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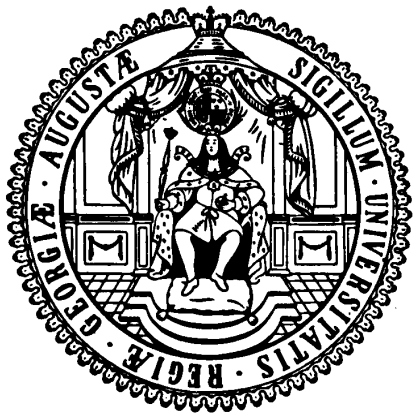

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New Stuff or Better Ways: What Matters to Access International Markets?

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Abstract

Innovation and export decisions are closely interlinked. Both activities contribute to firm performance in various ways: exporting provides a wider market to sell products, while innovation provides new and better products to supply those markets and/or more efficient ways to reduce costs. The connection of innovation and exporting is of major interest to developing countries aiming to achieve higher growth and wellbeing given that foreign markets are both a new challenge and a source of knowledge for firms. This study analyzes whether different types of innovation affect export behavior at the firm level for an unbalanced panel of Uruguayan manufacturing firms. Logistic regression and matching with difference-in-differences (MDID) techniques are applied to data from 2003 to 2012. Using logit models we find that previous innovation increases the probability of exporting. Unlike other studies, productivity-enhancing (or cost-reducing) innovation shows a stronger correlation than product innovation pointing out that price competition is more important than quality competition for Uruguayan products in foreign markets. Furthermore, using MDID we establish a direct causal link from innovation to exporting. Finally, we analyze export intensity by means of Tobit models. We find that innovation fosters export intensity. Overall, the findings indicate that active innovation policies along with other export promotion policies help to promote firms' participation in foreign markets.

Key Words: product innovation, process innovation, exporting.

JEL Classification: F14, D21, C23, O31, O33

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1. Introduction

Innovation can come out as gift from luck, but largely it is the result of a process purposely put in motion to generate better responses to a problem. In economics and business, we tend to

focus on two types of innovations: those that produce new stuff to satisfy the taste of more demanding clients, and innovations that improve the way that the old stuff is produced, marketed, or delivered. In this work, we analyze the impact of those types of innovations on exporting behavior, as well as the impact of exporting on innovation, from a firm level perspective using micro level data from Uruguayan manufacturing firms.

From a macroeconomic standpoint, innovation is often considered a source of international competitive advantage likely to improve the trade balance and boost economic growth (Rodil et al., 2015). At the firm level, innovation is expected to increase productivity and more productive firms are more likely to engage in international markets (Caldera, 2010). Participation in foreign markets can also prompt up further innovation, as firms have to deal with new competitive pressures while being exposed to new sources of knowledge. Hence, exporting may be a consequence as well as a cause of innovation suggesting an endogenous relationship between both, exports and innovation.

There is already a growing literature debating the double-edged relationship between innovation and exports (Damijan et al., 2010; Filipescu et al., 2013; Van Beveren and Vandenbussche, 2010). The novelty of this study is its focus on a small open economy for which the existent literature is scarce. Since the 1990s, Uruguay has engaged in a process of structural reforms and trade liberalization without major setbacks despite the serious economic crisis of 2002. Considering the reduced size of the local market and the increasing competition from abroad, thriving in international markets has become increasingly important for Uruguayan firms and a pressing issue for public policy design. A study of Uruguayan manufacturers can provide useful cues to other developing countries. These are firms operating in a traditionally commodity-oriented country, where most of its manufacturing industry developed under protectionist rules that have been reversed from the mid-1970s onwards.

We want to know whether innovation fosters internationalization[1] and what type, if any, of innovations are more relevant in that process. It has been reported that innovation is less important to enter export markets in less developed countries, because firms tend to compete based on access to existing resources (Cirera et al., 2015). Nevertheless, lack of innovation can hinder gains in efficiency but also the process of export diversification. To foster innovation both in terms of new products and new ways of production is necessary to accelerate the catching-up process with more developed countries.

Whether or not innovation helps firms enter and survive international markets is important for business decision-making and policy recommendations. We hypothesize that innovation would increase exporting entry and participation into foreign markets.

We use an unbalanced panel of 1,678 Uruguayan manufacturing firms surveyed between 2003 and 2012 by the National Agency of Research and Innovation (ANII). This period is covered by four surveys for the years 2003, 2006, 2009 and 2012. These surveys are referred as EAII, which stands for *Encuestas de Actividades de Innovación en la Industria* (Innovation Activities Surveys). Each of these surveys provides information on reported innovation and exporting activities, as well as a wide variety of firm's characteristics.[2]

[1] Due to data availability we have to focus only on exports.

[2] Unfortunately, EAII 2000 survey lacks information on a number of important variables such as exports, type of innovation, and sales. Therefore, even though we have the data at hand, information from this particular year is absent from the analyses.

The surveys contain rich information on the various types of innovation outputs as well as inputs such as R&D internal and external investment. For this study, we mainly rely on innovation output measures, in particular, the type of innovation reported by firms. Innovative activity can be aimed at (1) the introduction of new products in order to increase variety; (2) enhancing the efficiency in the production process or (3) improving the commercialization of already existing products; and/or (4) implementing new organizational methods in business practices. The data set allows us to identify all four types of innovation outputs: product, process, commercialization, and organization, respectively.

Product and process innovation have received most of the attention in the literature while the effects of organizational innovation on economic performance remain relatively unknown (Love and Roper, 2015).[3] Indeed, organizational innovation is often considered within the process innovation category and commercialization innovation is barely mentioned. For the purpose of this study, we will make a distinction between product and the other three types of innovation. The rationale is that product innovation aims to satisfy demand by offering something new, while the other types of innovation seek to improve at least one aspect of the production and delivery process of already existing goods. The manufacture of new products may or may not be more efficient than the old ones, and therefore productivity gains are not guaranteed (Harrison et al., 2014). On the other hand, process, commercialization, and organizational innovations are expected to deliver productivity gains. Henceforth, we will refer to these three types as productivity-enhancing innovations. This classification of innovative firms is similar to that used by Cassoni and Ramada-Sarasola (2015) also working with Uruguayan data.[4]

We are interested in the relationship between innovation and exports. Thus, the purpose of this study is to provide an answer to two questions. First, does innovation affect firms' entry into export markets?; and second, if so, what is more important for Uruguayan firms in order to access foreign markets, to introduce new products or to produce more efficiently?. The questions can be associated with the following non-exclusive hypothesis, since also some complementarity may exist between product and productivity enhancing innovations.

