Product Quality and Exporting: Evidence from Italian Manufacturing Firms

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ABSTRACT: In this paper we study the effect of innovation on the firm propensity to export. Preliminary, we develop a simple model where heterogeneous firms operate in a monopolistically competitive market and set their prices as a markup above the marginal cost. Innovation is conceived as a quality improving strategy, and allows firms to increases the markup that they can charge. The key proposition of our model is that firms that invest in better quality products are more likely to export. We test this proposition using data on Italian firms over the period 2004-2006. Consistently with the predictions of the theoretical model, the econometric results suggest a positive effect of firm innovation on firms' propensity to export. Specifically, although process innovation has a positive effect on the probability of exporting the effect is not as large as for product innovation. The empirical investigation further reveals that product innovation defined as quality improvement on the existing line of product is not as large as the effect of product innovation defined as developing a new product. Finally, we restrict our sample to firms who export in 2006 and again observe that new product innovation exert the largest impact on export performance.

JEL classification: L1, O31, C24

Keywords: exports, innovative activities, quality.

1. Introduction

Worldwide manufacturing firms are facing a growing competitive pressure coming from the newly industrializing countries (NICs) which produce and export in the global markets cheap and competitive commodities. Firms in high-cost countries cope with such difficulties in various ways. Some raise their capital/labour ratio through massive investments, while others outsource or relocate a part or all of their activities to low-cost areas. Many entrepreneurs, however, meet the challenge in a different way that does not involve cost-reduction. They attempt to regain a long-lasting competitive advantage through enhanced knowledge creation. This idea is at the heart of the so called knowledge-based economy where the competitive edge of many firms operating in high-costs countries has ultimately shifted from static price competition towards dynamic improvement, favoring those who can create knowledge faster than their competitors (Maskell and Malberg, 1999: 167).

It appears, though, as the previous literature has failed to disentangle how knowledge-based innovation can impact export performance. Most studies, based on Melitz (2003), assume that firms set prices as a fixed markup over marginal cost. In these studies, innovation is typically interpreted as improvements in the "production process" that lead to a reduction of the marginal cost of production. Following these assumptions, only the more productive firms will innovate and output prices should be decreasing in the level of innovation (Bustos, 2011; Caldera, 2010). However, this conclusion does not seem to fit the stylized fact very well, since innovation is not usually found to be associated with lower prices. Italy is a case in point: several recent studies (Basile et al., 2006; Borin and Quintieri, 2006) have shown that Italian exports gained momentum in the last years mainly thanks to what could be labeled a "quality" effect – while the volume of exported commodities stayed unchanged the overall value of exports has grown; this has been interpreted as a rise in the quality of exported commodities matched to an increase in the unit value of goods sold abroad. Moreover, Giovannetti et al. (2012) found that, at leas in some manufacturing sectors (such as apparel) Italian producers countered the competitive pressure coming from China, upgrading the quality of their products, as suggested by the positive and significant coefficient of the unit value of exports.

Given this gap between theoretical prediction and empirical finding, Johnson (2007) calls for a revision of the baseline model to include heterogeneous "product quality" to better fit the

stylized facts. In this vain, we propose a model of the effect of product innovation on the firm propensity to export. In our model, innovation does not necessarily decreases the marginal cost (and hence the output price); still it is profitable because it increases the markup that the firm can charge. Although we develop the theoretical model solely in terms of innovation as quality improving strategies, we do not disregard that innovation can lead to cost savings and we control for this factor in our the empirical estimation. This will allow us to shed light on the complete spectrum of how innovation can affect export. The previous literature proxies innovation with the amount of investment in R&D (Aw et al, 2011). We add to this literature by distinguishing the effect of innovation as cost saving strategies from innovation as quality enhancing strategies. To test which form of innovation is more relevant, we use the "Survey of Italian Firms" (UniCredit, 2008) a unique data set that contains specific information on whether the objective behind the firm's investment decision was: (1) to reduce the cost of production, (2) to produce new product, (3) to improve the quality of existing product. The paper is structured as follows: in the next section we briefly review the relevant literature on the role of innovation and quality for firms aiming at becoming exporters. In section 3, we introduce a simple model of heterogeneous firms performing innovation and product quality improvements. Subsequently, in section 4 we present the empirical methodology and the data used to test the model findings. Section 5 presents our econometric results and section 6 concludes.

