The Export Activity of Spanish Manufacturing Firms: Does Innovation Matter?.

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Abstract.

The article analyses the export behaviour of a sample of Spanish manufacturing firms for the year 2000, estimating which factors affect that behaviour, and, above all, the influence of firm's innovation activities. For doing that, it begins testing if its better to use a Tobit specification for the model rather than, following Wakelin's methodological approach, to estimate a Probit model for the decision of participating or not in foreign markets and, afterwards, estimate a Truncated Regression model for the export propensity of firms. The results show that variables influencing the decision of participate in foreign markets are different from those that affect export propensity, rejecting the Tobit model, and show that size, age, and the degree of standardization of the product affect the export decision, but export propensity is independent of those variables. At the same time, been participated by foreign capital positively influences both decisions. Finally, the innovation attitude also affects the export decision and the volume exported, but in different ways.

Introduction.

Export activity has been usually considered as an indicator of competitiveness and the ability to generate resources by firms. At the same time, technological innovation, involving R&D activities, the introduction of new products, the improvement of a firm's existing product range, or changes in the production process, play a key part in helping a firm to maintain or improve its market position. The relationship between innovation and export success has therefore attracted much attention in economic literature[1].

Nevertheless, this relationship between innovation and export behaviour has not a clear sign. Some studies have found a positive sign of it, supported by the idea that new or improved products increase competitiveness and open new markets. But other authors have sustained that innovative firms, specially those with a reduced size, concentrate in local markets, finding, in consequence, a negative sign.

On the other side, one of the controversies of the studies that make firms' exports depend on a set of variables focuses its attention on knowing if these firms use an unique decision model to establish the volume of their exports[2] or, on the contrary, if the decision process is double: first the company chooses to take or not part in international markets and, once it has decided to participate, it establishes the volume of its production that it is going to be exported[3]. The usual translation of this discussion in econometric terms consists in estimating a Tobit model with all the companies for the first case, and test it against a model of discrete election (Logit or Probit) for the first one of the decisions, to export or not, and a Truncated Regression model for the second one, the exported production.

The present study analyses the relationships between export activity and a set of variables that define the characteristics and the strategic behaviour of a sample of Spanish manufacturing firms for the year 2000. For doing that, a Tobit model is tested

[1] Wakelin (1998); Nassimbeni (2001); Basile (2001); Wagner (2001); Ruper & Love (2002); and others.
[2] An example is Wagner (2001).
[3] Wakelin (1998) is a very representative case.

against a model that includes a Probit specification for the decision of export or not, and a Truncated Regression model for the exported volume. The data come from a sample of 1820 firms, and have been obtained from the *Firms Strategic Behaviour Survey (ESEE)*[4] elaborated by Fundación Empresa Pública for the Spanish Science and Technology Ministry.

Inside the explanatory variables included in the model, innovation, process or product, reaches a special importance, as it was notice at the beginning of the introduction. That is why, and additionally to its inclusion in the initial estimated models, separate equations have been estimated for innovators and non-innovators, testing if innovating firms follow a different behaviour from non-innovating ones.

The structure of the study is the following: the first section discusses the model and the variables that are included in the equations to be estimated; the second section analyses the data; section three estimates the models that allow to explain exports, and test their validity and the significance of the variables; the fourth section estimates separates models for innovating and non-innovating firms; finally, the fifth section resumes the main conclusions of the study.

I. The model and the variables.

I.1. The model.

As it has been commented in the Introduction, the initial controversy of the studies that analyses the relationships between exports and a set of variables that reflect the behaviour and characteristics of firms consist in establishing if exports follow an unique decision model or, on the contrary, if firms first decide to participate or not in foreign markets and, afterwards, they choose the amount of their production to be sold abroad.

[4] Encuesta sobre Estrategias Empresariales.