On one hand, product innovation may affect the exporting status of firms more than the other forms of innovation. The introduction of a new product pushes firms towards international markets. An alternative interpretation would state that firms planning to expand their business abroad adapt their products to the destination markets. In either case, product innovation increases the probability of exporting behavior in the following period more than any other type of innovation.

On the other hand, productivity-enhancing (cost-reducing) innovations affect the exporting status of firms more than product innovation. Innovations that reduce production cost allow firms to enter into international markets. An alternative interpretation would be that firms planning to expand their business abroad need to reduce costs first in order to be competitive. In

[3] Organizational innovation: refers to innovation resulting from an improvement in the organization and internal management of the firm, this can result for example due to improvements in the business management that involves the elimination of duplicate costs in the firm, a management of the work that improves the production, etc.

[4] Previous studies have shown a considerably larger impact of process innovation on productivity than that of product innovation for Uruguayan manufacturing firms (Cassoni and Ramada-Sarasola 2010).

either case, process innovation, organizational innovation, and/or commercialization innovation are more important in order to participate in international trade.

The empirical literature provides at best mixed results. Some works find that innovation is important to enter into foreign markets, while the effects of product and process innovation seems to point out that product innovation is more important for developed countries than for developing economies.

The empirical strategy is designed in three steps. First, panel data logit models offer a first approximation of the association between innovation and exports. Second, we use propensity score matching with differences in differences (MDID) to explore the causal relationship between both variables. Finally, we also analyze export propensity using Tobit models.

The main results suggest that productivity-enhancing innovation predicts exporting behavior better than product innovation does, and there is evidence of a causal relationship that goes from innovation to exports. This result may be explained due to the trade specialization of the country, based in commodity goods –such as meat, soy beans and rice– with a low degree of differentiation. We also find that innovation activities have a positive effect on export intensity. Moreover, bigger, younger, highly productive and foreign owned firms export a higher proportion of sales.

The rest of the paper is organized as follows. Section 2 summarizes the closely related literature. Section 3 outlines the empirical strategy, describing the methodology, data and variables. Section 4 presents the main results and Section 5 concludes.

2. **Literature Review**

Previous studies have found a strong and positive correlation between innovation, exporting and performance (Love and Roper 2015; Monreal-Pérez et al., 2012). Some suggest the existence of complementarities between innovation and exporting, meaning that the combination of both is required to obtain substantial productivity gains (Love et al., 2010). But other research have found no significant interaction between them (Monreal-Pérez et al., 2012). Nevertheless, it is well established in the literature that exporting firms are more productive than the non-exporting and they are so even before they started exporting (Bernard and Jensen, 1999; Melitz, 2003).

Whether firms gain productivity before exporting, and to what extent exporting induces productivity gains, are two independent questions addressed in the literature. It is possible that causality runs in both directions, from productivity gains to exporting and from exporting to higher productivity. The problem can be summarized in three non-exclusive hypotheses: self-selection, conscious self-selection or anticipation and learning-by-exporting.

Self-selection in terms of productivity simply means that more productive firms are more likely to become exporters (Eliasson et al., 2012; Love and Roper 2015; Monreal-Pérez et al., 2012; Ricci and Trionfetti, 2012; Wagner, 2007). A variant of the former hypothesis would be conscious self-selection or anticipation (Alvarez and Lopez, 2005; Costantini and Melitz, 2007; Iacovone and Javorcik, 2012; Van Beveren and Vandenbussche, 2010). Exporting firms were more productive before exporting because they consciously invested on enhancing their productivity in order to access international markets.

While self-selection into exporting is overwhelmingly supported by the literature, there is no such consensus on the learning-by-exporting hypothesis. Many studies found no significant

effect of exporting on productivity (Clerides et al., 1998; Ganotakis and Love, 2011; Monreal-Pérez et al., 2012). Others found increasing productivity before entering the export market but not afterwards, supporting the hypothesis of anticipation (Bernard and Jensen, 1999; Clerides et al., 1998; Eliasson et al., 2012; Kim et al., 2009; Love and Roper, 2015). For some countries however favorable evidence to the learning-by-exporting hypothesis has been found. The country studies include the Taiwanese electronics industry (Aw et al., 2007); Japanese firms (Kimura and Kiyota, 2006); the United Kingdom (Girma et al., 2004; Greenaway and Kneller, 2007; Love and Ganotakis, 2013); Slovenia (Damijan et al., 2010; De Loecker, 2007); Spanish manufacturing firms (Hanley and Monreal-Pérez, 2012); Indonesian manufacturing (Blalock and Gertler, 2004); Colombian manufacturing (Fernandes and Isgut, 2007). Evidence of learning by exporting was also found for Uruguayan firms that start exporting to less developed countries (Barboni et al., 2012).

To draw a clearer picture of the link between innovation and export we ought to consider investment decisions. Investing to improve productivity before exporting is consistent with both the self-selection and anticipation hypotheses. Bear in mind that investment is actually an input whose expected output can be some sort of innovation that boosts productivity but not all forms of innovation necessarily increase productivity. Since productivity correlates with exporting, then the association between productivity and exports may be partially explained by investment and productivity-enhancing innovations (Cassiman et al., 2010; Peluffo, 2016).

It is possible that firms invest in enhancing productivity due to their willingness to enter international markets, in which case productivity-enhancing innovation may be endogenous with respect to the decision to export (Alvarez and Lopez, 2005; Van Beveren and Vandenbussche, 2010). The decision to innovate may respond to the anticipation of a liberalization process either because firms expect to reap the benefits of easier access to external markets or because they anticipate fierce competition from entering foreign firms (Costantini and Melitz, 2007). It could be the case that innovative firms enter foreign markets to increase or to compensate sales when local demand falls (Monreal-Pérez et al., 2012). A countercyclical pattern of innovation propensity has been found among Uruguayan firms coping with the crisis of the early 2000s (Cassoni and Ramada-Sarasola, 2015).

In this paper, we will make no assumption about the reasons behind the observed innovative behavior of firms. The first question we want to answer is whether innovation affects entry into export markets, and what type of innovation is more important to entry into foreign markets, if any, for Uruguayan manufacturing firms.