2. Exports, Innovation and Quality: an Overview of the Literature

The recent trade literature has unveiled a significant concentration of exports in a handful of firms. On this point empirical evidence is unambiguous, showing that "A minority of the firms that export make up the bulk of exporting activity measured on a value basis. […] in most […] countries, the largest 5 percent of exporting firms account for more than three-quarters of total exports" (WTO, 2008). These stylized facts have been incorporated into theoretical models of trade that consider firm heterogeneity to explain differences in patterns of export participation as an interaction between firm productivity and fixed costs to export. Melitz (2003) constructed a model in which only a few highly productive firms engage in exporting. The underlying idea is that firms have a heterogeneous level of productivity and only highly productive firms are able to make sufficient profits to cover the large fixed costs required for exporting. Various scholars

(Eaton and Kortum, 2002; Bernard et al, 2003) empirically estimated the link between productivity and exporting concluding that exporter premia can be explained by self-selection of best performers into export markets, rather than by learning by exporting.

The importance of innovation for exporting is based on the assumption that innovation can increase a firm's productivity. In fact, several empirical studies have documented a positive correlation between investment in R&D and exporting using micro-level data (Aw et al. 2007; Cassiman and Martınez-Ros 2005; Girma et al. 2008; Iacovone and Javorcik 2008; Lileeva and Trefler 2011). However, only recently a few theoretical papers have formalized the potential linkages between firm productivity, export decisions and R&D efforts. In particular, Melitz and Constantini (2008) present a model in which firms anticipate trade liberalisation by making investments to upgrade their production process through innovation. The reason is that higher expected profits from internationalisation are contingent on higher productivity. Similarly, Aw et al. (2011) develop a structural model of the firm decision to invest in R&D and participate in the export market. Using a sample of Taiwanese firms they find that the self-selection of high productive plants is the main driver of the decision to export and to undertake R&D. Their study suggests further that both R&D and exporting have a positive effect on the plant's future productivity. However, they find little effect of investments in R&D on the export decision once they control for the initial productivity differences.

Using the same logic, Bustos (2011) shows that expected increases in revenues produced by trade integration can induce exporters to upgrade their technology. This is particularly true for firms with medium productivity levels. These firms have a stronger interest in investing in technological upgrading, since they are at the fringe and are most probably hit by the selection processes following trade liberalisation. Caldera (2010) modifies Bustos (2011) to derive a simple theoretical model of the decision to export and innovate. In the model firms are heterogeneous in terms of productivity and have the choice to invest in innovation to upgrade their technology. As in Bustos (2011), Caldera interprets innovation as "process innovation" in line with Melitz (2003). The model predicts that innovating firms are more likely to participate in exporting than non-innovating firms. Although innovating and non-innovating firms face similar fixed costs to access export markets, the innovating firms generate higher expected profits from exporting that makes them more likely to export. Caldera tested this proposition on a sample of Spanish firms and found a positive effect of firm innovation on the probability of participation in

export markets. The study is innovative in that it uses information on whether the investment in R&D was geared toward process innovation or product innovation. However, the author failed to recognize that any investment in product innovation was not consistent with her model. Also, she never included both measures of innovation at the same time in her estimation, so she could not compare directly which form of innovation is a stronger determinant of the firm's propensity to export.

Antoniades (2012) and Borin (2008) independently developed a model of how heterogeneity in productivity influences quality strategies and how these two components are affected by trade. The proposed theoretical models differ from existing literature in the fact that the quality of production is endogenously determined by each firm. Both papers conclude that exporters are more productive than non-exporters. As the most productive firms tend to produce high quality, the average quality of goods sold abroad is higher with respect to domestic sales. The two papers differ in that Borin (2008) focuses more on the effect of trade cost on the quality composition of export, while Antoniades (2012) focuses more on the effect of the trade partner's characteristics such as size and income.

Building on the latter development of the literature, we use a strategy similar to Caldera (2010) to derive a model of the effect of innovation on export propensity. While Caldera (2010) use the set up in Busto (2011) to derive a model of the effect cost saving innovation on the propensity to export, we start from Borin (2008) to derive a model of the effect of product innovation on the propensity to export. The main prediction of our model is that firms that invest in innovation and quality upgrading will also be more likely to export. We subsequently test this prediction and present empirical results in section 5.