The authors that support the first option[5] argue that firm chooses the export production that maximizes profits, and this could be zero. Therefore, the decision process should be modelized as unique, implying that a model including all the firms, exporters and non-exporters, must be estimated. And, since the independent variable is usually export propensity (the percentage of the production directed to international markets) and this is, obviously, a truncated variable (it takes values from 0 to 100%), the best way to estimate the equation consist on using a Tobit model with the whole sample.

On the other side, other authors[6] suggest that firms decide their production volume *independently* of the markets to be sold. Only after the level of output has been selected, firms choose between national or international markets depending on which one reports higher profits. In fact, firms consider in a different way national and international markets because of the existence of specific costs related to the establishment in foreign markets. Those costs are sunk costs, since they have to be assumed even though firm fails to continue in the market[7].

If the assertions made on the previous paragraph are true, then the export activity of firms follows a double decision model: firms first decide if they export or not, what can be econometrically approached by a binomial model (Probit or Logit); and, as soon as they have decided to take part in foreign markets, they establish the volume of their exports, which forces to estimate a truncated model, since the dependent variable only is observed if it is bigger that zero (the export propensity is positive).

In fact, the assumption underlying this type of specification implies that the two stages are independent of each other, that is, the disturbances in the latent regression underlying the Probit model and those in the truncated regression are independent[8]. Additionally, the assumption of independence also implies that variables explaining one of the decisions do not have to influence the other one.

Consequently, it is possible to test the independence of the decisions of acceding or not to international markets and the exported volume of production comparing the results of

[5] Wagner (2001).
[6] Wakelin (1998) or Basile (2001), for instance.
[7] Basile (2001); Bernard and Wagner (1998).

a Tobit model, under the assumption of dependence and supposing that the same variables affect both decisions in the same way since it is a unique decision, with those of a Probit and a Truncated models, in which decisions are independent and the variables that explain one or another equation can differ.

I.2. The variables.

There is an important microeconomic literature relating the export probability so much as the volume exported to some indicators on the characteristics and behaviour of firms. From the analysis of this literature and depending on the information facilitated by the data, the following variables have been included in the equations estimated in this study:

a. *Size*.- This is a variable incorporated in almost all the studies related to the export ability of firms[9]. It is included by two ways: in levels, and also as a quadratic term. The assumption underlying this kind of specification is that exports, the probability to export and the export intensity, increase with size to an optimum size level. Therefore, we should expect a positive sign for the first term (levels), and negative sign for the second one (quadratic variable).
   In this study firm size is approached by the number of employees (PERTOT).

b. *Age*.- There are no assumptions made about the effects of this variable on exports, although firms age has frequently been incorporated to estimated equations. Some studies have failed to come up with any correlation[10]; others have verified a positive relationship[11]; while still more have confirmed a negative one[12].

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[8] Cragg (1971)
[9] Wakelin (1998); Nassimbeni (2001); Wagner (2001); Ruper & Love (2002), and for SME, Abbas & Swiercz (1991); Holzmuller & Kasper (1991); Bonaccorsi (1992); Calof (1994) or Ogbuehi & Longfellow (1994).
[10] Ong & Pearson (1982); Reid (1982), Nassimbeni (1999)
[11] Welch & Wiedersheim-Paul (1980); Abbas & Swiercz (1991); IKEI (1993).
[12] Kirpalani & MacIntosh (1980); Ursic & Czinkota (1984); Calvo (1996)

The variable it will be used is AGE, defined as the difference between the year the firm was born up and 2000.

c. *Standardised Product*.- The sign of this variable is not determined, since some authors[13] point out how "client tailored" product specification policies represent quite an advantage, but, on the other hand, standardised products enable scale economies and cost advantages[14], improving competitiveness.
The variable employed in the study is EP, a dummy variable taking the value 1 if the firm produces a standardised good and 0 otherwise.