There is no consensus in the literature regarding the causal impact of innovation on exporting propensity/intensity. The majority of studies show a positive impact of innovation on exports (Cassiman et al., 2010; Leonidou et al. 2007; Monreal-Pérez et al., 2012; Wagner, 2007). Self-selection into exporting and innovation cannot be ruled out as more productive firms are more likely to engage in both activities (Ganotakis and Love, 2011). There are studies in which no evidence was found that either product or process innovation increase the probability of becoming an exporting firm (Damijan et al., 2010). Cassiman et al. (2010) find for a panel of Spanish manufacturing firms that product innovation is a very important driver of exports. Lo Turco and Maggioni (2015) find for Turkey that innovation strengthens firms' export probability. Product innovation matters for exporting to developing economies, while process innovation reinforces the role of product innovation for exporting to richer markets. Halpern and Murakozy (2012), using innovations survey data merged with customs data, find that innovative firms are more productive, more likely to trade and export more products to more countries. An

odd case is Wakelin (1998) who found that among UK firms, when size is controlled for, innovating firms are actually less likely to export. It seems that the small British innovative firms do not feel the pressure to look for costumers abroad and concentrate in domestic markets instead.

The interaction between innovation and exports is complex and causality is likely to operate in both directions. For instance, some studies have focused on investigating whether the causality runs from exporting to innovation. Selling in a foreign market is a challenge that redefines firms and entry and survival in exports markets requires adaptation either through productivity gains (price) or through the introduction of new products to accommodate foreign tastes (quality). In this sense, exports may affect innovation through three main channels. First, stronger competition faced in external markets would force firms to improve products and processes. Second, firms will be exposed to foreign knowledge and will acquire information from foreign customers (Salomon and Shaver, 2005). Knowledge acquired in foreign markets allows firms to register more patents and develop new products.[4] Third, exporting firms can benefit from economies of scale that make costly innovations more profitable (Pla-Barber and Alegre, 2007; Rodil et al., 2015).

In this paper, we will make no assumption about the reasons behind the observed innovative behavior of firms. The first question we want to answer is whether innovation affects entry into export markets, and what type of innovation is more important to entry into foreign markets for Uruguayan manufacturing firms. The second question is whether innovation also affects export intensity. We acknowledge that the causality could be bidirectional and hence innovation is considered as endogenous in our estimated models.

3. Empirical Strategy

The baseline analysis consists in the implementation of logit regression for panel data. Since these models do not account for selection into the treatment, its results cannot be given a proper causal interpretation. A more accurate approach follows, which consists in the application of MDID.

3.1. Methodology

The probability of exporting (EX=1) will be treated as a binary response outcome. Exporting is the outcome variable (Y=EX), and starting to innovate is the treatment variable (T=IN). Four different types of innovation are considered, namely process, product, commercialization and organizational innovations, modeled as binary variables that can take 0 or 1 values.

The corresponding models look as follows (Rabe-Hesketh and Skrondal, 2008):

$$logit\{Pr(EX_{it}=1|IN_{it},X_{it})\} \equiv ln\left\{\frac{Pr(EX_{it}=1|IN_{it},X_{it})}{1-Pr(EX_{it}=1|IN_{it},X_{it})}\right\} = \beta_0 + \beta_1 IN_{it} + \beta_2 X_{it} \quad (1)$$

The covariates included in X are: Firm size measured by number of employees; foreign ownership of capital defined as a dummy equal one if the firm has foreign capital participation; absorptive capacity proxy by the share of skilled workers and/or spending in R&D per worker;

year dummies to control for macroeconomic shocks and other contextual changes; and, industry dummies to control for industry-specific effects.[5]

We expect that size of the firm is positively associated to exporting, while the presence of foreign capital indicates a certain degree of internationalization that distinguishes the firm from the nationally owned. The propensity to export among foreign-owned firms may be different even in the absence of any kind of innovations. Furthermore, international links have been shown to affect the productivity of Uruguayan firms (Peluffo, 2012) and, as we discussed before, productivity is related to exports and innovation.[6]

Regarding our proxies for absorptive capacity, innovation in developing countries largely relies on absorption and adaptation of what has been done elsewhere, so a shortage of skills can be an important handicap for firms willing to produce or incorporate technology. Investment in R&D and the proportion of skilled workers are two proxies for absorptive capacity. Investment in R&D is an innovation input that correlates with innovation outcomes, but usually is very low in small developing economies.[7]

Logit models are useful to explore the correlation between exporting and innovation but they cannot provide a reliable estimate on the causal effect between the former variables. That is because this technique does not solve the problem of selection bias. Both innovation and exporting usually are randomly assigned, and firms select themselves into these activities.

To circumvent this problem, we rely on propensity score matching (PSM) and matching with difference-in-differences (MDID). These methods tackle not only the endogenous nature of innovation, but also the influence of common macroeconomic shocks, which are neutralized with this techniques (Blundell and Costa Dias, 2000; Girma et al., 2003; Greenaway and Kneller, 2007; Hanley and Monreal-Pérez, 2012).

PSM techniques create a control group matching treated individuals with non-treated that are as similar as possible based on a set of observable characteristics that are assumed to be unaffected by the treatment but are statistically related to the probability of receiving such treatment. For example, if innovation is the treatment, then firms that did engage in innovation activities are going to be matched with similar firms that had a similar probability of becoming innovators but for some reason did not. The average difference in outcomes for these two kinds of firms will be attributed to the impact of the treatment.

The Average Treatment Effect on the Treated (ATT) can be expressed as follows:

$$ATT = \left\{ Pr\left(EX_{it} = 1 \middle| IN_{it} = 1, PS(X)\right) - Pr\left(EX_{it} = 1 \middle| IN_{it} = 0, PS(X)\right) \right\} \qquad (2)$$

In the first stage, we use a logit model to estimate the propensity score (PS) as the conditional probability of receiving treatment (T), i.e. export status based on the lagged values of the following variables: lagged firm size measured as the total number of workers employed (Workers) and sales in constant pesos; absorptive capacity proxied by the share of skilled

[5] Greenaway and Kneller (2007) show that the potential learning from exports effect is lower for industries already exposed to high level of international competition and high intensity of R&D.

[6] It is confirmed in the empirical literature that exporters exhibit a higher productivity levels than non-exporters (see ISGEP (2008) for a large international survey).

[7] Results using R&D that turn out to be not significant are available upon request from the authors.

workers (Skilled Share), and investments in R&D per worker.[8] We also introduce a dummy variable that takes the value of one if the firm is foreign owned (ForCap) lagged one year,[9] as well as industry (D_j) and time dummies (D_t).