3. Theoretical model

In this section, we borrow heavily from Borin (2008). In line with the current literature, we assume firms with underlying heterogeneous productivity operate in a monopolistically competitive market and set their prices as a markup above the marginal cost. As the cost structure varies according to the production quality, firms that differ in productivity may adopt different strategies of vertical differentiation. In order to analyze the differences in pricing

behaviors of vertically differentiated producers, a theoretical framework that allows firms to charge variable markups is considered (Melitz and Ottaviano, 2008).

3.1 Demand

We modify Melitz and Ottaviano (2008) utility function for a representative consumer to allow quality to appear in the representation of preferences:

$$U = q_0 + \int_o^N \lambda_i q_i \, di - \frac{1}{2}\gamma \int_o^N \lambda_i (q_i)^2 di + \frac{1}{2}\eta \left(\int_o^N \lambda_i q_i \, di \right)^2 \quad (1)$$

where q_0 is the quantity of consumption in the numeraire good, q_i is the quantity of consumption of a differentiated good over a continuum of variety and λ_i is a quality measure of the i-th variety. Note that if $\lambda_i = 0$, the equation above collapsed to Melits and Ottaviano (2008). The parameter η measures the degree substitutability between the differentiated goods and the numeraire, while γ indexes the degree of product differentiation among differentiated goods. Setting the price of the numeraire good equal to 1, we can solve the consumer maximization problem to derive the individual demand for variety *i* as in Borin (2008):

$$q_i = \frac{1}{\gamma + \eta N \Lambda} - \frac{1}{\gamma}\frac{p_i}{\lambda_i} + \frac{\eta N \Lambda}{\gamma(\gamma + \eta N \Lambda)}\frac{P}{\Lambda} \quad (2)$$

where $\Lambda = \left(\int_0^N \lambda_i di \right)/N$ and $\mathrm{P} = \left(\int_0^N p_i di \right)/N$. The demand for the product *i* is negatively related to its price p_i and positively related to the price of the other goods *P*. Moreover an increase in the quality supplied by the firm *i* boosts its demand, while an increase in the average quality in the market reduces the demand for good *i*.

3.2 Supply

Each firm produces a single variety *i* of good q_i. As in Melitz and Ottaviano (2008), firms have marginal cost (c_i) that is drawn from a distribution of possible productivity parameters. Firms with high marginal costs (low productivity) exit. Firm with low marginal cost (high productivity) stay in the market and produce a single variety *i* of the differentiated good. Following closely Borin (2008), this model is augmented to include not only the firm's decision to produce, but also whether to undertake quality upgrades for their products. Firms that decide to develop a high quality product {I=1} need to incur a fixed cost (f_I) that is higher than the fixed cost of firms that

choose not to innovate {I=0}. The marginal cost of production is increasing in the level of quality chosen, $\lambda_{I=1}c_i > \lambda_{I=0}c_i$. Markup ($\mu_i$) and total profits ($\pi_i$) are defined as:

$$\mu_i = (p_i - \lambda_I c_i) = \frac{\lambda_i}{2}(c_D - c_i) \tag{3}$$

$$\pi_i = \frac{\lambda_I L}{4\gamma}(c_D - c_i)^2 - f_I \tag{4}$$

Where L is the number of consumers and c_D is the marginal cost of the least productive firm that will be indifferent between producing and leaving the market. Equation (3) indicates that, given a certain productivity, a higher quality producer will increase its markup.

3.3 Innovation decision

Firms observe their productivity and then decide whether to invest in R&D to improve the quality of the product. Firms will choose to invest as long as profits from innovating $\{\pi^{I=1}\}$ will exceed the non innovating profits $\{\pi^{I=0}\}$, i.e.

$$\pi^{I=1} > \pi^{I=0} \leftrightarrow \frac{L}{4\gamma}(c_D - c_i)^2(\lambda_{I=1} - \lambda_{I=0}) > f_{I=1} - f_{I=0} \tag{5}$$

The expression above shows that a firm's gains from high quality variety are larger the smaller its marginal cost. Therefore, high quality products are produced by the most productive firms in the market.