d. *Being part of a business group (foreign capital share)*.- The usual assumption is to obtain a positive relationship between this variable and export capacities, since firms belonging to a business group are expected to be more likely to export, allowing the group to overcome the problem of lacking resources necessary to export, such as finance, physical or human capital[15]. Moreover, if business group is international, the firm could easier surpass the barriers early mentioned, as it is shown in different studies for the Spanish case[16].
KEXT is the variable used in this article, defined as the percentage of foreign capital in firm's total resources.

e. *The use of new technologies*. Some studies have reported a positive correlation between the use of advanced manufacturing technologies and export success[17]. The underlying assumption can be that new technologies are related to more dynamic firms, which are also those that best perform in foreign markets, so we would expect a positive sign, at least in the decision of export.
The variable included in the estimation is NEWTEC, defined as a dummy variable that takes value 1 if the firm has used advanced manufacturing technologies[18] during the period 1998-2000 and zero otherwise.

[13] Christensen et al. (1987); Nassimbeni (2001).
[14] IKEI (1993); Alonso & Donoso (1993); Fernández & Casado (1994); Nassimbeni (1999).
[15] Roper & Love (2002); Basile (2001).
[16] IKEI (1993); Fernández & Casado (1994); Calvo (1996).
[17] Mechling et al. (1995); Wagner (1995).
[18] The technologies included are: Numeric Control; Robotics; CAD; CAM; a combination of those systems; or LAN.

f. *Geographical location and technological development of the region*.- A variable defining the geographical location of firms has been employed in some studies related to export capacity, but the conclusions on its effects diverge. Some authors[19] find that firms located in regions with high technological development have smaller export probability and propensity since "…high levels of innovative activity tend to be associated with higher regional incomes, and greater local demand in these areas may be reducing the need for local firms to export". On the other side, it can be argued that technologically developed regions increase both the probability and the propensity to export because of spill-overs.

   The variable selected in this article in order to distinguish Spanish regions with high technical capacity from other regions is CCAAHT. It takes the value 1 if the firm is located in Madrid, Catalonia or the Basque Country, and 0 otherwise.

g. *R&D Activities*.- There is not unanimity on the sign of the relationship between R&D activities and exports. In some studies a positive relationship is established between the probability of exporting or the volume of the production sold in international markets and the research activity[20]; others find a negative one[21]; and others, finally, are not able of establishing any significant relationship[22].

   Three dummy variables has been defined in order to approach firms R&D activities: AIDINT, that takes value 1 if the firm has developed *inside* R&D activities and 0 otherwise; AIDCONT takes value 1 if some R&D activities have been developed *outside* the firm[23]; and AIDAUX, taking the value 1 if the firm develops R&D complementary activities[24]. The period considered for these variables is from 1998 to 2000.

[19] Roper & Love (2002).
[20] IKEI (1993); Calvo (1996) for the export probability; Kumar y Siddharthan (1994); Hirsch & Bijaoui (1985); Ito & Pucik (1993).
[21] Calvo (1996) for the export intensity.
[22] Lefebvre et al (1998); Willmore (1992).
[23] 341 firms have developed R&D activities *inside and outside* their installations, at the same time. Obviously, those firms have value 1 in both variables, AIDINT and AIDCONT.
[24] R&D complementary activities are: Scientific and Technical Information Services; Quality Control Services; Efforts for Adapting Imported Technologies; Market Studies and Marketing of New Products; Design. The variable values 1 if the firm has developed any of these activities in 1998, 1999 or 2000.

h. *Innovation*.- Innovation, process or product, is one of the most important variables incorporated to export behaviour analysis, but again, the conclusions about its influence diverge. In general, product innovation positively affects the probability of export[25] and export intensity[26], since it can be supposed that new products increase competitiveness and open new markets. Nevertheless, this assumption is not sustained by other authors[27] reaching the conclusion that small innovating firms concentrate on local markets, been negative the innovation effect on export probability. On the other side, process innovation obtains unlike results: in some cases there is not relationship to export probability[28], or a positive effect is found on the probability and the propensity[29].