The matching can be done using different techniques[10]. Nearest-neighbor matches each treatment unit with one –or more– comparison unit(s) based on score proximity. We employed this technique using 5 nearest neighbors. As robustness, we also used kernel and local linear matching, nonparametric estimators that use a weighted average of all nonparticipants to create the counterfactual match (Khandker et al., 2010).

Next, to analyze export intensity we use Tobit models. The Tobit model is useful when the dependent variable is observed only over some interval of its support. Since for export intensity the sample will be a mixture of observations with zero and positive values, which are left-censored. The Tobit model will help us to obtain consistent estimates when the zero export intensity is interpreted as a left-censored variable that equals zero when the dependent variable is less or equal than a firm latent (unobserved) variable –named L– that is expressed as exports when some known constant threshold is passed. The truncated mean, or expected value of the dependent non-censored observations is given by:

$$E(ExpI_{it}|X_{it}, ExpI_{it} > L) = X'_{it} + \sigma \frac{\phi\{X'_{it}\beta - L)/\sigma\}}{\Phi\{\frac{(L - X'_{it}\beta)}{\sigma}\}} \quad (3)$$

Where ExpI stands for export intensity, **X** denotes the covariates, Φ is the standard normal cumulative distribution function, φ the standard normal density, and σ the standard deviation. The conditional mean of equation (3) differs from $X'_{it}\beta$ because of the censoring; this difference leads to Ordinary Least Squares being inconsistent. The exact formula in (3) relies on the assumption that the error distribution is normal, i.e. $\varepsilon \sim N(0, \sigma^2)$.

3.2. **Data and Variables**

We have at our disposal four waves of the Innovation Activities Surveys (Encuestas de Actividades de Innovación en la Industria – EAII) collected by the National Agency of Research and Innovation (Agencia Nacional de Investigación e Innovación – ANII). Each survey was delivered every three years by the National Bureau of Statistics (Instituto Nacional de Estadísticas – INE) following the guidelines established in the Bogotá Manual (Jaramillo et al., 2001).[11] For this study we have data corresponding to the years 2003, 2006, 2009, and 2012.

[8] The share of skilled workers represents the sum of the share of professionals and the share of technicians in the total number of workers employed by the firm.

[9] Foreign firms are important determinant, both for innovation as well as export behavior. While it is reasonable to assume that the intensity of foreign ownership matters lack of data prevents us from including the shares of foreign ownership to shed more light on its role for both activities.

[10] Estimation of propensity scores and the following matching of observations was done in STATA, using the command "psmatch2" (Leuven and Sianesi, 2015). The same command was used to produce the MDID estimates of the Average Treatment Effect on the Treated (ATET).

[11] The Bogota Manual is the adapted version for Latin America of the Oslo Manual (OECD and Eurostat, 2005).

Surveys combine two inclusion criteria: (1) compulsory participation for big firms[12] until 60 percent of employment within the industry is covered –after such a quota is filled, some big firms may be exempt from the survey-; (2) representative random selection of small and medium firms stratified by industry. Two public firms and one mixed-capital firm were excluded from the analysis.[13] The remaining data contains information on 1,678 privately owned firms of whom 275 are observed throughout the full period. On the other hand, 517 firms are observed only once and therefore cannot be used for panel data analysis. Information is collected through personal interviews that are compulsory for all the sampled firms.

Innovation is introduced in the models in three different ways. First, the basic models include a binary variable taking value 1 when the firm reported any type of innovation. Second, four binary variables corresponding to each type of innovation reported by the surveys: product, process, organizational, and commercialization. Third, three binary variables representing three possible combinations: (1) when "only product" innovation was reported, (2) when "product and other" form of innovation was reported, or (3) "any but product", when any form of innovation was reported except for product.

Statistical correlation between the various types of innovation is high.[14] Nevertheless, having four kinds of innovations is an asset of the data, since some previous studies have found that combining different types of innovation was crucial for exporting (Greenaway and Kneller, 2007). From 2003 to 2012 there is information on export intensity defined as the value of exports over total sales. With that information we have created a binary variable indicating whether the firm has reported any sort of exporting activity.

Regarding productivity, we must state that the lack of information on capital prevent us from estimating total factor productivity (TFP), thus we have to rely on a simple measure of labor productivity: sales per worker (Ricci and Trionfetti, 2012). All the monetary values are deflated by the corresponding price index with 2003 as base year, so expressed in constant pesos.

3.3 Stylized Facts

At the international level, the literature shows that exporting firms are bigger in terms of employment and output, more capital intensive, pay higher wages and are more productive, in line with the empirical literature (Aw and Hwang, 1995; Bernard and Jensen, 1999; Cassiman et al., 2010; Clerides et al., 1998; Delgado et al., 2002). We can observe that Uruguayan exporting firms also tend to be bigger both in terms of sales and the number of workers they employ (Barboni et al., 2012). Within exporters and non-exporters alike, innovative firms tend to be bigger than their non-innovative counterparts (Table 1).

Considering labor productivity (ratio of sales per worker), exporting firms are notoriously more productive than non-exporting firms. Innovative firms are also more productive than non-innovating, but the difference disappears once exporting status is taken into account. Indeed,

[12] Participation in EAII Surveys is mandatory for firms that either reported: (A) more than 50 employees in 2000, 2003, and 2006, or 100 employees from 2009 onwards; or (B) annual sales are higher than: 13 million Uruguayan pesos (EAII 2000); 1 million American dollars (EAII 2003); 25 million of Uruguayan pesos (EAII 2006); $U 120 million (EAII 2009). Additionally, some activities are defined as mandatory inclusion regardless of size.

[13] The exclusion of ANCAP produces important changes in the composition of the sample, since it is by far the biggest firm in the sample.

[14] See Table A.1 in the Appendix.

Table 1 shows that non-innovating exporters are the more productive in terms of labor productivity.

Among innovating firms, those with exporting activity invest much more heavily in R&D than those that do not export. The difference is not only evident in absolute terms –exporting firms are bigger so this is unsurprising– but also as a ratio of R&D investment per worker, which is more than twice in exporting firms.

Foreign networks reduced the cost of acquiring information about foreign markets and are usually associated with a higher probability of exporting (Ricci and Trionfetti, 2012). From Table 1 we see that the presence of foreign capital is clearly more preeminent among exporting firms. We observe that foreign capital is always associated with bigger firms: in all categories firms that are wholly or partially owned by foreigners represent a bigger share of the labor force and an even bigger share of sales. For example, less than a quarter of non-innovating exporting firms present some degree of foreign capital ownership. These firms represent 39% of employment and 54.5% of sales within the category.

