data and quality

Leonardo Iacovone
World Bank
1818 H Street, NW
Washington DC, 20433
USA

Email:
l.iacovone@gmail.com

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=173031

Beata Javorcik
Department of Economics
University of Oxford
Manor Road Building
Oxford OX1 3UQ
UK

Email:
beata.javorcik@economics.ox.ac.uk

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=145554

* This paper was previously circulated under the title Shipping The Good Tequila Out: Investment, Domestic Unit Values and Entry of Multi-Product Plants into Export Markets. The authors are grateful to Gerardo Leyva and Abigail Durán for granting us access to INEGI data at the offices of INEGI in Aguascalientes subject to complying with the confidentiality requirements set by the Mexican Law. Special thanks go to all INEGI employees who provided assistance and answered our questions, in particular to Gabriel Romero, Alejandro Cano, Araceli Martinez, Armando Arellanes, Ramon Sanchez, Otoniel Soto, Candido Aguilar, Adriana Ramirez. We also thank David Atkin, Andy Bernard, Oscar Calvo-Gonzalez, Tommaso Ciarli, Judy Dean, Rafael De Hoyos, Emily Farchy, Caroline Freund, Michael Gasiorek, Brad Jensen, Maurice Kugler, Yue Li, Andy McKay, Henry Overman, Nina Pavcnik, Saso Polanec, Ferdinand Rauch, Jagadeesh Sidivasan, Ginger Turner, Jim Tybout, Eric Verhoogen, Deborah Winkler, Alan Winters, Veronika Zavacka and seminar participants at the NBER ITI Summer Institute, CEPR ERWIT, AEA Annual Meetings in San Francisco, LACEA Regional Integration Network conference in Puerto Rico, Empirical Investigations in International Economics conference in Ljubljana, Yale University, University of Michigan, Georgetown University, World Bank, IMF, US International Trade Commission, London School of Economics, Oxford, University of Sussex, University of Nottingham, University of Melbourne, Katholieke Universiteit Leuven, Banco de Mexico, Colegio de Mexico and Universidad Anhauac for their useful comments and Ernesto Lopez-Cordoba and John Romalis for sharing with us tariff data. Leonardo Iacovone acknowledges financial support from the ESRC and LENTISCO. The findings, interpretations and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the view of the World Bank, its Executive Directors or the countries they represent.

Submitted 24 March 2012

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. Product quality has also been linked to growth by Hausmann, Hwang, and Rodrik (2007) who argue that countries promoting exports of more "sophisticated" goods tend to grow faster.[1] The interest in product quality has also spilled over to the policy world. Increasing product quality has become an important item on the agenda of policy makers in developing countries keen on expanding exports, moving the labor force to higher value-added activities and achieving faster economic growth.

The economic theory gives several reasons why higher quality products are more likely to be successful in export markets. The first line of argument goes back to the Alchian and Allen's (1964) "shipping the good apples out" hypothesis. The 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 a 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). Another strand of the literature emphasizes that access to a new market makes investments in improving the production process or the product quality worthwhile (Bustos 2011, Lileeva and Trefler 2010) and predicts that such upgrading in the exporting country will happen prior to exports actually taking place (Constantini and Melitz 2007). 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.

Yet there is no *direct* evidence on quality upgrading and exporting at the plant-product level, as previous data limitations have prevented researchers from examining this issue. The existing literature presents evidence of firms changing their production process and/or the input mix during the period of bilateral or multilateral trade liberalization, without explicitly examining product quality or focusing on the timing of these developments. Alvarez and

[1] In an influential paper, Flam and Helpman (1987) explicitly incorporate the quality dimension in a model of North-South trade and suggest a mechanism through which quality upgrading occurs in the South. In their model, the North exports high-quality and the South exports low-quality products. Technical progress in the South leads the North to introduce new high-quality products and the South to abandon low-quality products. Production of northern low-quality products is shifted to the South allowing southern producers to move up the quality ladder.

Lòpez (2005) show that future exporters tend to have higher investment outlays. Verhoogen (2008) finds that after the peso devaluation more productive Mexican plants increased their export share of sales, white-collar wages, blue-collar wages, the relative wage of white-collar workers, and ISO 9000 certifications more than less-productive plants. Bustos (2011) documents a link between a fall in Brazilian MERCOSUR tariffs and increases in entry into export markets and technology spending by Argentinian firms. Lileeva and Trefler (2010) find that the fall in Canadian tariffs against the US resulting from the Canada-US FTA increased plant labor productivity and induced plants to engage in innovation. Using linked employer-employee data from Brazil, Molina and Muendler (2009) show that anticipated export status, predicted with destination-country trade instruments, led firms to hire workers from other exporters. None of these studies, with the exception of Alvarez and Lòpez (2005), examines the exact timing of the changes taking place.

To the best of our knowledge, our paper is the first study providing *direct* evidence evidence on quality upgrading taking place in *anticipation* of entry into export markets. In contrast to the existing literature, which relies on data on productivity, technology or skills, we use information on unit values at the producer-product level.[2] We analyze developments at the plant-product level before and after entry into export markets during a period of an export boom. This allows us to search for evidence of preparation for exporting and revisit the debate on whether exporters are born or made through the lens of product quality.

Our plant-product level data set from Mexico is unique in that it includes information on domestically sold and exported products listed in the same classification.[3] The data set includes information on 3,186 unique products manufactured by 6,291 plants during the 1994-2004 period, which gives us between 12,887 and 19,154 plant-product observations a year. Focusing on the period of the Mexican export boom stimulated by the North American Free Trade Agreement (NAFTA), which came into effect on January 1, 1994, and the peso devaluation, which took place in December 1994, provides an excellent setting for our exercise. We are able to observe many instances of manufacturers introducing into export markets product varieties 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 variety being introduced into export markets. If product upgrading is indeed a real phenomenon, this is a setting where it should manifest itself.

In our analysis, we proxy for quality using the domestic price premium defined as the difference between the log unit value (i.e., value of domestic sales divided by the quantity

[2]While we recognize that unit values are an imperfect proxy for quality, they have been widely used in the international trade literature. See for instance Schott (2004) and Hallak (2006).

[3]The existing studies typically rely on customs transaction level data to capture exports and national surveys to capture the production side. The two sources use different product classifications which can be matched only in an imperfect way.

sold) obtained by product p sold in Mexico by producer i at time t and the average unit value obtained by all producers selling product p in Mexico at time t. We focus on the following questions: Do exported product varieties sell at a premium at home relative to goods sold solely on the domestic market? If so, when does this premium appear? Does it increase after entry into epoxrt markets? And most importantly, is there evidence of product upgrading taking place in anticipation of exporting?

A crucial benefit of focusing on the period following NAFTA coming into effect is that we are able to use the anticipated changes in US tariffs on imports from Mexico, mandated by NAFTA, to instrument for the decision of Mexican producers to begin exporting a particular product. In this way, we identify product upgrading taking place in response to the anticipated improvement in market access. As Mexico was the weakest player at the NAFTA negotiation table (Kowalczyk and Davis 1996), the timing of tariff cuts can be plausibly treated as exogenous.[4] In our IV strategy, we also utilize information on producers' market share in a particular product in the initial year of the sample. This allows us to incorporate the theoretical prediction that no all producers will respond to the emergence of new export opportunities. Finally, we supplement the instrument set with information on industry advertising intensity which captures the difficulty of breaking into the mature market, such as the US.

Our findings are consistent with quality upgrading taking place in preparation for entering export markets, as predicted by Constantini and Melitz (2007). To make this argument we proceed in two steps. First, we show that manufacturers who export a particular product variety tend to obtain a price premium for their domestic sales of this variety. Consistently with the hypothesis of quality upgrading, we show that the manufacturers that will export a particular variety in the future experience an increase in the price premium obtained for this variety one year before exporting starts. Interestingly, two and three years before exporting takes place, their variety carries no price premium, i.e., it is indistinguishable in terms of its unit value from varieties sold by other producers. We find no evidence of upgrading after entering export markets. Second, our IV estimates suggest that the changes in price premium are driven by the anticipated cuts in US tariffs and are particularly pronounced among producers with larger domestic market shares in the initial period. Our results are robust to controling for plant-product fixed effects as well as current changes in the US and Mexican trade policy.

Our study contributes to the debate on the role of nature versus nurture in exporting. A rapidly growing literature started by Clerides, Lach, and Tybout (1998) and Bernard and Jensen (1999) documents the superior performance of exporters in terms of productivity,

[4]Our empirical strategy was inspired by the work of Lileeva and Trefler (2010) who use plant-specific cuts in the US tariffs mandated by the Canada-US Free Trade Agreement as an instrument for the decision of Canadian plants to start exporting.

sales, skill 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.[5] Our results are more nuanced. While they indicate that products with most desirable attributes (as reflected by their price premia) are exported, the patterns found in the data are suggestive of producers changing the product attributes before beginning to export.