3.4 Export decision

For the purpose of this research, we modify Borin (2008) to derive the exporting conditions of firms that innovate versus those that do not. When deciding whether to export, a firm needs to consider that international trade entails two additional costs: a fixed cost of exporting (f_x) and a per unit trade cost ($0 > \tau > 1$). The fixed cost can be interpreted as a distribution and servicing cost in the foreign country while the variable cost represent the transportation cost. We assume that both costs are independent from the quality of the good delivered. The export profits are:

$$\pi_i^X = \frac{\lambda_I L^X}{4\gamma}\left[c_D - c_i\left(\frac{\lambda_I + \tau}{\lambda_I}\right)\right]^2 - f_x \tag{6}$$

Note that f_I does not appear in equation (6) since this equation represents the extra profit the firm can earn by operating in the international market taking the quality choice as given.

Proposition *firms that invest in better quality products are more likely to export.*

To verify the proposition above, we need to compare the total profits, given by the sum of the profits from the domestic market and from the international market, to the profits from serving only the domestic market, i.e.

$$\pi_i^D + \pi_i^X > \pi_i^D. \tag{7}$$

which, after using equation (6) becomes

$$\frac{\lambda_I L^X}{4\gamma}\left[c_D - c_i\left(1 + \frac{\tau}{\lambda_I}\right)\right]^2 > f_x \tag{8}$$

Since $\lambda_{I=1} > \lambda_{I=0}$, the right hand side of equation (8) is clearly larger for firms that choose to produce high quality, while the cost of exporting is independent from the firm's quality choice. Hence the preposition above is verified. In what follows, we try to empirically test this proposition.

4. Data and empirical strategy

The data for empirical analysis is provided by the 10th wave of the Survey of Italian Firms, conducted by UniCredit (2008). The sample consists of more than 5 thousands small and medium size manufacturing firms (10 to 500 employees). The survey asks retrospective questions about the management of the firm over the period spanning from 2004 to 2006. We do not observe directly whether the firm was successful in innovating during these three years, but we know whether the firm invested over the period. We are interested in two forms of investment: namely, product and process innovation. Specifically, product innovation is characterized as (1) investments in new products and (2) investments in the improvement of existing products' quality; process innovation is characterized as (3) investment aiming at curbing production costs. The ability to discriminate between these sources of investment will allow us to evaluate our theoretical framework against more popular view that innovation has a positive effect on export propensity merely because it decreases the cost of production (Melitz, 2003; Bustos, 2011; Caldera, 2010). In fact, in our model innovation increases the propensity to export because it increases the quality of the product. We speculate that, for a developed economic like Italy, quality should play a bigger role when competing on the international arena.

If so, but focusing only on the cost reducing property of innovation, the previous literature has failed to explain why even high cost country can still be successful in a globalized world.

It is possible for a firm to invest in both product and process innovation. Although it is impossible to establish the amount of the investment directed to each specific form, we know from the survey the objective behind the investment decision. In particular, the questionnaire asked firms to report up to three reasons for investing and to rank their choices. The possible options are: 1) to improve existing products; 2) to increase production level; 3) to develop new products; 4) to reduce environmental damages; 5) to reduce production cost (labor, raw material, etc.); 6) marketing; 7) to improve the distribution network; 8) to improve customer service; 9) other. In this paper we take option (1) and (3) as measures of product innovation and option (5) as a measure of cost reducing process innovation. Using this information we create dummy variables that identify whether a specific form of investment was ranked as number one or two by the firm, does allowing for a firm to invest in both forms of innovation at the same time.

Since the model predicts that the propensity to export is a function of the underlying firm's productivity, we proxy the firm's productivity with the average revenue per worker. We also control for the age of the firm, the regional location, and the industry of operation. We estimate both the probability that a firm exports in 2006 and, for those that export, the revenue for export. The descriptive statistics of the variable used in this study are reported in Table 1.