In Table 2 we present the number and share of exporters and non-exporters according to whether they undertake innovation activities or not. Furthermore, we show the number and percentage of different types of innovation and the combination of them (See also Table A.2 in the Appendix). In the sample 1,883 observations report no innovation. In 1,502 cases at least one type of innovation was reported: 134 observations reported only product innovation and not any other type, 690 observations correspond to product along with any other type of innovation, and 644 correspond to any innovation except for product. There are also 190 cases in which all four types were reported.[15]

4. Empirical Results

4.1. Innovation and Exports

We start by addressing the impact of innovation activities on exporting behavior, namely whether innovation, and type of innovation (product or process) affects the entry into foreign markets. Our dependent variable is export status, a binary variable that takes the value of one if the firm exports and zero otherwise. Then we analyze causal relations using MDID techniques. Finally, we explore whether innovation has any effect on export intensity (exports/sales) using Tobit models and instrumental variables techniques.

In Table 3 we present logit models that differ in how the treatment is defined keeping the same set of covariates (Table 3.a show the estimated coefficients and 3.b the marginal effects). We use random effect logit models since the fixed effect models in some specifications did not achieve convergence and also because due to the lack of variation of some covariates those models have a poor explanatory power. There are certain regularities that transcend any particular specification. First, larger firms in terms of employment and firms with a larger share of skilled workers are more likely to export; second, the presence of foreign capital also increases the likelihood of exporting; finally, labor productivity is always positive and significant.

The relationship between lagged innovation and exporting status depends on how we define the treatment. When we include each type of innovations represented by a single binary variable

[15] See Appendix Table A.2.

(Innovation), lagged innovation has a positive and significant impact on the probability of exporting (Model 1).[16] Models 2 to 5 include each innovation type and the results show that apart from product innovation (Model 2), the other three types show statistically significant coefficients. Model 6 presents mutually exclusive innovation categories and its interaction. Again, product innovation alone shows no significant association with export status, while the combination of any type of innovation positively relates to exporting status. The combination of product innovation with any other type is significant (Model 6). Finally, in Model 7 we observe that productivity enhancing innovation –i.e. the firm has undertaken process, organizational or commercialization innovation– shows a positive and significant impact on exports while product innovation alone does not.

We present the marginal effects of the different types of innovation variables on exporting evaluated at the means, in Table 3.b. We find that undertaking organizational innovation, enhancing productivity innovations and any innovation except product increase the probability of exporting by 7 %, while product and commercialization innovation show an effect of 6 %.

The main message seems to be that productivity enhancing innovations positively correlate with the presence into export markets, whereas product innovation alone does not. This would indicate that innovations that reduce production costs ease entry into foreign markets.

So far, the evidence shows a positive association between innovation –any type– and the probability of exporting. When disaggregating by types, product innovation alone turned out to be non-relevant. Productivity-enhancing innovations seem to be paving the way to international markets.

We now turn to MDID. We defined the treatment only in those cases in which a firm switches from reporting no innovative activity in (t-1) to some form of innovation in (t). Firms that reported any form of innovation the first time they were observed in the sample are excluded from the analysis.

In Table 4 we analyze the effect of innovation and different types of innovation on exporting (See Table A.3 in the Appendix for the balancing tests for selected models). As above, we present the results when we consider: (1) any type of innovation, (2) process innovation, (3) product innovation, and (4) productivity enhancing innovation, on export status. Process innovations always have positive and significant effect on the outcome variable, whereas –in two out of three set of results– also for product innovation the results are positive and significant. However, undertaking any type of innovation (Model 1) or productivity enhancing innovation (Model 4), though positive do not show a significant causal link on exports. The impact of process innovation varies according to the matching procedure from 9 % to 13 % while for product innovation ranges between 7 % to 13.6 %.

Thus, the causal effect of some types of innovation on exports is endorsed by MDID models, namely for process and in two out of three cases– also for product innovation, which indicates that introducing this type of innovation in firms that have not done that before, does increase the probability of exporting.

Summarizing, our findings in terms of associations show that productivity improvements were more relevant than product innovation in explaining export status. In terms of causality we

[16] When we exclude labor productivity as control process innovation is positive and significant but product innovation is not significant. Results are available upon request from the authors.

find that the positive correlation between process innovation, and export status can be interpreted as causal, going from innovation to exporting.

4.2. **Effect of Innovation on Export Intensity**

In the previous section we estimated models in with exports were defined as a binary outcome: firms either export or not. However, the exporting performance can also be measured as export intensity: the ratio of exports over total sales. In this sub-section we estimate Tobit models with and without considering the panel structure of the data (with standard errors clustered by firm). Due to space constraints we do not report the results of the Tobit using the panel structure with random effects.[17]

Some significant results were obtained using Tobit models with standard errors clustered at the firm level. Tobit models using the panel structure produced very similar results. In Table 5 we report the coefficient estimated for Tobit models (5.a) with standard errors clustered at the firm level.[18] We find that undertaking any kind of innovation, process, product, product and other and enhancing innovation have a positive and significant association with export intensity. Thus, contrary to our findings for export status, in the case of export intensity undertaking product innovation seems to have a positive association with export intensity. In Table 5.b we present the marginal effects evaluated at the means. We observe that undertaking innovation increases export intensity by 6 %, process and enhancing innovation by 5 % and product and other innovations by 7 %.

5. **Concluding Remarks**

This paper explores the link between innovation activities and exporting behavior among Uruguayan manufacturing firms. On a general level, innovation correlates positively with exporting as shown by logit and Tobit models. Furthermore, a causal relationship can be inferred as MDID show that switching from no innovating to introducing innovations does increase the probability of exporting.

Contrary to previous research for developed countries, product innovation is not the type of innovation that better anticipates the probability of exporting (Becker and Egger, 2009; Caldera, 2010; Cassiman et al., 2010; Damijan et al., 2010). We worked under the assumption that process, organizational, and commercialization innovation, improve the way a firm produces its existing products. Our results suggest that reducing production costs may be more important than creating new products in order for Uruguayan manufacturing firms to enter and survive in the international markets. Similar results were obtained for Turkish manufacturing (Özçelik and Taymaz 2004). Thus, it seems that what matters for Uruguayan firms, which are specialized in goods with low scope for vertical differentiation, is price competition. Regarding export intensity, we find positive effects of innovation by means of Tobit models and using IV-GMM models with two different instruments.