   Two variables have been used in order to represent innovation capacity of firms: INPRC is a dummy variable that values 1 if the firm has introduced process innovations in 1998, 1999 or 2000; and NINPRO is the number of product innovation introduced by the firm in that period of time.

Then, the model that will be estimated in the article can be defined as:

$$DEXP=\alpha_0 + \alpha_1 PERTOT + \alpha_2 PERTOT^2 + \alpha_3 AGE + \alpha_4 KEXT + \alpha_5 EP + \alpha_6 NEWTEC + \alpha_7 CCAAHT + \alpha_8 AIDINT + \alpha_9 AIDCONT + \alpha_{10} AIDAUX + \alpha_{11} INPRC + \alpha_{12} NINPRO + \mu$$

$$PEXP=\beta_0 + \beta_1 PERTOT + \beta_2 PERTOT^2 + \beta_3 AGE + \beta_4 KEXT + \beta_5 EP + \beta_6 NEWTEC + \beta_7 CCAAHT + \beta_8 AIDINT + \beta_9 AIDCONT + \beta_{10} AIDAUX + \beta_{11} INPRC + \beta_{12} NINPRO + \mu$$

Where *DEXP* is a dummy variable valuing 1 if the firm is exporter and 0 if it does not sale in foreign markets. *PEXP* is export propensity, defined as the percentage of the production sold abroad. In order to test the models, they will estimated as follows: Tobit model estimates the last equation using the whole sample; in the double decision model the first equation is estimated with a Probit specification taking *DEXP* as the dependent

[25] Nassimbeni (2001); Basile (2001); Wakelin (1998); Roper & Love (2002) in Germany and United Kingdom.
[26] Basile (2001); Roper & Love (2002)
[27] Waklein (1998).
[28] Nassimbeni (2001).

variable and also employing all the sample; Truncated Regression is used for the second equation (*PEXP*) but only for the subsample of exporters.

II. The data.

The data used in the article come from the *Firms Strategic Behaviour Survey (ESEE)*. This is a survey of Spanish manufacturing firms that began in 1990 and is conducted annually for about 2000 firms. It includes a very complete questionnaire about each firm's structure and strategic decisions, producing a good insight into the Spanish manufacturing industry[30].

Once the data have been filtered, the sample is reduced to 1820 firms, having full information for the period 1998-2000. The selection of a three years period crucially depends on R&D and innovation variables, since it is supposed that R&D activities and innovation need a long period of time to reach any result[31]. Then, all the variables that represent R&D activities or innovation are related to that period[32]. The other variables (size, age,…) are referred to 2000.

In order to know if variables defined in the last section can be used to distinguish between exporters and those firms oriented to national markets, an ANOVA analysis is conducted for non-dummy variables of both samples. The results are included in Table 1.

As it can be seen, almost all the variables selected have a different behaviour depending on export activity: the average size is bigger for exporting firms (385 employees); the same happens with age, its average been10 years higher for exporters; foreign capital share, 29% for exporters and 2,9% for non-exporting firms on average; and the number

[29] Basile (2001).
[30] The methodology, questionnaire and general results of ESEE can be found in www.funep.es.
[31] The three years period is the assumption employed, for instance, in the *Firms Innovation Survey* made up by the Spanish Statistical National Institute, in which all the innovation references are related to a period of three years. See INE (2001).

of product innovation introduced from 1998 to 2000 which is, on average, 11 in the exporters group and it is less than 2 in the other subsample.

On the other side, and related to dichotomous variables, Table 2 includes firms' distribution depending on been exporters or not and the selected variable.

As we can observe, the distribution of firms depending on selling or not abroad is very different for all variables, exception made of CCAAHT. For the rest of the variables so much the number as the percentage of firms that use new technological developments, carry out R&D activities (inside, outside, or complementary activities), innovate in process, or standardised the product, are significantly bigger for exporting businesses.

Consequently, we should expect that these variables, and specially those related to the innovation activities, should play an important role in order to distinguish the export behaviour of Spanish manufacturing firm.