Our research also contributes to the emerging empirical literature showing that firms respond to changing market conditions, including trade barriers, by changing their product mix (see Baldwin and Gu 2009, Bernard, Redding, and Schott 2009, Goldberg, Khandelwal, Pavcnik, and Topalova 2009 and Iacovone and Javorcik 2010).[6] This literature takes the characteristics of varieties produced by a specific firm as given (i.e., determined by a productivity draw or a firm-specific competency). In contrast, our results indicate that product quality is not predetermined and endogenously responds to market conditions.

Finally, our paper adds to the literature which, in the spirit of the Alchian-Allen's hypothesis, focuses on the effects of trade costs on the quality of exports (Hummels and Skiba 2004, Baldwin and Harrigan 2007, Crozet, Head, and Mayer 2009). Although the existing studies have been able to establish a relationship between trade costs and unit values of exports at the national level, they have been unable to explicitly examine whether the products destined for exports exhibit higher unit values than their counterparts sold at home. To the best of our knowledge, our study is the first one to do so. Our results provide evidence that exported varieties exhibit higher unit values, relative to their domestic counterparts, even within very narrowly defined categories. Moreover, we present evidence of dynamic effects suggesting that producers upgrade the quality of their products in anticipation of future exporting.[7]

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 used. Section 4 discusses our methodology and findings. The last Section presents concluding remarks.

---

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

[6] In Iacovone and Javorcik (2010), we present a series of observations on product-level dynamics taking place within firms in during Mexican trade integration under NAFTA. Our data show intense product churning within firms and confirm the existence of within-firm product heterogeneity. They also indicate that new Mexican exporters enter foreign markets with a small number of varieties, most of which were previously sold at home, and with a small export small volume. The data also suggest that export discoveries are relatively rare and are imitated within a short period of time.

[7] Kugler and Verhoogen (2012) and Hallak and Sivadasan (2010) find that exporters charge on average higher output prices. Neither study is able to identify which products sold by exporters are actually sold abroad.

2 Related theoretical literature

Our analysis is motivated by the recent advances in the theoretical literature modeling firm-level responses to globalization. This literature originated with the contribution of Melitz (2003) who models firms as heterogeneous in terms of their marginal costs. As a fixed cost is required to access export markets, only more productive firms find it profitable to export. While his model does not explicitly deal with quality, high productivity firms can be viewed as firms producing higher quality varieties at equal cost. Baldwin and Harrigan (2007) extend the work by Melitz (2003) to explicitly 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. Hallak and Sivadasan (2010) develop a model of international trade with two sources of firm heterogeneity: productivity and "caliber", the latter being the ability to produce quality using fewer fixed inputs. Although there is no quality restriction to sell domestically, exporting requires attaining minimum quality levels. Their model explains the empirical fact that firm size is not monotonically related to export status, and predicts that, conditional on size, exporters sell products of higher quality and at higher prices and use capital more intensively.

The theoretical predictions most closely related to our work come from the literature modelling endogenous adjustment to the production process (which can be interpreted as adjustment to product quality) taking place in response to a decline in the cost of exporting. In the theoretical framework developed by Verhoogen (2008), plants are heterogeneous in productivity and there is a fixed cost of 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 across countries, and hence in willingness to pay for product quality. Thus an exporting plant in a Southern country 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. 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. 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), Bustos (2011) and Lileeva and Trefler (2010). 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 (2011) expands Melitz's (2003) model by allowing firms to pay an extra fixed cost to introduce a new technology that reduces their marginal cost. More productive firms earn higher revenues and are the only ones that find paying the fixed costs of exporting profitable. In addition, only the most productive firms adopt the most advanced technology. This is because the benefit of adoption is proportional to revenues, while its cost is fixed. In these models, a decline in the cost of exporting (e.g., signing a regional trade agreement) induces firms to invest in order to take advantage of export opportunities. The model presented in Lileeva and Trefler (2010) predicts that for lower-productivity firms, incurring the fixed costs of investments into improving the production process is justifiable only if accompanied by the larger sales volumes that come with exporting. Thus lower foreign tariffs will induce these firms to simultaneously export and invest. In contrast, lower foreign tariffs will induce higher-productivity firms to export without investing.

Our empirical analysis focuses on two predictions emerging from the theoretical literature. First, we examine whether exported product varieties have higher unit values than varieties sold only on the Mexican market. Second, we search for evidence of product upgrading taking place in anticipation of exporting stimulated by trade liberalization under NAFTA. 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. This is exactly the setting considered in Constantini and Melitz's (2007) framework. Higher requirements of American consumers together with the improved access to the large US market would have investment in product quality worthwhile for Mexican producers.

3 Data

In our analysis, we use Mexican data from the Monthly Industrial Survey (EIM) for the period 1994-2004 collected by the *Instituto Nacional de Estadistica y Geografia* (INEGI). The data set includes information on the values and quantities of monthly production, sales and exports. As we are not interested in short-run fluctuations, we aggregate the data into annual figures. The data source does not include *maquiladoras* and covers about 85 percent of Mexican industrial output outside of the *maquiladora* sector.[8]

Particularly valuable for our purposes is the fact that the EIM collects information at the establishment-product level. For each 6-digit code (*clase*) in the Mexican Industrial Classifi-

[8]For additional information about the EIM refer to the Data appendix and Verhoogen (2008).

cation System (CMAP), the EIM survey form includes a list of possible products, developed in 1993 and unchanged throughout the period under observation. The list includes 4,085 products of which 3,183 are actually produced during the period under study. For instance, the clase Uniforms (identified by the CMAP code 322006) lists 18 products: sports uniforms, school uniforms, military uniforms, uniforms for doctors and nurses, uniforms for members of other organizations, generic uniforms for workers, safety uniforms for workers, other uniforms, laboratory coats, camisoles and shirts, headgear, uniforms for chefs, aprons, jackets, other work clothing, other sports clothing, other products not elsewhere classified, other subproducts not elsewhere classified. The clase of small electrical appliances (CMAP code 383304) contains 29 products, including vacuum cleaners, coffee makers, toasters, toaster ovens, 110 volt heaters and 220 volt heaters (within each group of heaters the classification distinguishes between heaters of different sizes: less than 25 liters, 25-60 liters, 60-120 liters, more than 120 liters). These examples illustrate the narrowness of product definitions and the richness of micro-level information available in our data set.

After data cleaning, our sample includes between 6,291 and 4,424 plants in 1994 and 2004, respectively. The decrease in the number of plants is due to plant exit from the market.[9] Our sample includes 19,154 plant-product observations in 1994. This number decreases to 12,887 by 2004. A quarter of producers are exporters in 1993. During the time period considered, the number of exported varieties increases from 2,844 to 3,118 in the last year of the sample, reaching a peak of 4,193 varieties in 1998 (see Table 1). The tripling of Mexican exports during the period under study (as compared to a 75% increase in the total world exports between 1993 and 2002), and the availability of detailed micro-level data, make the Mexican case an extremely interesting one to study.

We also use information on US MFN and NAFTA tariffs.[10] Tariff data, available originally in the 8-digit HS classification, are matched with the Mexican product-level classification, using the concordance specifically developed for this study. This allows us to construct time-varying data on the tariffs faced by each product produced by a given establishment, which is particularly valuable in the context of our study. We use this information to construct our instrumental variables.[11]

Additionally, we utilize information on Mexican tariffs imposed on imports from NAFTA

[9]INEGI does not attempt to replace plants exiting from the sample in a systematic manner. In Table 6 we will demonstrate that taking into account plant exit or plants dropping products from their portfolio does not affect our estimation results.

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

[11]Note that the US tariff data include information on both ad valorem and specific tariffs. Specific tariffs were converted into their ad valorem equivalents by John Romalis and added to the ad valorem rates. In some cases, this adjustment produced a figure suggesting that combined tariffs were increasing (rather than decreasing) under NAFTA. Dropping these figures (pertaining to about 1% of the sample) from the analysis would not change the conclusions of this study.

countries (obtained from Secretaría de Economía). The Mexican tariff data are more aggregated and are available at the 6-digit industry (clase) level.

4 Empirical analysis

Our empirical analysis proceeds in two steps. First, we evaluate whether manufacturers who export a particular product variety tend to obtain a price premium for their domestic sales of this variety and whether this price premium is visible prior to the variety being exported. We also ask if the premium increases after the variety's entry into export markets. In the second step, we investigate the causal link between the changes in the price premium and the entry into export markets. To identify this causal effect, we instrument for future entry into exporting with the anticipated changes in US tariffs under NAFTA. We use product-specific tariffs and interact them with the market share enjoyed by each producer in the domestic market for a particular product in the initial year of the sample. The use of the market share is justified by the theoretical predictions suggesting that high productivity producers (who are also the ones with large market shares) are more likely to respond to the anticipated improvement in market access.

Before we discuss our empirical exercise, we motivate the analysis with some anecdotal evidence.