While we know whether a particular firm export in 2006, we do not know its position on the international market in 2004. However, equation (5) indicates that the propensity to innovate is a positive function of the size of the market (L). By virtue of opening the product to new consumers, international trade can make quality upgrading more profitable. Thus, failing to control for the export status of the firm at the beginning of the period puts some serious strains on the ability to estimate an unbiased measure of the effect of innovating between 2004 and 2006 on export performance in 2006, since innovating between 2004 and 2006 may just be a result of exporting at the beginning of the period. To overcome this problem we adopt the following strategy. There is small number of firms (841) that were also interview in the previous wave of the survey. Hence for this sub-group we know what the export position in 2003 was. An interesting feature of the UniCredit (2008) is that it is possible to link each firm in the survey to its historical balance sheets from AIDA (Analisi Informatizzata delle Aziende) and Centrale dei

Bilanci. Thus, we were able to obtain the income statement in 2003 for each firm in the 10 wave. Using this information, we estimated the probability that a firm exported in 2003 for the 841 firms that were interviews in both waves. We define the probability of exporting as a function of the firm's age, total spending in research and advertisement, the value of any patent holding, total cash and cash equivalent, properties, equity, sales, payroll, and geographical and industry dummies. Then we predict out of the sample the probability that a firm was exporting in 2003 using the estimate from the subsample of firms present in both waves. Finally we include this estimated probability in our empirical model for equation 5.

5. Results

We started the discussion of our results with the estimation of the propensity to export. The first two columns of Table 2 report the results of our probit estimations with and without the lag indicator for exporting. For an easy interpretation of the coefficients we report the marginal effects. Consistently with results in the existing literature, we found that the firm's productivity is an important drive of the propensity to export: the more productive the firm, the higher the probability that the firm will export. One reason for while innovation can have a positive effect on export performance is because innovation increases firm's productivity. However, all our measures of innovation are significant even if we condition on the level of productivity of the firm. This result suggests innovation has a direct effect on firm's propensity to export. Interestingly, we found that although process innovation has a positive effect on the probability of exporting as predicted by Caldera (2010) the effect is not as large as for product innovation. For example, investments aiming at cutting the cost of production increase the probability of exporting by half as much as investments aiming at the development of new products. It should be noticed though, that product innovation as quality improvement on the existing line of product is not as large as the effect of product innovation as developing a new product. This result highlights the importance of keeping the two forms of innovation separately rather than combining them in one variable as done in previous studies (Caldera, 2010; Morone et al., 2013). The remaining variables have the usual interpretation. Propensity to export is positively correlated with age and size of the firm. Compared to firms operating in the food, beverage and

tobacco sector, firms operating in the wood, paper, refinery, and non-metallic minerals industry (traditionally low technological industries) have a lower probability of exporting.

The previous literature has concluded that learning by exporting is not credible thus excluding the possibility of reverse causality (Eaton and Kortum, 2002; Bernard et al, 2003). Still, one could conjecture that some unobserved heterogeneity could bias the effect of innovation on export propensity found in column 1. The UniCredit dataset is partially a panel. The survey is administered every three years. Each wave, 20 percent of the sample stays and the remaining is replaced with new firms. In theory one could run a fixed effects model on the overlapping sample between the 9th and 10th wave. However, the identification of the fixed effects relays only on firms that changed their export status between waves. This would leave us with a sample of only 150 firms that can be used in the fixed effect estimation, a sample size too small to produce reliable and robust estimates. Alternatively, we exploit an important feature of our dataset to predict the probability that a firm appearing in the 10th wave but not in the preceding one was exporting in 2003. As discussed in section 4 above, by adding a lag dependent variable we can capture the importance of the sunk costs on export market participation (Roberts and Tybout, 1997). Even if this extended model may not be able to fully control for all of the firm's idiosyncratic characteristics, it will definitively reduce the amount of the bias related to these unobserved factors.