III. Estimation of the model.

The model to be estimated has been defined in the second section[33]. The estimated parameters of the three equations are included in Table 3.

As we can see in Table 3, Tobit model is clearly rejected against Probit and Truncated Regression combination based on a Maximum Likelihood Test[34]. At the same time, looking at the Probit and Truncated regression estimators, it is evident that the variables affecting export decision are not the same as those establishing the export volume of Spanish manufacturing firms, what reinforces Tobit specification refusal. Thus,

[32] For instance, if the variable INPRC values 1 it means that the firm has introduced a process innovation in any of the years 1998, 1999, 2000 or in more than one year. NINPRO is the number of product innovations introduced by the firm from 1998 to 2000.

[33] Nineteen industry variables have also been introduced in all the equations, but Tables do not include their results. Complete results are upon request.

meanwhile the variables of size have the predicted effect and are significant for the probability to export, augmenting it to an optimum size, it does not occur the same with the export propensity, since they are not significant. Age, standardised product, and the use of new technological developments are also significant in the Probit model, revealing that older is the firm, more standardised be the product, and bigger is the use of technology greater is the probability of export, but this is not true for the Truncated specification. The only significant variable in both equations is foreign capital share, increasing so much the probability of export as export propensity.

R&D activities, but above all those accomplished inside the firm, increase the probability of participate in foreign markets and rise up the percentage of sales directed to those markets, been significant in both equations.

Finally, innovation variables play a definitive role in both elections, though with different characteristics depending on the equation. Product innovation increases the export probability, where as process innovation do not have any effect on it. For the export propensity the situation is inverted, and now process innovation is significant, staying in a second level product innovation.

Consequently, we can affirm that there exists a defined profile of the Spanish exporter manufacturing firm: big in terms of size, reaching an ideal dimension; installed some time ago on the market; producing a standardized good; using new technologies; participated by foreign capital; developing R&D activities; and introducing product innovation. On the contrary, the information adduced by the estimation leaves an image much more blurred of the characteristics that influence export propensity: we only can say that the bigger foreign capital participation; R&D activities; and process innovation, the bigger the amount of the production dedicated to foreign markets.

IV. Export firms versus non-exporters.

[34] The test is: $\chi(31) = -2[l^R - l^{NR}]$ where l^R is the log of the likelihood function from the Tobit model, and l^{NR} is the sum of the logs of the likelihood functions of Probit and Truncated Regression estimations. The value is 404.394.

We have seen in the last section that product innovation increases the probability of export meanwhile process innovation augments export propensity. An additional step can be taken in the study analysing how the model behaves depending on firms' innovating characteristics. Nevertheless, the estimated results from Table 3 show that the only interesting analysis consists on using product innovation as an argument to differentiate the election of participating or not in foreign markets (Probit model) and employ process innovation to establish the exported volume (Truncated Regression). The results are included in Tables 4 and 5.

Tables 4 and 5 have a double structure: in the upper side the estimators of separated equations from innovating and non-innovating firms are included, product innovators in Table 4 and process innovators in Table 5; in the lower side a Maximum Likelihood test is presented in order to decide if separated estimations improve the results[35], and Wald tests about equality of the estimated parameters in a joined estimation from innovating and non-innovating firms are also included.

The results of Table 4 show that innovation implies two different models of choosing to participate in foreign markets, as it can been seen by Maximum Likelihood test and Wald test for all variables. Moreover, size, age, foreign capital and R&D activities estimators are different depending on product innovating attitude of the firm.

On the contrary, that is not the case for export propensity, since Maximum Likelihood test and Wald tests for the estimators do not show any significant difference depending on process innovating capacities of firms.