4.1 Anecdotal evidence and evidence from other data sources

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 US) than in Mexico.

The second dimension of quality is the product's appeal to the tastes of foreign consumers. Consumers in the US (the major export market for this producer) demand higher-quality products than the average Mexican buyer. For instance, they prefer juices closer in taste to fresh juices than products from concentrates. The company recently 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 the 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.

Generalizing this anecdotal evidence to other sectors has the following implication for our study. 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 variety to a high unit value variety. Alternatively, 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 prior to the juice being exported.

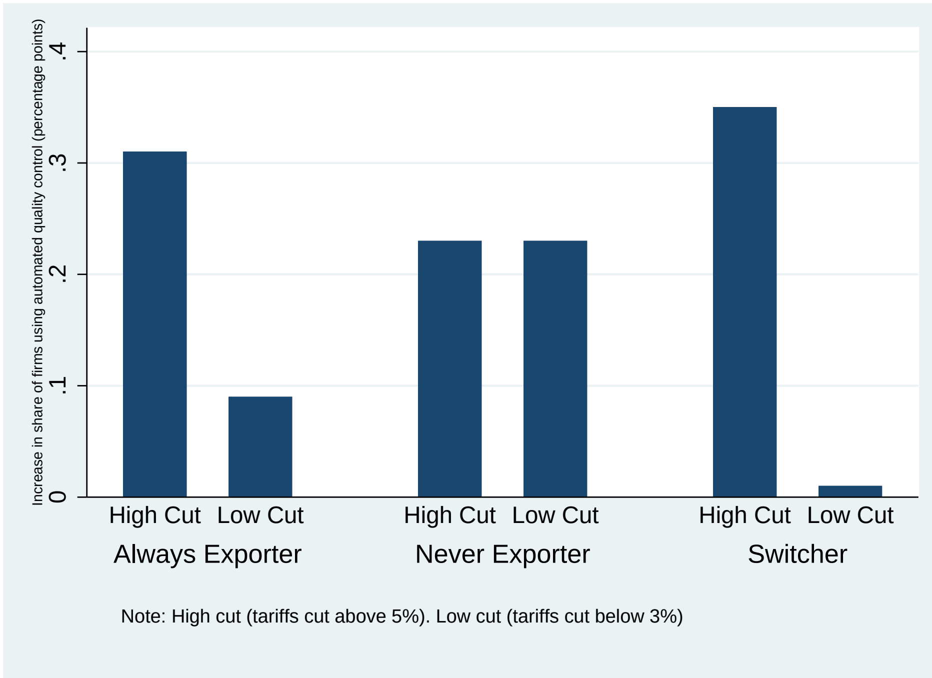
Another piece of evidence supporting our story of quality upgrading comes from the Survey on Employment, Science, Technology and Training (ENESTyC) conducted in 1992 and 2001 which reports information on whether or not an establishment uses an automated quality control system. As illustrated in Figure 1, we find that new and established exporters were more likely to introduce an automated quality control process in sectors experiencing a large improvement in market access under NAFTA than in sectors where little improvement was seen. Among producers focused solely on the Mexican market, no such difference was registered between the two types of sectors. Among established exporters, the share of those with automated quality control increased from 63% to 95% in industries with a tariff cut above 5% and from 73% to 81% in industries with a tariff cut below 3%. For new exporters, the corresponding increase was from 56% to 90% in industries with a high tariff cut and from 75.5% to 76% in industries with a low tariff cut.[12]

Why would product upgrading take place one year prior to exporting? Most likely, Mexican producers learn from potential US buyers that there is interest in their product, provided their meet some quality requirements.[13] To meet the buyer's expectations, Mexican producers upgrade the quality of their product by changing product specifications, packaging,

[12]These results are based on a panel of 1093 firms surveyed in both years. The initial number of companies with automated quality control systems in sectors with little improvement in market access under NAFTA is respectively 72 of 117 firms among never exporters, 40 of 55 among always exporters and 37 of 49 among switchers into export markets. The initial number of companies with automated quality control systems in sectors with substantial improvement in market access under NAFTA is respectively 103 of 159 among never exporters, 54 of 85 among always exporters and 53 of 95 among switchers into export markets.

[13]Products manufactured in developing countries often lack the quality suitable for developed country markets. For instance, in the World Bank Technical Barriers to Trade Survey, conducted in 2001, among 619 firms in 25 agricultural and manufacturing industries in 17 developing countries (Argentina, Bulgaria, Chile, Czech Republic, Honduras, India, Iran, Jordan, Kenya, Mozambique, Nigeria, Pakistan, Panama, Poland, Senegal, South Africa and Uganda) 58 percent of respondents reported that quality/performance standards impacted their ability to export (Chen, Wilson, and Otsuki 2008).

Figure 1: Improved access to the US market under NAFTA and the introduction of automated quality control systems

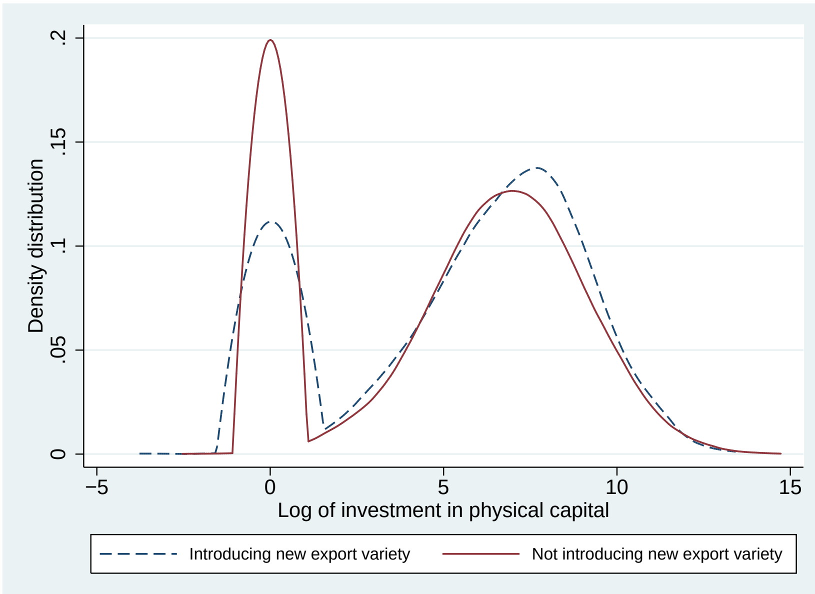


quality control systems, etc. To do so, they may have to invest in additional physical assets. This investment is worthwhile as its cost can be spread over the large export market. This view is consistent with the evidence on producers' investment behavior presented in Figures 2 and 3.

The first figure plots 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. As visible from the figure, the former group is more likely to have a positive 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) and the summary statistics in Table 3 in the Appendix. 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). 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 3).

After the quality upgrading takes place, Mexican producers present the new version of the product to potential buyers. As it takes time to finalize a deal (further improvements may be needed, price negotiations may be lengthy, larger volume may be needed), producers start selling the product in Mexico. The described scenario is consistent the observation that product upgrading would take place about a year prior to the variety being introduced in export markets.

Figure 2: Exporters invest prior to adding a new export product



4.2 Baseline specification

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 quality premium fetched by the product.[14] The premium, defined in equation 1, for a product variety p produced by plant i at time t is equal to the unit value of this variety divided by the average unit value of all varieties of product p produced in Mexico at time t by all producers. The unit value UV_{pit} is obtained by dividing the value of domestic sales of product p by producer i at time t by the quantity sold.[15]

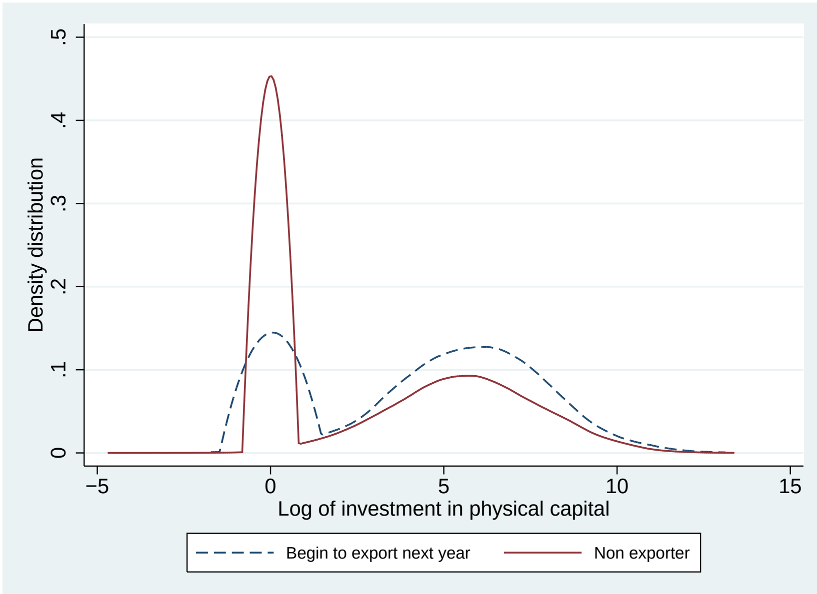
$$Price\ premium_{pit} = \frac{UV_{pit}}{\frac{1}{N}\sum_{i=1}^{N} UV_{pit}} \tag{1}$$

While unit values are often used as a measure of quality (see for instance Schott 2004 and 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.). Therefore, an increase in

[14]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. However, as documented by Iacovone and Javorcik (2010) using the same data, about 80% of new export products were sold in Mexico prior to being exported.