To predict the probability that a firm was exporting in 2003, we match the 2003 balance sheets for each firm in the 10th wave to the export status in the 9th wave. For the sample overlapping the two waves, we estimate the probability that a firm exported in 2003 using information on the amount spent in R&D, the monetary value of any patent holding, the value of liquid assets, properties, equity, revenues from sales, and the amount spent in payroll. We also control for the age of the firm, the major geographical location (north-east, north-west, center, and south)[1] and the sector of operation. The results of this estimation are reported in Appendix 1. Using the results from this regression, we predict out-of-sample the probability that a firm exported in 2003 for the non-overlapping sample. Column 2 of Table 2 reports the results of the estimation of our basic model augmented with the created lag export variable. Not surprisingly we found that the lag variable is a strong predictor of the probability that a firm will export in 2006. After

[1] Given the small number of observation in this regress, we need to aggregate the location variables at a macro level to avoid the problem of empty region cells.

including the lag export variable, the indicator for new product and cost cutting innovation become smaller but they retain their significance. Also, the conclusion that the impact of new product is twice as large as the impact of cost cutting remains true. The effect of quality improvements instead is not affected at all by the inclusion of the lag export variable.

In column 3 of Table 2 we restrict our sample to firms who export in 2006 and we analyze the effect of the three forms of innovation on the firm's earnings from export. Since our dependent variable is in log, the coefficients in Table 2 represent the semi-elasticities. Again we observe that new product innovation exert the largest impact on export performance: firms that have had any investment of this form saw an increase in the earnings from export of 44%. Cost cutting innovations are associated with an increase of earnings from export of 19% and improvements in the quality of existing products leads to an increase in earnings from export of 16%. After including the lag export variable (column 4) we found the effect of the three forms of innovation diminished, while their relative magnitude is confirmed.

6. Conclusions

This paper investigated the effects of innovation on firms' propensity to export. Building on recent literature, we preliminary developed a simple model where heterogeneous firms operate in a monopolistically competitive market and set their prices as a markup above the marginal cost. Innovation is conceived as a quality improving strategy and allows firms to increases the markup that they can charge. The key proposition of our model is that firms that invest in better quality products are more likely to export. We test this proposition using data on Italian firms over the period 2004-2006.

Consistently with the predictions of the theoretical model, econometric results suggest a positive effect of firm product quality upgrading on firms' propensity to export. This finding appears to be robust to alternative specifications and different sample definitions. Specifically, the empirical test allowed us to conclude that although process innovation has a positive effect on the probability of exporting the effect is not as large as for product innovation. The econometric investigation further revealed that product innovation as quality improvement on the existing line of product, is not as large as the effect of product innovation as developing a new product. In fact, this is by far the most effective strategy as for increasing the probability of exporting.

A further development of our investigation reveals that when restricting the sample to firms who exported in 2006, again new product innovation exert the largest impact on export performance suggesting that firms that have had any investment of this form saw an increase in the earnings from export by more than one third of their turnover.

In conclusions, our model and our econometric assessment suggest that innovation (defined as product, process and quality upgrading) has a significant effect on both (1) firms' propensity to export and, for those who are already exporting, (2) firms' turnover. These findings suggest that more innovative firms self-select into international markets and that the competitive edge of those firms already operating in the international arena, is largely associated to their ability of introducing new products into the market.

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TABLE 1: descriptive statistics

Name	Definition	Mean	Std. Dev
EXPORT	D.V., 1 = firm exports in 2006	0.6394	0.4802
QUALITY	D.V., 1 = investment aimed at improving existing products	0.3530	0.4780
NEW PRODUCT	D.V., 1 = investment aimed at developing new products	0.1015	0.3020
LOWER COST	D.V., 1 = investment aimed at lowering the cost of production	0.1865	0.3896
Productivity	Revenue in 2004 divided by number of employees in 2004	12.10	0.88
AGE	Age of the firm	30.29	23.93
SIZE	Number of employees	89.24	306.58
regions ("Abruzzo" is the reference group)			
	D.V., 1= Basilicata	0.0025	0.0503
	D.V., 1= Calabria	0.0058	0.0757
	D.V., 1= Campania	0.0288	0.1673
	D.V., 1= Emilia-Romagna	0.1215	0.3268
	D.V., 1= Friuli Venezia-Giulia	0.0307	0.1724
	D.V., 1= Lazio	0.0256	0.1579
	D.V., 1= Liguria	0.0106	0.1025
	D.V., 1= Lombardia	0.3182	0.4658
	D.V., 1= Marche	0.0390	0.1935
	D.V., 1= Molise	0.0025	0.0503
	D.V., 1= Piemonte	0.0996	0.2995
	D.V., 1= Puglia	0.0249	0.1558
	D.V., 1= Sardegna	0.0106	0.1025
	D.V., 1= Sicilia	0.0164	0.1269
	D.V., 1= Toscana	0.0793	0.2703
	D.V., 1= Trentitno Alto-Adige	0.0141	0.1178
	D.V., 1= Umbria	0.0168	0.1287
	D.V., 1= Valle D'Aosta	0.0012	0.0339
	D.V., 1= Veneto	0.1303	0.3366
Manufacturing sector of operation ("food, beverages, and tobacco" is the reference group)			
	D.V., 1= Textile and clothing	0.0975	0.2967
	D.V., 1= Leather	0.0350	0.1839
	D.V., 1= Wood	0.0277	0.1640
	D.V., 1= Paper and paper printing	0.0620	0.2412
	D.V., 1= Petroleum and coke	0.0032	0.0567
	D.V., 1= chemicals	0.0466	0.2108
	D.V., 1= plastic and robber	0.0533	0.2246
	D.V., 1= Mineral	0.0689	0.2534
	D.V., 1= Metals	0.1937	0.3952
	D.V., 1= Mechanical machines	0.1494	0.3565
	D.V., 1= Electronic machines	0.0911	0.2878
	D.V., 1= transportation machines	0.0261	0.1593
	D.V., 1= other	0.0636	0.2441
N Obs		4337	