V. Conclusions

The probability that a Spanish manufacturing firm directs part of its production to foreign markets positively depends on the size of the firm, the time elapsed since its creation, foreign capital share, the use of new technologies, R&D activities, specially

[35] The value of the test is: $\chi^2 = -2[l^R - l^{NR}]$ been l^R the likelihood log from a joined estimation including all the variables by a double way: in its original form and also multiplied by a dummy variable that values 1 if it is an innovating firm and 0 otherwise. l^{NR} is th sum of the likelihood logs of separated estimations.

those realised inside the firm, and the number of product innovations introduced in the market.

On the other side, the data of the study do not allow us to have a clear image of the characteristics that delimit the exported volume by Spanish manufacturing firms adventuring in foreign markets, since we only can affirm that the export propensity increases with foreign capital participation; R&D activities; and process innovation.

The special interest related to innovation variables and their role played in the estimated equations has stimulated to distinguish between innovative and not innovative firms, product innovation in the probability of export, and process innovation in the propensity to export. The results show how product innovation clearly separates the decision of selling abroad or not, whereas it can not be said the same for the relationship between process innovation and export intensity, since there has not been stated any significant difference depending on innovations in the productive process of firms.

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Table 1.- *ANOVA analysis. Exporters versus Non-exporters.*

VARIABLES	**Exporters** Mean	**Non-Exporters** Mean	F Statistics	Significant
KEXT	29.06	2.89	216.96	0.000
PERTOT	385.17	53.40	76.82	0.000
AGE	26.72	15.40	132.46	0.000
NINPRO	11.26	1.71	16.67	0.000

Source: Drawn up by author.

Table 2.- *Firms' distribution. Exporters versus Non-exporters.*

	Exporters				***Non-exporters***			
Val***ue of the Variable***	1		0		1		0	
	Nº	%	Nº	%	Nº	%	Nº	%
EP	772	65.6	404	34.4	371	57.6	273	42.4
NEWTEC	1062	90.3	114	9.7	422	65.5	222	34.5
CCAAHT	599	50.9	577	49.1	267	41.5	377	58.5
AIDINT	535	45.5	641	54.5	58	9.0	586	91.0
AIDCONT	380	32.3	796	67.7	41	6.4	603	93.6
AIDAUX	917	78.0	259	22.0	276	42.9	368	57.1
INPRC	733	62.3	443	37.7	270	41.9	374	58.1

Source: Drawn up by author.

Table 3.- *Estimation Results.*

	Tobit	***Probit***	***Truncated Regression***
Constant	-21.46*** (3.99)	-0.75*** (3.25)	-165.28*** (3.62)
PERTOT	0.005** (2.25)	0.002*** (7.12)	-0.0002 (0.03)
$PERTOT^2$	-3.37e-07* (1.60)	-1.42e-07*** (5.78)	2.54e-07 (0.50)
AGE	0.109*** (2.72)	0.011*** (5.19)	-0.213 (1.44)
KEXT	0.178*** (8.28)	0.009*** (6.41)	0.281*** (3.81)
EP	1.67 (0.93)	0.203** (2.46)	-10.04 (1.51)
NEWTEC	7.04** (2.41)	0.312*** (2.74)	-8.325 (0.54)
CCAAHT	-2.12 (1.27)	-0.40 (0.51)	-6.54 (1.04)
AIDINT	12.67*** (6.08)	0.418*** (3.67)	25.01*** (3.32)
AIDCONT	5.22** (2.41)	0.208* (1.65)	7.767 (1.11)
AIDAUX	9.69*** (4.12)	0.236** (2.37)	22.47** (2.01)
INPRC	3.47** (2.04)	0.486 (0.63)	11.86** (1.75)
NINPRO	0.033** (2.16)	0.008*** (2.62)	0.053 (1.36)
Log. Likelihood	-6095.2612	-818.0272	-5075.037
Pseudo R^2	0.0493	0.3083	0.0013
Industry variables test	F (19,1789)= 5.43***	χ^2 (19)=71.32***	χ^2 (19)=43.01***
Size variables test.	F(2,1789) = 2.94*	χ^2 (2) = 50.75***	χ^2 (2) = 1.42**
R&D variables test.	F(3, 1789) = 32.23***	χ^2 (3) = 35.86***	χ^2 (3) = 20.68***
Number of observ.	1820 left censored observations = 644	1820 Observ. with Dep=1: 1176 Observ. with Dep=0: 644	1176

Source: Drawn up by the autor.