[15]An alternative definition of the price premium would involve using the weighted average of unit values of all varieties of product p produced in Mexico at time t by all producers. As we will show in a robustness check, our results are not altered by using this alternative definition.

Figure 3: Future exporters invest more



the domestic unit value of a given product in our data is consistent with a combination of (i) upgrading of the product quality, (ii) other changes in product characteristics that make the product more desirable, (iii) a compositional change within the product category towards higher quality or more desirable products.[16]

To examine differences between products destined for the foreign versus the domestic market and to search for evidence of changes in product attributes prior to exporting, we estimate a model where the dependent variable is the logarithm of the price premium of product p sold in Mexico by producer i at time t:

$$\begin{aligned} log\,(Price\ premium_{pit}) \quad &= \quad \beta_1\ 1\ yr\ before\ exporting_{pit} + \beta_2\ 2\ yrs\ before\ exporting_{pit} + \\ & \quad\quad \beta_3\ Exported_{pit} + \alpha_t\ (+\alpha_{pi}) + \mu_{pit} \end{aligned} \tag{2}$$

To compare the premium of product varieties that are or will be exported by their manufacturers to the premium of varieties of the same product sold by manufacturers that do not export, the model includes three indicator variables. The first one ($Exported_{pit}$) takes on the value of one if producer i exports product p at time t, and zero otherwise. The other two, $1\ yr\ before\ exporting_{pit}$ and $2\ yrs\ before\ exporting_{pit}$, take on the value of one if producer i will start exporting product p at time $t+1$ or $t+2$, respectively, and zero otherwise.[17] Note

[16]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.

[17]For instance, if producer i starts exporting widgets in 2000, the dummy $1\ yr\ before\ exporting_{pit}$ will be equal to 1 in 1999 while the dummy $2\ yrs\ before\ exporting_{pit}$ will be equal to 1 in 1998. Both dummies will be equal to 0 in all other years.

that because we are focusing on the price premium, instead of the absolute unit value, we do not need to control for year-specific shocks that affect the price of product p. Thus the estimated coefficients will indicate how the prices of current and future export varieties differ from the average price of other varieties of the same product category sold in Mexico in the same year.

We will first estimate the above specification controlling for year fixed effects (α_t), and then we will add plant-product fixed effects (α_{pi}) to the model. The latter addition means that we will be estimating the coefficients based on the time variation in the price premium specific to a given product produced by a given plant. To take into account potential correlation between standard errors, we will clustering of standard errors on plant-product combinations when plant-product fixed effects are not included.[18][19]

Our baseline results, presented in the first column of Table 4, indicate that exported product varieties fetch a price premium of about 7 percent. In other words, the unit value of exported varieties is on average 7 percent higher than the unit values of the varieties of the same product sold by manufactures that do not export the product. This is consistent with the theoretical prediction that product varieties sold on export markets are on average of higher quality than product varieties sold exclusively at home. The estimated coefficient is stastically significant at the 1 percent level. What is even more interesting is that a statistically signifcant price premium of about 6 percent is observed already one year prior to the product variety entering the export markets.

A careful look at the timing of the changes, suggest that the premium emerges exactly one year before entering export markets. There is no evidence of a price premium being present two years prior to exporting. The tests shown in the lower panel of Table 4 reject the hypothesis of the premium being the same one and two years before exporting. At the same time, the tests cannot reject the hypothesis that the premium enjoyed by product varieties that will enter the export markets in the following year is significantly different from the premium on product varieties that are already exported.

Extending the analysis to three years before the variety's introduction into export markets (see column 2 of Table 4) confirms that the changes in the price premium take place only one year prior to exporting. In fact, neither the coefficient on 2 $yrs\ before\ exporting_{pit}$ nor the

[18]The magnitudes and significance levels of the estimated coefficients are exactly the same if we do not cluster standard errors, or if we cluster them on products. Therefore, we will not use clustering in subsequent tables.

[19]Note that in the earlier version of this study, we focused on the logged unit value (rather than the price premium) as the dependent variable and additionally included product-year fixed effects on the right hand side. The resuls were quite similar to those obtained here. We focus on the price premium in the current version because it allows us to include plant-product fixed effect. Doing so was not computationally feasible in the previous approach.

coefficient on 3 $yrs\ before\ exporting_{pit}$ is statistically significant. As before, the tests in the lower panel confirm that these coefficients are significantly different from the coefficient on 1 $yr\ before\ exporting_{pit}$. This is an important point because it excludes the possibility that the products manufactured by future exporters exhibit some intrinsic initial differences. As before, the tests indicate that there is no increase in the premium after the entry into export markets.

Nevertheless, we may be concerned that our results are driven by some unobservable plant-product characteristics. To address this possibility, we augment the model by adding plant-product fixed effects. This means that the coefficients are identified based on the variation observed over time *within* each plant-product combination. The results, shown in columns 3 and 4, confirm that future export varieties exhibit a statistically significant premium on the domestic market exactly one year before penetrating export markets. The inclusion of the plant-product fixed effects reduces the size of this premium. Varieties that are exported fetch a price premium equal to 3.1 percent, while varieties that will start being exported in the following year fetch a premium equal to 2.9 precent. As before, we find that the difference between the two coefficients is not statistically significant. The premium obtained by varieties that will enter export markets in two or three years is either not significantly different from zero or negative (respectively), but it is significantly different from the premium on varieties entering export markets the following year. In other words, we confirm our earlier observation that the price premium arises exactly one year before a variety enters export markets and not earlier. Further, we also confirm that there is no increase in the price premium after entry into foreign markets.

In the above regressions, we pooled together varieties sold domestically, with varieties entering export markets for the first time, and varieties that were exported throughout the period.[20] In a robustness check, we exclude from the sample varieties that were exported throughout the period, and we estimate the specification with plant-product fixed effects. The results, presented in columns 5 and 6, show that this change has little effect on the estimated coefficients and does not change our conclusions on the price premium emerging exactly one year prior to the variety entering the foreign markets.

In the regressions presented so far, the premium for product p manufactured by the plant i at time t was calculated by dividing its unit value by the average unit value of all varieties of product p sold in Mexico by all producers at time t. The disadvantage of using a simple average for the normalization is that it assigns equal weight to varieties of the same product sold in very large and very small quantities. Therefore, as a robustness check we re-calculate the price premium using a weighted average, instead of a simple average, in the denominator of equation 1. We use the domestic market share of product p sold by producer i at time t to

[20] Note that all of the varieties considered were sold in Mexico because our dependent variable is the price premium on the domestic market.

weight each component of the average. The results, shown in column 7 and 8, confirm that our findings are robust to this alternative calculation of the price premium.

One may be concerned that our results are affected by exit of some product varieties from the sample, either due to a plant dropping a particular product variety or due to plant exit. To address this issue, in Table 5 we augment our specification with an indicator variable taking on the value of 1 if producer i will discontinue domestic sales of product p at time $t+1$. In columns 1 and 4 of the table, the indicator variable captures product dropping by producers that will remain in operation at $t+1$. In columns 2 and 5, the indicator variable captures product dropping by continuing producers as well as products disappearing from the sample due to the exit of their producer next period. Regardless of which definition of the indicator variable we use, we find that product varieties selling at a discount are more likely to exit next period. This could be potentially be due to unsuccessful products being sold at a salvage price before their exports are discontinued. More importantly for the purposes of this study, our results on the increase in the price premium prior to entry into exporting remain robust. The finding that exiting products sell at a discount gives us confidence that our results on the increase in price premium prior to exporting are not driven by the decline in the average price of the product (i.e., the denominator of the price premium). If anything, the result that exiting varieties tend to fetch lower prices than surviving ones works against finding support for our hypothesis. Exit of low price varieties mechanically increases the denominator in equation 1 and thus reduces the price premium.

To check whether the price premium is not driven by a temporary drop in the volume of sales in the domestic market, in columns 3 and 6 we present results controling for the producer's i market share in product p at time t. Doing so does not affect our conclusions with respect to the price premium of current and future export products.