[17] Results are quite similar and available upon request from the authors.

[18] We also consider alternative specifications, such as the growth in export intensity as the dependent variable. Nonetheless, these models did not show any significant results, which are available upon request from the authors.

We conclude that the hypothesis that trade pushes firms to improve efficiency through productivity-enhancing innovations does hold for Uruguay, similarly to the results found by Damijan et al. (2010) in Slovenia.

The results presented highlight the importance of bringing context into consideration when comparing results. For policy-makers and firms in Uruguay, the lesson would be to promote innovation, and mainly productivity-enhancing innovation in order to access and expand in international markets.

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Table 1: Main characteristics of firms according to exporting and innovation status, 2003-2012

	Non-Exporters			Exporters		
	Non-Innovators	Innovators	All Non-Exporters	Non-Innovators	Innovators	All Exporters
Age of the Firm (years)	25.1	29.3	26.6	29.9	35.9	33.5
Employment (number of workers)	31.5	58.5	41	107.8	181.4	152.0
Share of Skilled Workers	8.2	12.4	9.7	8.7	12.8	11.2
Avg. Sales[a] (constant pesos)	34.9	87.2	53.2	279.1	540.1	435.1
Sales/Worker	1.0	1.1	1.0	4.3	3.6	3.9
R&D per Worker[a] (constant pesos)	0	0.8	0.1	0	1.7	0.3
Foreign Capital (% of firms)	3.2	6.3	4.3	22.6	28.3	26.0
Number of Observations	1,365	733	2,098	518	769	1,287

Notes: [a]Thousands of constant pesos, base year 2003. Own elaboration based on survey information provided by ANII.

Table 2: Number and Share of exporters and innovators (2003-2012)

	Exporters					
	Non-Innovators			Innovators		
Survey	Number	Expo	%	Number	Expo	%
2003	407	111	27.3	404	216	53.5
2006	470	153	32.6	364	200	54.9
2009	510	128	25.1	412	199	48.3
2012	496	126	25.4	322	154	47.8
Total	1,883	518		1,502	769	

	Innovators					
	Non-Exporters			Exporters		
Survey	Number	Innova	%	Number	Innova	%
2003	484	188	38.8	327	216	66.1
2006	481	164	34.1	353	200	56.7
2009	595	213	35.8	327	199	60.9
2012	538	168	31.2	280	154	55
Total	2,098	733		1,287	769	

Notes: Authors' own calculations.

Table 3: Innovation and Export Activity

Table 3.a: Coefficients Logit model

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5	‘(6) Model 6	‘(7) Model 7
$Innovation_{it-1}$	0.697**						
	(0.276)						
Process $Innovation_{it-1}$		0.535**					
		(0.266)					
Product $Innovation_{it-1}$			0.351				
			(0.289)				
Commercialization Inn_{it-1}				0.633*			
				(0.363)			
Organizational Inn_{it-1}					0.720**		
					(0.295)		
Only Product Inn_{it-1}						0.627	0.628
						(0.593)	(0.592)
Product & Other Inn_{it-1}						0.669**	
						(0.338)	
All but Product Inn_{it-1}						0.706**	
						(0.326)	
Enhancing Inn_{it-1}							0.689*
							(0.279)
Medium $Size_{it-1}$	3.099***	3.165***	3.214***	3.258***	3.207***	3.117***	3.112***
	(0.496)	(0.496)	(0.499)	(0.499)	(0.500)	(0.498)	(0.497)
Big $Size_{it-1}$	5.695***	5.793***	5.867***	5.934***	5.862***	5.722***	5.712***
	(0.642)	(0.642)	(0.647)	(0.644)	(0.645)	(0.647)	(0.643)
Age_{it}	0.00483	0.00485	0.00511	0.00523	0.00516	0.00496	0.00465
	(0.00818)	(0.00816)	(0.00820)	(0.00831)	(0.00830)	(0.00820)	(0.00819)

Notes: The reference category for Employees is 0-19. Standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1

Cont. Table 3.a: Logit model

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5	‘(6) Model 6	(7) Model 7
Share Skilled Workers$_{it-1}$	0.0143	0.0156	0.0162	0.0163	0.0154	0.0143	0.0142
	(0.0127)	(0.0127)	(0.0127)	(0.0128)	(0.0128)	(0.0128)	(0.0128)
Ln(Sales/Worker)it-1	1.702***	1.711***	1.734***	1.749***	1.758***	1.710***	1.707***
	(0.197)	(0.198)	(0.199)	(0.199)	(0.200)	(0.199)	(0.198)
R&D per Worker$_{it-1}$	0.0399	0.0420	0.0440	0.0402	0.0399	0.0402	0.0403
	(0.0350)	(0.0351)	(0.0352)	(0.0362)	(0.0362)	(0.0351)	(0.0351)
Foreign Owned Firm$_{it-1}$	2.200***	2.169***	2.197***	2.205***	2.190***	2.198***	2.196***
	(0.515)	(0.513)	(0.514)	(0.519)	(0.521)	(0.516)	(0.516)
Constant	-16.48***	-16.47***	-16.57***	-16.81***	-16.85***	-16.54***	-16.49***
	(1.591)	(1.596)	(1.600)	(1.608)	(1.620)	(1.602)	(1.595)
Observations	1,879	1,879	1,879	1,879	1,879	1,879	1,879
Number of id	1,089	1,089	1,089	1,089	1,089	1,089	1,089
Time Dummies	YES	YES	YES	YES	YES	YES	YES
Industry Dummies	YES	YES	YES	YES	YES	YES	YES

Notes: The reference category for Employees is 0-19. Standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1

Table 3.b: Logit Model (Marginal Effects)