*** Significant at 99%
** Significant at 95%
* Significant at 90%

Table 4.- *Estimation Results for the Probit model. Product Innovators versus Non-innovators*[36].

	Innovators	***Non-innovators***
Constant	-0.336 (0.57)	-0.778*** (3.07)
PERTOT	0.002*** (3.55)	0.002*** (6.01)
$PERTOT^2$	-1.67e-07** (2.69)	-1.99e-07*** (4.97)
AGE	-0.079* (1.65)	0.014*** (5.40)
KEXT	0.010*** (2.80)	0.001*** (5.88)
EP	0.260 (1.27)	0.196** (2.09)
NEWTECH	0.205 (0.52)	0.281** (2.31)
CCAAHT	-0.014 (0.08)	-0.061 (0.70)
AIDINT	0.130 (0.64)	0.447*** (2.92)
AIDCONT	0.497** (2.18)	0.086 (0.53)
AIDAUX	-0.193 (0.64)	0.311*** (2.85)
INPRC	-0.020 (0.10)	0.035 (0.41)
Log. likelihood	-152.1239	-646.3974
Nº Observations	507	1291
Maximum Likelihood Test	30.44**	
Wald Tests		
All variables	$\chi^2(11)$= 68.49***	
Size	χ^2 (2)= 8.41***	
Age	χ^2 (1)= 6.76***	
Foreign capital	χ^2 (1)=4.26**	
Standardization	$\chi^2(1)$ = 0.05	
Geographical location	$\chi^2(1)$ = 1.29	
New Technology	$\chi^2(1)$ = 2.08	
R&D	$\chi^2(3)$= 12.28***	
Process Innovation	$\chi^2(1)$ = 0.10	

Source: Drawn up by the autor.

*** Significant at 99%
** Significant at 95%
* Significant at 90%

[36] Estimations include nineteen industrial dummies.

***Table 5**.- Estimation Results for the Truncated Model. Process Innovators versus Non-innovators*[37].

	Innovators	***Non-innovators***
Constant	-101.70** (2.19)	-292.26*** (4.83)
PERTOT	-0.001 (0.22)	0.032 (0.80)
$PERTOT^2$	2.86e-07 (0.68)	-3.93e-06 (0.70)
AGE	-0.253* (1.78)	-0.169 (0.38)
KEXT	0.199*** (3.12)	0.503* (1.79)
EP	-7.877 (1.30)	-26.057 (1.16)
NEWTECH	-31.96* (1.94)	6.40 (0.17)
CCAAHT	-7.268 (1.26)	-1.135 (0.06)
AIDINT	25.22*** (3.63)	13.86 (0.61)
AIDCONT	4.956 (0.79)	11.54 (0.48)
AIDAUX	13.526 (1.21)	56.45* (1.66)
NINPRO	0.046 (1.33)	0.114 (0.78)
Log. likelihood	-3197.9891	-1854.5684
Nº Observations	733	443
Maximum Likelihood Test	39.575	
Wald Tests		
All variables	$\chi^2(11)= 12.69$**	
Size	$\chi^2(2)= 0.90$	
Age	$\chi^2(1)= 0.16$	
Foreign capital	$\chi^2(1)=3.28$*	
Standardization	$\chi^2(1) = 4.40$**	
Geographical location	$\chi^2(1) = 0.19$	
New Technology	$\chi^2(1) = 0.70$	
R&D	$\chi^2(3) = 2.43$	
Product Innovation	$\chi^2(1) = 0.12$	

Source: Drawn up by the autor.

*** Significant at 99%
** Significant at 95%
* Significant at 90%

[37] The estimations include nineteen industrial variables.