In a final robustness check (not reported to save space), we take on the concern that our results could potentially reflect an increase in the producer's market power. To address this possibility we re-estimate the model with plant-product fixed effects but change the dependent variable to the market share of producer i in product p at time t. A decline in the market share that coincides with the future entry into exporting would be indicative of our results capturing an increase in market power rather than quality upgrading. We find no evidence of a decline in the market share one year prior to entry into export markets or after exporting starts. If anything, the data indicate a slight increase (of about 0.5 percentage point) in the market share one year before exporting. We reach the same conclusions when we change the dependent variable to the number of units sold (expressed in the log form). Thus we conclude that our results cannot be attributed to the change in the producer's market power.

Having analyzed the evolution of the price premium *before* a product variety enters export markets, we next examine what happens to the premium *after* the entry. With this objective in mind, Table 6 focuses on the trajectories of the price premium allowing for differential effects one year before entering export markets, in the first year of exporting, and in the second or later year of exporting (columns 1 and 3). In columns 2 and 4, we additionally allow for different effects in the second year of exporting and in the third or later year of exporting. The estimation sample excludes product varieties exported throughout the period covered by our data. The results show that after entering export markets the products keep fetching a premium that is very similar to the one obtained one year before being sold abroad. More formally, the tests in the lower panel of Table 6 confirm that there is no statistically significant difference between the premium fetched one year before exporting and that in the first, second or third (or later) year after entering export markets. In other words, while we find evidence of upgrading before entering foreign markets, we do not find evidence of upgrading after a product has penetrated export markets.[21]

To summarize, the results presented so far lead to two conclusions. First, in line with the hypothesis that exported product varieties are of higher quality than those consumed only domestically, we find that exported varieties exhibit a domestic price premium of between 3 and 7 percent depending on the empirical specification. Second, our results are consistent with the hypothesis of intentional product upgrading taking place in preparation for entry into export markets taking place about one year prior to exporting (though so far cannot give a causal interpretation to the second conclusion).

4.3 Instrumental variable approach

The objective of our study is to search for evidence of product upgrading taking place in preparation for exporting. The key challenge we are facing is establishing the direction of causality. The results presented so far suggest that future export products tend to be of higher quality. However, these results do not tell us whether quality upgrading takes place in preparation for exporting or whether products whose quality had improved for some other reason just happened to enter export markets in the subsequent period. To pin down the causal relationship between trade liberalization under NAFTA and product upgrading, we adopt an instrumental variable approach.

To instrument for the decision to introduce a product into export markets, we rely on the anticipated changes in the US tariff mandated by NAFTA. NAFTA, a trilateral treaty between Canada, Mexico and the US, was enacted on the 1st of January 1994. The agreement was signed on the 8th of December 1993 after a very close vote of the US Congress (with 234 votes in favor and 200 opposed). The negotiations were very quick, as they formally started in April 1991 and were completed by August 1992.[22]

[21] The observed patterns are consistent with the conclusions of studies failing to find evidence of learning from exporting (Clerides, Lach, and Tybout 1998, Bernard and Jensen 1999).

[22] An agreement in principle was signed by the three heads of state and negotiations continued only on labor and environmental issues, which took longer and were concluded by September 1993.

Import products were classified into five groups which were subject to specific liberalization schedules: (1) category A: duty free trade from 1994, (2) category B: tariffs to be reduced over five years and duty free trade from 1998, (3) category C: tariffs to be reduced over ten years and duty free trade from 2004, (4) category C+: tariffs to be reduced over fifteen years and duty free from 2008, (5) category D to be maintained duty free. The majority of tariffs were to be eliminated within ten years, and most tariffs fell within categories specifying equal-sized annual reductions over either five, seven or ten years (Kowalczyk and Davis 1996).

The fact that the negotiations were completed quickly and the existence of uncertainty surrounding the approval of NAFTA by the US Congress is very convenient for our study. It means that Mexican producers were unlikely to react to improvements in their access to the US market before 1994, which is the first year for which unit value data are available in our sample. The fact that Mexico was the weakest party at the negotiation table means that the schedule of cuts in the US tariffs mandated by NAFTA can be plausibly considered exogenous for the purposes of our exercise. Finally, the fact that tariffs were phased out over time provides us with variation needed to identify the effects we are interested in.

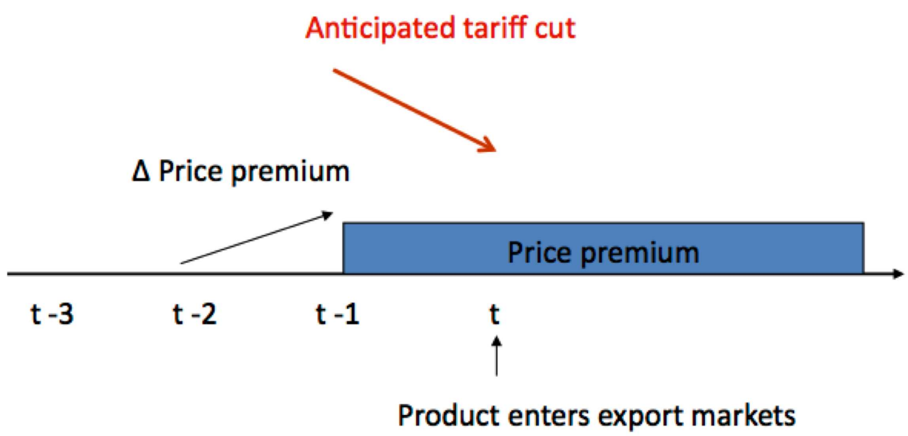
To pinpoint the causal link between quality upgrading and exporting, in the second stage of the IV estimation, we regress the change in the log of price premium of product p sold by producer i at time t on the indicator variable $1\ yr\ before\ exporting_{pit}$. In other words, we ask whether a product variety that will enter export markets next period $(t+1)$ experiences an increase in the price premium this period (t).

$$ln\,(\Delta Price\ premium_{pit}) = \gamma_1\ 1\ yr\ before\ exporting_{pit} + \alpha_t\ (+\alpha_{pi}) + \mu_{pit} \tag{3}$$

In the first stage of the estimation, we will use several instruments to predict the variety's entry into export markets next period ($1\ yr\ before\ exporting_{pit}$). Our first instrument for the entry of product p produced by plant i into export markets at time $t+1$ is the anticipated change in the access of Mexican exporters to the US market mandated by NAFTA. We rely on the change in the US tariff applied to Mexican exports of product p taking place at time $t+1$. We expect that a decline in the US tariff at $t+1$ will stimulate Mexican exports at $t+1$. There is no reason to think that the tariff cut happening at $t+1$ will affect the change in the product's price premium in Mexico at t through channels *other than* preparation for the anticipated entry into export markets at $t+1$, thus fulfilling the conditions for a valid instrument.[23] To make the timing of the variables clear we present it graphically in Figure 4 below.

[23]One could be potentially concerned about the correlation between the current and the future US tariff cuts and the Mexico's own tariff cuts. We will come back to this issue later.

Figure 4: IV Approach



Theoretical models predict that not all producers will react to the anticipated tariff cuts in the same way. For instance, in the framework proposed by Verhoogen (2008) a reduction in trade costs increases the incentive for firms to upgrade, but this is only true for more productive firms.[24] This is because the benefit of upgrading and entering export markets is proportional to revenues (which are larger for more productive firms), while its cost is fixed. We take this prediction into account by introducing a second instrument: an interaction between the anticipated tariff change on product p and the market share of producer i in product p in 1994, the first year of our data. The second instrument varies by product, producer and time, which is exactly the variation we need for the purposes of our exercise. We also include the market share of producer i in product p in 1994 as an additional instrument.

Entering a mature market, like the US, may be particularly difficult in advertising-intensive sectors. This is because the importance of brand name/reputation may create larger barriers to entry for products of lesser known producers. This effect will be magnified if Mexican producers are not be able to match the advertising outlays of the incumbents, which is likely to be the case. To account for this possibility we will add as an additional instrument advertising intensity of a given 4-digit industry as well as the interactions of this variable with the other instruments. Advertising intensity is measured using the sales, general and administrative expenditures (SGA) which is the standard proxy used in the literature.[25]

[24] Also in Constantini and Melitz (2007) a gradual "anticipated" liberalization leads most productive domestic firms to upgrade and innovate before entering export markets.

[25] See Javorcik (2004) and the references within.

The SGA figures come from Worldscope, a commercial database which includes information on thousands of companies from all countries in the world.[26] The industry average is calculated based on the figures reported for 1993 by all companies listed in the data base, thus it represents the world average for the year prior to the beginning of our sample period.

As we have several instruments, which can be combined in different interactions, we present several specifications starting with the smallest number of instruments. In our baseline approach in Table 7, we include year fixed effects (we will expand the set of controls in subsequent tables). Our instruments perform quite well in predicting the variation in future entry into export markets, as reflected by the F-statistics which are all above 10 and the Anderson underidentification test. The Hansen test does not cast doubt on the validity of our instruments.