VARIABLES	(1) ME 1	(2) ME 2	(3) ME 3	(4) ME 4	(5) ME 5	(6) ME 6	(7) ME 7
$Innovation_{it-1}$	0.066**						
	(0.0262)						
$Process\ Innovation_{it-1}$		0.0508**					
		(0.0253)					
$Product\ Innovation_{it-1}$			0.0333				
			(0.0275)				
$Commercialization\ Inn_{it-1}$				0.0585*			
				(0.0327)			
$Organizational\ Inn_{it-1}$					0.0679**		
					(0.0277)		
$Only\ Product\ Inn_{it-1}$						0.0596	0.0584
						(0.0554)	(0.0536)
$Product\ and\ Other\ Inn_{it-1}$						0.0670**	
						(0.0303)	
$All\ but\ Product\ Inn_{it-1}$						0.0635**	
						(0.0321)	
$Enhancing\ Inn_{it-1}$							0.0653**
							(0.0263)
$Medium\ Size_{it-1}$	0.2388****	0.243***	0.245***	0.245***	0.242***	0.239***	0.239***
	(0.0285)	(0.0283)	(0.0282)	(0.0280)	(0.0282)	(0.0285)	(0.0285)
$Big\ Size_{it-1}$	0.4745***	0.482***	0.486***	0.484***	0.479***	0.475***	0.475***
	(0.0007)	(0.0410)	(0.0410)	(0.0411)	(0.0412)	(0.0414)	(0.0414)
Age_{it}	0.00046	0.000463	0.000487	0.000493	0.000487	0.000473	0.000472
	(0.0008)	(0.000777)	(0.000779)	(0.000782)	(0.000781)	(0.000779)	(0.000779)

Notes: Standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1; dy/dx for factor levels is the discrete change from the base level.

Cont. Table 3.b: Logit Model (Marginal Effects)

VARIABLES	(1) ME 1	(2) ME 2	(3) ME 3	(4) ME 4	(5) ME 5	(6) ME 6	(7) ME 7
Share Skilled Workers$_{it-1}$	0.0014	0.00149	0.00154	0.00154	0.00145	0.00136	0.00135
	(0.0012)	(0.00121)	(0.00121)	(0.00121)	(0.00121)	(0.00122)	(0.00121)
Ln(Sales/Worker)it-1	0.1626***	0.163***	0.165***	0.165***	0.166***	0.163***	0.163***
	(0.0166)	(0.0166)	(0.0166)	(0.0167)	(0.0166)	(0.0167)	(0.0167)
R&D per Worker$_{it-1}$	0.0038	0.00401	0.00420	0.00379	0.00376	0.00383	0.00384
	(0.0033)	(0.00335)	(0.00336)	(0.00342)	(0.00342)	(0.00335)	(0.00335)
Foreign Owned Firm$_{it-1}$	0.199***	0.196***	0.198***	0.196***	0.194***	0.209***	0.198***
	(0.0461)	(0.0459)	(0.0460)	(0.0457)	(0.0458)	(0.0477)	(0.0461)
Observations	1,879	1,879	1,879	1,879	1,879	1,879	1,879
Time Dummies	YES	YES	YES	YES	YES	YES	YES
Industry Dummies	YES	YES	YES	YES	YES	YES	YES

Notes: Standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1; dy/dx for factor levels is the discrete change from the base level.

Table 4: Matching and Difference-in-Differences Results

Matching Procedure	Model	Outcome Variable	ATT	S.E.	No. Treated*	No. Controls*	Total
Nearest Neighbor 5	(1)	Innovation	0.0103	0.0381	505	923	1428
	(2)	Process Inn	0.0924**	0.0446	693	1022	1715
	(3)	Product Inn	0.1302***	0.0444	693	1022	1715
	(4)	Enh. Inn.	0.0348	0.0399	564	957	1428
Kernel	(1)	Innovation	0.0289	0.0382	527	932	1459
	(2)	Process Inn	0.1026**	0.0418	693	1022	1715
	(3)	Product Inn	0.1359***	0.0410	693	1022	1715
	(4)	Enh. Inn.	0.0380	0.0393	564	957	1521
Local Linear Epan.	(1)	Innovation	0.0088	0.0409	505	923	1428
	(2)	Process Inn	0.1268**	0.0526	693	1022	1715
	(3)	Product Inn	0.0735	0.0511	505	923	1428
	(4)	Enh. Inn.	0.0315	0.0470	564	957	1521

Note: we have also used Neighbor 1 and 3 as alternatives in order to perform robustness checks and we obtained similar results, which are available upon request from the authors. Furthermore, we tested using the treatment variable after treatment with a lag and results were similar. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5: Innovation and Export Intensity

Table 5.a: Coefficients Tobit model

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5	(6) Model 6	(7) Model 7
$Innovation_{it-1}$	0.261***						
	(0.0974)						
Process $Innovation_{it-1}$		0.272***					
		(0.0884)					
Product $Innovation_{it-1}$			0.228**				
			(0.0935)				
Commercialization Inn_{it-1}				0.0370			
				(0.109)			
Organizational Inn_{it-1}					0.139		
					(0.0938)		
Only Product Inn_{it-1}						0.0439	0.0390
						(0.213)	(0.213)
All but Product Inn_{it-1}						0.186	
						(0.114)	
Product and Other Inn_{it-1}						0.349***	
						(0.111)	
Enhancing Inn_{it-1}							0.270***
							(0.0972)
Medium $Size_{it-1}$	1.008***	1.019***	1.041***	1.069***	1.054***	1.009***	1.009***
	(0.154)	(0.152)	(0.152)	(0.151)	(0.152)	(0.153)	(0.154)
Big $Size_{it-1}$	1.916***	1.928***	1.958***	2.023***	1.991***	1.904***	1.916***
	(0.179)	(0.176)	(0.173)	(0.173)	(0.175)	(0.178)	(0.179)
Age_{it}	-0.00499**	-0.00500**	-0.00497**	-0.00485*	-0.00491*	-0.00500**	-0.00494*
	(0.00253)	(0.00251)	(0.00252)	(0.00251)	(0.00251)	(0.00253)	(0.00252)

Notes: Productivity is included as sales per worker. Robust standard errors clustered by firm in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Cont. Table 5.a: Coefficients Tobit model

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5	(6) Model 6	(7) Model 7
Share of Skilled$_{it-1}$	0.00280	0.00317	0.00318	0.00430	0.00377	0.00242	0.00275
	(0.00424)	(0.00424)	(0.00423)	(0.00424)	(0.00425)	(0.00423)	(0.00424)
Ln(Sales/Worker)$_{it-1}$	0.600***	0.599***	0.611***	0.612***	0.610***	0.601***	0.599***
	(0.0598)	(0.0598)	(0.0593)	(0.0590)	(0.0590)	(0.0599)	(0.0598)
R&D per Worker$_{it-1}$	0.00871*	0.00843*	0.00845*	0.00981**	0.00947**	0.00786*	0.00860*
	(0.00465)	(0.00452)	(0.00464)	(0.00483)	(0.00473)	(0.00455)	(0.00463)
Foreign Capital$_{it-1}$	0.642***	0.631***	0.648***	0.644***	0.641***	0.639***	0.637***
	(0.138)	(0.138)	(0.138)	(0.139)	(0.139)	(0.138)	(0.138)
Constant	-5.352***	-5.337***	-5.389***	-5.382***	-5.382***	-5.358***	-5.343***
	(0.426)	(0.427)	(0.424)	(0.423)	(0.424)	(0.426)	(0.426)
Observations	1,885	1,885	1,885	1,885	1,885	1,885	1,885
Time Dummies	YES	YES	YES	YES	YES	YES	YES
Industry Dummies	YES	YES	YES	YES	YES	YES	YES