TABLE 2:

	Prob(1=export in 2006)				OLS (log Export Revenues)			
	(1)		(2)		(3)		(4)	
EXPORT in 2003			1.6782	***			3.2787	***
			(0.0620)				(0.2981)	
			[0.5320]					
QUALITY	0.1367	***	0.1454	***	0.1582	***	0.1272	***
	(0.0436)		(0.0418)		(0.0346)		(0.0351)	
	[0.0460]		[0.0461]					
NEW PRODUCT	0.2724	***	0.2053	**	0.4373	***	0.3641	***
	(0.0710)		(0.0845)		(0.0684)		(0.0510)	
	[0.0918]		[0.0651]					
LOWER COST	0.1405	***	0.0960	**	0.1931	**	0.1317	*
	(0.0426)		(0.0477)		(0.0847)		(0.0726)	
	[0.0473]		[0.0304]					
Productivity	0.0901	***	-0.0701	**	0.8258	***	0.5790	***
	(0.0188)		(0.0285)		(0.0390)		(0.0508)	
	[0.0304]		[0.0222]					
AGE	0.0052	***	0.0035	***	0.0071	***	0.0038	***
	(0.0013)		(0.0013)		(0.0007)		(0.0009)	
	[0.0018]		[0.0011]					
SIZE	0.0007	**	0.0002		0.0018	***	0.0014	***
	(0.0003)		(0.0001)		(0.0003)		(0.0002)	
	[0.0002]		[0.0001]					
constant	-1.4533	***	-0.3308		-3.3091	***	-2.2164	***
	(0.2482)		(0.3378)		(0.5308)		(0.5172)	
R-sq					0.3461		0.4503	
N obs	4337		3818		2748		2456	

Region and industry dummy variables included but not reported

Standard errors in parentesis and marginal effects in brackets

Standard errors are clustered at the region level

*** denotes significance at 1%, ** denotes significance at 5%, and * denoted significance at 10%

APPENDIX 1

TABLE 3: Prob(1=export in 2003)

AGE	-0.0002	
	(0.0023)	
Ln(R&D and Advertisement)	0.0250	*
	(0.0147)	
Ln(Patent)	0.0104	
	(0.0121)	
Ln(Cash)	0.0578	**
	(0.0250)	
Ln(Equity)	0.0503	
	(0.0466)	
Ln(Sales)	0.2299	*
	(0.1261)	
Ln(Properties)	0.0032	
	(0.0745)	
Ln(Payroll)	0.0098	
	(0.1244)	
North-East	-0.0922	
	(0.1420)	
Center	-0.3483	**
	(0.1566)	
South	-0.4815	***
	(0.1823)	
constant	-4.6044	***
	(1.0048)	
N obs		841

Industry dummy variables included but not reported

Standard errors robust to unobserved heteroskedasticity

*** denotes significance at 1%, ** denotes significance at 5%, and * denoted significance at 10%