The results in column 1 are consistent with the theoretical predictions arising from models of heterogenous firms. We find that producers that initially enjoyed a larger market share in a given product are more likely to start exporting the product next period. This effect is larger for products that will experience a larger decline in the US tariff next period.[27] As expected, the magnitude of this effect is attenuated for products belonging to industries with high advertising intensity. All of these effects are statistically significant. The results with additional instruments in columns 2-4 confirm a positive link between the anticipated tariff cut and the probability of a product being exported as well as the positive relationship between the initial market share and the likelihood of future exports. As before, industry advertising intensity attenuates the effect of tariff cuts.

Moving on to the second stage, we find a positive and statistically significant relationship between the entry of a given product variety into export markets at time $t+1$ and the increase in its price premium at time t. This effect is statistically significant at the 1 percent level in all four specifications. The IV results thus indicate that the future changes in the US trade policy drive Mexican producers to upgrade their products in anticipation of introducing the products into export markets. The magnitude of the estimated effects suggest a 266-292% increase in the price premium between t and $t+1$ in varieties that will enter export markets at $t+2$. For comparison, recall that the first specification in Table 3 suggested an increase from a non-statistically significant premium of 2.5% two years before entry into export markets to a statistically significant premium of 6% one year before entry into export markets, which is equivalent to a 244% increase.

It is possible that the future changes in US tariffs are correlated with the current changes

[26] While the 1997 release of the data base, which we use, includes major companies from all countries, the coverage is heavily skewed towards firms operating in OECD economies.

[27] A tariff cut increases the probability of a product being introduced into foreign markets for varieties with a market share of above 0.043. For comparison, the mean market share is 0.15.

in the US tariffs, which could be problematic in our IV approach. To address this issue, in Table 8, we re-estimate our previous model adding the contemporaneous change in the US tariff on product p as a control. The results from the augmented model are very similar to those obtained earlier both in terms of magnitudes and statistically significance of the estimated effect. The contemporaneous change in the US tariff is statistically significant and bears a negative sign.

In the previous Section, we argued that it is important to include plant-product fixed effects in order to dispel the possibility that some plant-product time invariant characteristics may be driving our results. In the current setting with instrumental variables, the concerns related to endogeneity are substantially smaller. Nevertheless, as an additional robustness check, we combine the instrumental variable appraoch with plant-product fixed effects. Note that in this version of the model, there is no need to include the time-invariant instruments, such as the advertising intensity, the initial product market share and the interaction of the two variables, as their effects will be captured by the plant-product fixed effect. This reduces the number of specifications from four in Table 7 to just two.[28] The model includes year fixed effects in all specifications.

The results, presented in the first two columns of Table 9, confirm our earlier findings of quality upgrading taking place prior to penetration of export markets. We find that product varieties that will start being exported next period experience an increase in the price premium this period. The estimated effects are slightly larger in magnitudes and are statistically significant at the 10 percent level. In columns 3 and 4, we additionally control for the contemporaneous change in the US tariff. Doing so has little effect on the estimated coefficients.

As a final robustness check, we make two further changes to our IV approach. First, we follow Lileeva and Trefler (2010) and use the current change in Mexican input tariff relevant to product p as an additional instrument.[29] Second, we add the contemporaneous change in the Mexican tariff specific to the 6-digit industry to which product p belows as an additional control.[30] As before, the specification includes plant-product fixed effects, year fixed effects and the contemporaneous change in the US tariff. The results, presented in the last two columns of Table **??**, confirm our previous findings. Product varieties that will start being exported next year show an increase in their price premium this year. The estimated effects are comparable to the previous one and statistically significant at the 10 percent level.

[28]The slightly lower number of observations in the specifications with plant-product fixed effects is due to dropping singletons (instances of a given plant-product combination being observed only once).

[29]This tariff is equal to the weighted average of the tariffs on the various inputs required to produce product p. The weights are obtained from the 2003 Mexican input-output table produced by INEGI.

[30]Unfortunately, we do not have information on the Mexican tariffs at the product level.

5 Concluding Remarks

A vast empirical literature drawing on data from around the world has shown that exporters are different from other firms. They tend to be larger and exhibit a higher total factor productivity. This stylized fact has prompted researchers to examine whether the superior performers of exporters is due to self-selection (the best performers become exporters) or learning from exporting (exporters improve their performance as a result of contacts with foreign buyers). While the evidence on learning from exporting is mixed, there is a concensus on the self-selection issue (Greenaway and Kneller 2007). But are successful exporters born or made? Very little attention has been paid to *learning to export*, that is, understanding how firms achieve the performance level required to enter export markets, which is perhaps a more interesting and relevant question from the policy perspective.

This study aims to fill this gap in the literature. Its novelty is threefold. First, in contrast to the existing literature that relies on the plant- or firm-level data and compares the pre- and post-exporting performance, we study developments at the plant-product level and explicitly focus on developments preceding the product's introduction into export markets. Second, instead of examining producers' characteristics, as other studies have done, we examine the characteristics of exporters' products, in particular the product's quality. Third, to isolate the causal effect of *learning to export*, we use the instrumental variable approach inspired by the theoretical model of Constantini and Melitz (2007), which predicts that the anticipation of future liberalization will induce producers to innovate ahead of liberalization and thus also ahead of their anticipated, but yet unrealized, entry into export market.

In our analysis, we use Mexican plant-product level data for the 1994-2004 period to compare unit values of current and future export product varieties to those of their counterparts sold exclusively at home. We find that producers who export a particular product variety tend to obtain a price premium for their domestic sales of this variety. Manufacturers who will export a particular product in the future experience an increase in their variety's price premium exactly one year before exporting starts. Two and three years before exporting takes place, their product variety is indistinguishable in terms of price premium from varieties sold by other producers.

To establish a causal link between the intention to export in the future and current quality upgrading, we rely on the anticipated changes in the US trade policy vis a vis Mexico. Our data spans during a period when the North American Free Trade Agreement mandated significant tariff cuts on Mexican exports entering the US. The variation in tariff changes across products and time and the fact that the changes were known in advance gives us a product-specific instrument for the probability of a product being introduced into foreign markets in the future. The prediction of heterogeneous firms models suggesting that better performing producers will have a greater incentive to upgrade their production technology in anticipation of future entry into exporting inspires our second instrument. This instrument is an interaction between the future change in the US tariff and the initial market share a producer enjoyed in a given product. Thus the instrument gives us variation at the plant-product-year level, which is exactly what we need. We supplement the instrument set with information on industry advertising intensity which captures the difficulty of breaking into the mature market, such as the US.

Our results show that future tariff cuts stimulate quality upgrading among better performing Mexican producers *in anticipation* of entry into export markets next period. Thus our results are consistent with *conscious* product upgrading taking place in preparation for exporting. The findings confirm the patterns of behavior mentioned during the interviews we conducted with Mexican entrepreneurs.

Finally, our results suggest that there is no evidence of upgrading after the entry into export markets. In sum, our results point towards the fact that by focusing solely on learning from exporting researchers may have missed profound changes taking place at the producer and product level as part of their learning to export. Understanding these changes better is a key step towards devising successful export promotion policies.

References

Alchian, A. A., and W. R. Allen (1964): *Exchange and production: competition, coordination & control*. Belmont, CA: Wadsworth Publishing Company.

Alvarez, R., and R. A. Lòpez (2005): "Exporting and firm performance: evidence from Chilean plnts," *Canadian Journal of Economics*, 38(4), 1384–1400.

Baldwin, J., and W. Gu (2009): "The impact of trade on plant scale, production-run length and diversification," in *Producer dynamics: new evidence from micro data*, ed. by T. Dunne, B. Jensen, and M. Roberts, pp. 557–592. Chicago: University of Chicago Press.

Baldwin, R., and J. Harrigan (2007): "Zeros, Quality and Space: Trade Theory and Trade Evidence," NBER Working Papers 13214, National Bureau of Economic Research.

Bernard, A., S. Redding, and P. Schott (2010): "Multi-product firms and product switching," *American Economic Review*, 100(2), 70–97.

Bernard, A. B., and J. B. Jensen (1999): "Exceptional exporter performance: Cause, effect, or both?," *Journal of International Economics*, 47(1), 1–25.

Bustos, P. (2011): "Multilateral Trade Liberalization, Exports and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinean Firms," *American Economic Review*, 101(1), 304–340.

Chen, M. X., J. S. Wilson, and T. Otsuki (2008): "Standards and export decisions: Firm-level evidence from developing countries," *Journal of International Trade & Economic Development*, 17(4), 501–523.

Clerides, S. K., S. Lach, and J. R. Tybout (1998): "Is Learning By Exporting Important? Micro-Dynamic Evidence From Colombia, Mexico, And Morocco," *The Quarterly Journal of Economics*, 113(3), 903–947.

Constantini, J. A., and M. J. Melitz (2007): "The Dynamics of Firm-Level Adjustment to Trade Liberalization," Mimeo.

Crozet, M., K. Head, and T. Mayer (2009): "Quality sorting and trade: firm-level evidence for French wine," Discussion Paper 7295, CEPR.