Notes: Productivity is included as sales per worker. Robust standard errors clustered by firm in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 5.b: Marginal Effects for the Tobit Model Evaluated at the Means

VARIABLES	(1) ME	(2) ME	(3) ME	(4) ME	(5) ME	(6) ME	(7) ME
$Innovation_{it-1}$	0.0578*						
	(0.0308)						
Process $Innovation_{it-1}$		0.0546*					
		(0.0297)					
Product $Innovation_{it-1}$			0.0526				
			(0.0325)				
Commercialization Inn_{it-1}				0.00651			
				(0.0382)			
Organizational Inn_{it-1}					0.0215		
					(0.0320)		
Only Product Inn_{it-1}						0.0439	0.0401
						(0.0675)	(0.0674)
All but Product Inn_{it-1}						0.0367	
						(0.0356)	
Product and Other Inn_{it-1}						0.0741*	
						(0.0379)	
Enhancing Inn_{it-1}							0.0534*
							(0.0311)
Medium $Size_{it-1}$	0.284***	0.287***	0.289***	0.295***	0.293***	0.284***	0.285***
	(0.0465)	(0.0462)	(0.0462)	(0.0461)	(0.0462)	(0.0464)	(0.0464)
Big $Size_{it-1}$	0.606***	0.615***	0.617***	0.629***	0.625***	0.610***	0.612***
	(0.0605)	(0.0601)	(0.0601)	(0.0599)	(0.0600)	(0.0605)	(0.0605)
Age_{it}	-0.00226**	-0.00227**	-0.00225**	-0.00226**	-0.00226**	-0.00226**	-0.00226**
	(0.00108)	(0.00108)	(0.00108)	(0.00108)	(0.00108)	(0.00108)	(0.00108)

Cont. Table 5.b: Marginal Effects for the Tobit Model Evaluated at the Means

VARIABLES	(1) ME	(2) ME	(3) ME	(4) ME	(5) ME	(6) ME	(7) ME
Share of Skilled Workers$_{it-1}$	0.00107	0.00109	0.00110	0.00125	0.00119	0.000967	0.000993
	(0.00135)	(0.00135)	(0.00135)	(0.00134)	(0.00135)	(0.00135)	(0.00135)
Ln(Sales/Worker)$_{it-1}$	0.219***	0.222***	0.223***	0.225***	0.225***	0.222***	0.222***
	(0.0188)	(0.0189)	(0.0188)	(0.0188)	(0.0188)	(0.0189)	(0.0189)
R&D per Worker$_{it-1}$	-0.000448	-0.000377	-0.000264	-0.000222	-0.000220	-0.000303	-0.000281
	(0.00233)	(0.00234)	(0.00234)	(0.00235)	(0.00234)	(0.00234)	(0.00234)
Foreign Owned Firm$_{it-1}$	0.435***	0.427***	0.428***	0.427***	0.426***	0.428***	0.428***
	(0.0599)	(0.0600)	(0.0600)	(0.0600)	(0.0601)	(0.0600)	(0.0600)
Constant	-1.216***	-1.106***	-1.112***	-1.118***	-1.118***	-1.108***	-1.110***
	(0.131)	(0.128)	(0.128)	(0.128)	(0.128)	(0.128)	(0.128)
Observations	1,885	1,885	1,885	1,885	1,885	1,885	1,885
Number of id	1,091	1,091	1,091	1,091	1,091	1,091	1,091
Time Dummies	YES	YES	YES	YES	YES	YES	YES
Industry Dummies	YES	YES	YES	YES	YES	YES	YES

Note: Standard error in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Appendix

Table A.1: Correlation matrix between different types of innovation

	Innovation	Product Innovation	Process Innovation	Organizational Innovation	Commercialization Innovation	Enhancing Productivity Inn.
Innovation	1					
Product Innovation	0.6367	1				
Process Innovation	0.7894	0.5365	1			
Organizational Innovation	0.5421	0.3143	0.4275	1		
Commercialization Innovation	0.4117	0.3636	0.3547	0.4632	1	
Enhancing Productivity Inn.	0.9033	0.5165	0.8739	0.6001	0.4557	1

Notes: Authors' own calculations.

Table A.2: Number of Observations by Type of Innovation

Innovation Activity	Freq.	Percent
Non-Innovative	1,883	56
Innovative	1,502	44
Only Product	134	4
Product and Other	690	20
All but Product	644	19
All four types	190	13
Total	3,385	

Notes: Authors' own calculations.

Table A.3: Balancing tests for selected models

Treatment: Start to innovate						
Kernel Matching	Outcome:	Unmatched ATT			t-test (matched)	
Variable	Exports (t)	Treated	Control	% bias	t	p>|t|
Export Status		0.441	0.450	-2.000	-0.230	0.819
Lagged Employment		80.043	65.444	8.600	2.050	0.041
Lagged Share of Skilled Workers		8.820	7.311	11.300	1.540	0.124
Lagged R&D per worker		8.043	0.000	0.700	1.560	0.119
Lagged Foreign Ownership		12.076	11.064	3.300	0.380	0.701

Treatment: Start to innovate						
Local Linear Epan Matching	Outcome: Exports (t)	Unmatched ATT			t-test (matched)	
Variable		Treated	Control	% bias	t	p>|t|
Export Status		0.442	0.376	13.500	1.720	0.086
Lagged Employment		79.899	72.109	4.600	1.200	0.229
Lagged Share of Skilled Workers		8.872	9.683	-6.000	-0.820	0.414
Lagged R&D per worker		9.986	0.000	0.900	1.550	0.122
Lagged Foreign Ownership		12.263	8.802	11.200	1.430	0.152

Note: We report the balancing tests for the kernel and local linear matching techniques, with exports as the outcome variable.