Flam, H., and E. Helpman (1987): "Vertical Product Differentiation and North-South Trade," *American Economic Review*, 77(5), 810–822.

Goldberg, P., A. Khandelwal, N. Pavcnik, and P. Topalova (2010): "Multi-product firms and product turnover in the developing world: evidence from India," *Review of Economics and Statistics*, Forthcoming.

Greenaway, D., and R. Kneller (2007): "Firm heterogeneitty, exporting and foreign direct investment," *The Economic Journal*, 117, F134–F161.

Hallak, J. C. (2006): "Product Quality and the Direction of Trade," *Journal of International Economics*, 68(1), 238–265.

Hallak, J. C., and J. Sivadasan (2010): "Productivity, quality and exporting behavior under minimum quality requirements," Working Papers 99, Universidad de San Andres, Departamento de Economia.

Hausmann, R., J. Hwang, and D. Rodrik (2007): "What You Export Matters," *Journal of Economic Growth*, 12(1), 1–25.

Hummels, D., and A. Skiba (2004): "Shipping the Good Apples Out? An Empirical Confirmation of the Alchian-Allen Conjecture," *Journal of Political Economy*, 112(6), 1384–1402.

Iacovone, L., and B. S. Javorcik (2010): "Multi-product exporters: diversification and micro-level dynamics," *The Economic Journal*, 120, 481–499.

Javorcik, B. S. (2004): "The Composition of Foreign Direct Investment and Protection of Intellectual Property Rights in Transition Economies," *European Economic Review*, 48(1), 39–62.

Kowalczyk, C., and D. R. Davis (1996): "Tariff phase-outs: theory and evidence from GATT and NAFTA," Working Paper 5421, National Bureau of Economic Research.

Kugler, M., and E. Verhoogen (2012): "Prices, Plant Size, and Product Quality," *Review of Economic Studies*.

Lileeva, A., and D. Trefler (2010): "Improved access to foreign markets raises plant-level productivity ... for some plants," *The Quarterly Journal of Economics*, 125(3), 1051–1099.

Linder, S. (1961): *An Essay on Trade and Transformation*. Almqvist & Wiksell, Stockholm.

Melitz, M. J. (2003): "The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 71(6), 1695–1725.

Molina, D., and M.-A. Muendler (2009): "Preparing to Export," Mimeo, University of California, San Diego.

Schott, P. K. (2004): "Across-Product versus Within-Product Specialization in International Trade," *Quarterly Journal of Economics*, 119(2), 647–678.

Sutton, J. (2007): "Quality, Trade and the Moving Window: The Globalisation Process," *The Economic Journal*, 117(524), F469–F498.

Verhoogen, E. A. (2008): "Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector," *Quarterly Journal of Economics*, 123(2), 489–530.

Yeaple, S. R. (2005): "A simple model of firm heterogeneity, international trade, and wages," *Journal of International Economics*, 65(1), 1–20.

6 Appendix: Data and Results

The Encuesta Industrial Mensual (EIM) is a monthly survey collected by INEGI to monitor short-term trends and dynamics. The EIM covers the Mexican manufacturing sector, with the exception of *maquiladoras*. 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. In the EIM, plants can be tracked through time thanks to unique plant-level identifiers.

The sampling design of the EIM follows what INEGI defines as "deterministic sampling" which aims at producing a panel of companies that are followed through time and refreshed every ten years, in the occasion of the national Economic Census. Within each 6-digit CMAP class of activity the firms are classified in decreasing order based on their sales and the largest companies are included in the sample up to the point of representing at least 90 percent of the class output. For sectors characterized by a limited number of companies, below 20, all companies are included in the sample. While for sectors characterized by a large number of companies, INEGI aims at including no more than 120 companies with the caveat that all companies with more than 100 employees are always included in the sample, hence the number of companies in a manufacturing class can be larger than 120.

The EIM contains the following revenue-related variables: total production, net sales, export sales. 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 quantity values are missing. 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).

Table 1: Number of plants and products

Year	No of plants		No of products	
	All	**Exporting**	**Sold**	**Exported**
1994	6,291	1,582	19,154	2,844
1995	6,011	1,844	18,568	3,406
1996	5,747	2,024	17,662	3,881
1997	5,538	2,138	16,938	4,092
1998	5,380	2,095	16,419	4,193
1999	5,230	1,951	15,885	3,889
2000	5,100	1,901	15,279	3,737
2001	4,927	1,770	14,714	3,509
2002	4,765	1,686	14,182	3,321
2003	4,603	1,678	13,507	3,282
2004	4,424	1,602	12,887	3,118
Total	58,016	20,271	175,195	39,272

Table 2: Summary statistics

	Mean	**No. of obs.**
Log domestic unit value (in thousands of pesos)	1.81	147451
Log unit value premium	-.21	147451
Product market share in 1994	0.15	147161
Advertising intensity	20.54	177380
Tariffs	**1994**	**2004**
Product level tariffs		
Average US-NAFTA tariff	1.9%	.09%
Top percentile US-NAFTA tariff	15%	2.9%
6-digit industry level tariffs		
Average Mexico-NAFTA tariff	9.7 %	.07%
Top percentile Mexico-NAFTA tariff	41%	2.4%
Average Mexico-NAFTA inputs tariff	29%	.11%
Top percentile Mexico-NAFTA input tariff	50%	.5%

Table 3: Investment patterns

	Invest	Not invest	Total No. of plants
All plants	60%	40%	54,816
Exporters	72%	28%	15,671
Exporter that will introduce new export variety	77%	23%	1,911
Exporter that will not introduce new export variety	71%	28%	13,760
Non exporters	51%	49%	27,369
Non expoters that will begin to export	70%	30%	1,066
Non exporters that will not begin to export	50%	50%	26,303

Notes:

Non exporters are plant not exporting t and t-1

Table 4: Baseline specification

	ln Price premium							
	Baseline		Adding plant-product FE		Dropping always exported products		Weighted price premium	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
3 years before entering export markets		-0.017		**-0.025***		-0.023		**-0.024***
		[0.029]		[0.014]		[0.014]		[0.012]
2 years before entering export markets	0.025	0.025	-0.004	-0.004	-0.003	-0.002	0.001	-0.001
	[0.023]	[0.023]	[0.012]	[0.012]	[0.011]	[0.012]	[0.010]	[0.010]
1 year before entering export markets	**0.060****	**0.054****	**0.029****	**0.030****	**0.031****	**0.032****	**0.027****	**0.026****
	[0.021]	[0.022]	[0.012]	[0.012]	[0.012]	[0.012]	[0.010]	[0.011]
Exported product	**0.070*****	**0.071*****	**0.031*****	**0.031*****	**0.030*****	**0.028*****	**0.024*****	**0.024*****
	[0.011]	[0.011]	[0.005]	[0.006]	[0.006]	[0.006]	[0.005]	[0.005]
N. Observations	130170	120849	130170	120849	115724	106403	127519	118387
R-squared	0.002	0.002	0.81	0.81	0.81	0.82	0.80	0.81
Plant-product FE	no	no	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
1 yr before = 3 yrs before		8.13		10.13		10.53		11.72
p-value		**0.00**		**0.00**		**0.00**		**0.00**
1 yr before = 2 yrs before	6.83	3.82	5.16	5.13	0.00	5.44	4.02	4.38
p-value	**0.01**	**0.05**	**0.02**	**0.02**	**0.00**	**0.02**	**0.05**	**0.04**
exported = 1 yr before	0.27	0.69	0.03	0.01	0.01	0.13	0.08	0.06
p-value	0.61	0.41	0.85	0.92	0.92	0.72	0.77	0.80

Notes:

Standard errors are listed in parentheses. *** denotes significant at 1%, ** at 5%, * at 10%.

In columns 1 and 2, standard errors are clustered at the plant-product level.

Table 5: Robustness Check: Controlling for exiting products. Specification with plant-product fixed effects

	ln Price premium					
	[1]	[2]	[3]	[4]	[5]	[6]
3 years before entering export markets	-0.03	-0.034	-0.032	**-0.026***	**-0.026***	**-0.026***
	[0.029]	[0.029]	[0.029]	[0.014]	[0.014]	[0.014]
2 years before entering export markets	0.014	0.01	0.01	-0.005	-0.006	-0.006
	[0.023]	[0.023]	[0.023]	[0.012]	[0.012]	[0.012]
1 year before entering export markets	**0.040***	**0.037***	**0.037***	**0.026****	**0.025****	**0.026****
	[0.022]	[0.022]	[0.022]	[0.012]	[0.012]	[0.012]
Exported product	**0.064*****	**0.062*****	**0.043*****	**0.029*****	**0.028*****	**0.029*****
	[0.011]	[0.012]	[0.012]	[0.006]	[0.006]	[0.006]
Product will exit next period	**-0.136*****			**-0.072*****		
(plant will continue to operate)	[0.012]			[0.006]		
Product will exit next period		**-0.123*****			**-0.062*****	
(plant will or will not continue to operate)		[0.009]			[0.005]	
Plant-product market share			**0.172*****			**0.278*****
			[0.016]			[0.011]
N. Observations	120849	120849	120849	120849	120849	120849
R-squared	0.004	0.005	0.006	0.81	0.81	0.81
Plant-product FE	no	no	no	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
1 yr before = 3 yrs before	7.98	7.99	7.71	9.40	8.96	9.52
p-value	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**
1 yr before = 2 yrs before	3.39	3.44	3.60	4.57	4.36	4.80
p-value	**0.07**	**0.06**	**0.06**	**0.03**	**0.04**	**0.03**
exported = 1 yr before	1.24	1.42	0.08	0.05	0.04	0.05
p-value	0.27	0.23	0.77	0.83	0.84	0.82

Notes:

Standard errors are listed in parentheses. *** denotes significant at 1%, ** at 5%, * at 10%.

Table 6: Developments after entry into export markets. Specification with plant-product fixed effects

	ln Price premium			
	[1]	[2]	[3]	[4]
1 year before entering export markets	**0.053****	**0.052****	**0.040*****	**0.035****
	[0.020]	[0.020]	[0.012]	[0.012]
1st year of exporting	**0.047****	**0.047****	**0.044*****	**0.039*****
	[0.021]	[0.021]	[0.012]	[0.012]
2nd year (or later) of exporting	**0.057****		**0.037*****	
	[0.019]		[0.007]	
2nd year of exporting		**0.043****		**0.045*****
		[0.021]		[0.012]
3rd year (or later) of exporting		**0.054****		**0.024*****
		[0.019]		[0.007]
N. Observations	115724	115724	115724	115724
R-squared	0.0011	0.001	0.81	0.81
Plant-product FE	no	no	yes	yes
Year FE	yes	yes	yes	yes
1 yr before = 1st year	0.41	0.25	0.08	0.10
p-value	0.52	0.62	0.78	0.75
1 yr before = 2nd year	0.08	0.46	0.04	0.52
p-value	0.78	0.50	0.83	0.47
1 yr before = 3rd year		0.02		0.74
p-value		0.88		0.39

Notes:

Standard errors are listed in parentheses.*** denotes significant at 1%,** at 5%,* at 10%.

Products which are always exported are excluded from the sample.

Table 7: Instrumental variable approach. Baseline

Second stage - Δ ln Price premium				
	[1]	[2]	[3]	[4]
1 year before entering export markets	**1.071*** **	**0.978*** **	**1.024*** **	**1.017*** **
	[0.376]	[0.359]	[0.356]	[0.356]
Constant	0.011	0.011	0.011	0.011
	[0.008]	[0.008]	[0.008]	[0.008]
N. Observations	76574	76574	76574	76574
Year FE	yes	yes	yes	yes
Sargan	1.78	2.73	3.34	4.61
p-value	0.62	0.6	0.65	0.60
F-stat	16.04	13.78	11.79	10.11
p-value	0.00	0.00	0.00	0.00
Underidentification test	64.11	68.84	70.67	70.69
p-value	0.00	0.00	0.00	0.00
First stage - 1 year before entering export markets				
1994 Product market share	**0.010*** **	**0.010*** **	**0.009*** **	**0.010***
	[0.002]	[0.002]	[0.002]	[0.006]
Future Δ tariff	**0.073***	**-0.513***	**-0.463***	**-0.467***
	[0.043]	[0.273]	[0.275]	[0.276]
Future Δ tariff x 1994 Product market share	**-1.686*** **	-0.61	-0.636	-0.616
	[0.573]	[0.757]	[0.757]	[0.767]
SGA x Future Δ tariff x 1994 Product market share	**0.058** **	0.004	0.005	0.004
	[0.029]	[0.038]	[0.038]	[0.039]
SGA x Future Δ tariff		**0.029** **	**0.027** **	**0.027** **
		[0.013]	[0.013]	[0.013]
SGA			-0.0001	-0.0001
			(0.000)	(0.000)
SGA x 1994 Product market share				-0.00004
				(0.0003)
Constant	-0.003	-0.003	-0.001	-0.001
	[0.003]	[0.003]	[0.003]	[0.003]

Notes:

Standard errors are listed in parentheses. *** denotes significant at 1%, ** at 5%, * at 10%.

Table 8: Instrumental variable approach. Controlling for contemporaneous change in US tariffs

Second stage - Δ ln Price premium				
	[1]	[2]	[3]	[4]
1 year before entering export markets	**1.084*** **	**0.959*** **	**1.003*** **	**0.997*** **
	(0.377)	(0.358)	(0.355)	(0.354)
Current Δ tariff	-0.164**	-0.163**	-0.164**	-0.164**
	(0.082)	(0.081)	(0.081)	(0.081)
Constant	0.010	0.010	0.010	0.010
	(0.008)	(0.008)	(0.008)	(0.008)
N. Observations	74659	74659	74659	74659
Year FE	yes	yes	yes	yes
Sargan	0.42	1.99	2.55	3.74
p-value	0.94	0.74	0.77	0.71
F-stat	16.03	13.83	11.84	10.15
p-value	0.00	0.00	0.00	0.00
Underidentification test	64.06	69.11	70.99	71.01
p-value	0.00	0.00	0.00	0.00
First stage - 1 year before entering export markets				
1994 Product market share	**0.010*** **	**0.010*** **	**0.009*** **	**0.010***
	(0.002)	(0.002)	(0.002)	(0.006)
Future Δ tariff	**0.077***	**-0.532***	**-0.483***	**-0.486***
	(0.045)	(0.274)	(0.277)	(0.278)
Future Δ tariff x 1994 Product market share	**-1.708*** **	-0.612	-0.638	-0.620
	(0.579)	(0.757)	(0.757)	(0.767)
SGA x Future Δ tariff x 1994 Product market share	**0.059** **	0.004	0.005	0.004
	(0.029)	(0.038)	(0.038)	(0.039)
SGA x Future Δ tariff		**0.030** **	**0.028** **	**0.028** **
		(0.013)	(0.014)	(0.014)
SGA			-0.000	-0.000
			(0.000)	(0.000)
SGA x 1994 Product market share				-0.000
				(0.000)
Current Tariff Change	0.008	0.019	0.020	0.020
	(0.030)	(0.030)	(0.030)	(0.030)
Constant	-0.003	-0.003	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)

Standard errors are listed in parentheses. *** denotes significant at 1%, ** at 5%, * at 10%.

Table 9: Instrumental variable approach. Controlling for contemporaneous change in US tariffs and plant-product fixed effects

Second stage - Δ ln Price premium						
	[1]	[2]	[3]	[4]	[5]	[6]
1 year before entering export markets	**1.213***	**1.175***	**1.366***	**1.221***	**1.186***	**1.106***
	(0.727)	(0.674)	(0.752)	(0.681)	(0.625)	(0.591)
Current Δ tariff			-0.212**	-0.209**	-0.190**	-0.189**
			(0.095)	(0.093)	(0.092)	(0.091)
Current Δ Mexican tariff					-0.282**	-0.282**
					(0.130)	(0.129)
N. Observations	75498	75498	75498	75498	73685	73685
Plant-Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sargan	1.13	1.17	0.53	0.81	0.72	0.92
p-value	0.57	0.76	0.77	0.85	0.87	0.92
F-stat	6.04	5.22	5.87	5.18	6.13	5.38
p-value	0.00	0.00	0.00	0.00	0.00	0.00
Underidentification test	18.11	20.88	17.61	20.7	24.52	26.92
p-value	0.00	0.00	0.00	0.00	0.00	0.00
First stage - 1 year before entering export markets						
Δ Mexican input tariff					**-0.142***	**-0.138***
					(0.049)	(0.049)
Future Δ tariff	0.051	-0.504	0.066	-0.519	0.075	-0.452
	(0.051)	(0.337)	(0.058)	(0.337)	(0.058)	(0.345)
Future Δ tariff x 1994 Product market share	**-1.966***	-0.960	**-2.021***	-0.973	**-1.988***	-1.009
	(0.670)	(0.902)	(0.678)	(0.902)	(0.716)	(0.955)
SGA x Future Δ tariff x 1994 Product market share	**0.072**	0.022	0.075**	0.023	**0.074**	0.025
	(0.034)	(0.045)	(0.034)	(0.045)	(0.036)	(0.048)
SGA x Future Δ tariff		**0.027***		**0.029***		0.026
		(0.016)		(0.016)		(0.017)
Current Δ tariff			0.020	0.029	0.021	0.029
			(0.037)	(0.037)	(0.037)	(0.037)
Current Δ Mexican tariff					0.015	0.015
					(0.042)	(0.042)

Notes:

Standard errors are listed in parentheses. *** denotes significant at 1%, ** at 5%, * at 10%.