# Innovation, productivity and the export activity of Spanish manufacturing firms[1]

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**Abstract**

In this work, the interconnections between the productivity, the innovating activity and the export behaviour of the firm are studied. To this end, a longitudinal study was made of 1670 Spanish firms in the manufacturing sector over the period between 2001 and 2005. Exploratory analysis of the relationship between export activity and innovation suggests that exporting innovative firms are more productive than non-exporting innovative ones. The detailed analysis of this relationship suggests that self-selection hypothesis is an adequate explanation of the phenomena observed, which is to say that the firm that innovates at the same time as it increases its productivity in previous periods is likely to engage in more export activity, as judged by both the propensity and intensity of that activity. In this sense, the analysis emphasizes the positive effect of the interaction between productivity and R&D expenditure. The learning-by-exporting hypothesis is only confirmed to the extent that there is a positive effect of the firm export propensity on its productivity.

**Key words:** export activity, innovation, panel data, productivity, self-selection, learning-by-exporting.

## 1. Introduction

To survive in the current competitive environment that confronts most firms in recent years, which is characterized by a high level of instability, it is increasingly important to renew competitive advantage through innovation in a continuous process (Filipescu et al., 2009). In this context, Porter (1998) considers the product and process innovation as the central issue of economic development. In the field of the export activity of firms, many studies have stressed the importance of an innovation strategy (Hitt et al., 1990; Wakelin, 1998; Roper and Love, 2002). In this sense, Leonidou et al., (2007) consider the development of a special innovative capacity to be one of the principal stimuli which drives the firm to engage in an export activity.

Traditional models that have tried to explain the relationship between the productivity of a firm and its export behaviour are based on the analysis of macroeconomic variables, and do not capture the evidence that relates to the fact that, in the same conditions (for example, same country or sector of activity) firms obtain different results. This raises the question of why exporters are more productive than non-exporters, if both come from the same environment.

In the search for an answer, the literature gives two fundamental theoretical explanations (Wagner, 2007): 1) the self-selection hypothesis, which argues that the more productive firms are more likely to export, mainly because competition in export markets is more intense, and the costs higher, relative to domestic markets. According to this explanation, the existence of barriers to entry to the export market ensures that firms must configure their resources and capabilities so as to improve the efficiency of their production processes; 2) the learning-by-exporting hypothesis, according to which firms benefit from the flow of knowledge arising from international markets, which in turn makes them more productive and improves their development once they have started export activities. This explanation coincides with the arguments of the models of sequential internationalization, according to which firms, on account of the knowledge gained from their international activity, go through a sequence of steps as a consequence of the new configuration of their resources and capabilities (Johanson and Vahlne, 1977).

In spite of the consensus in the literature that exporters are more productive than non-exporters (among others, Aw and Hwang, 1995; Bernard and Jensen, 1995; Fariñas and Martín-Marcos, 2007), and although there are numerous empirical studies that confirm that innovation increases the likelihood of positive export results for the firm (Hitt et al., 1990; Wakelin, 1998; Roper and Love, 2002; Leonidou et al., 2007), there are no studies that relate those two theoretical arguments. That is to say, no studies test whether more productive innovative firms perform better in terms of export behaviour than those with lower productivity. With the aim of filling this gap, the present study examines innovative activity of firms as one of the determinants which can increase the intensity of the positive relationship between productivity and export performance of the firm.

For that reason, in the present study, assuming that the export behaviour of the firm can be explained in terms of micro-economic variables – principally by the heterogeneity of resources and capabilities (Wernerfelt, 1984) or by the transfer and accumulation of knowledge in the light of international experience (Johanson and Vahlne, 1977) – we test whether the export activity is an effect of its productivity, as predicted by the self-selection hypothesis, or whether, conversely, it is the export activity that makes the firm more productive. The strategic importance of innovation in international markets makes it important to study the factors that encourage improved development of exports by a firm as a result of an innovative activity.

Moreover, although the relationship between productivity and exports has been a growing focus of attention in recent years, above all at the international level, studies of the Spanish case are scarce (Ruano and Fariñas, 1999; Delgado et al., 2002; Fariñas and Martín-Marcos, 2007; García and Avella, 2008), so the present work will contribute to the literature in this field related to Spain, at the same time as incorporating the new approach, not only of analyzing the positive relationship between productivity and exports, but taking into account the innovative activity of the firm.

To this end, the analysis will address two problems that arise from the literature that study the variables under consideration: 1) the measurement of innovation exclusively through the level of R & D

expenditure is incomplete (Greenhalgh et al., 1994, Santamaría, 2009), for which reason the present study measures innovation activity using both the inputs of innovation (R & D expenditure) and its outputs (product and process innovation); and 2) in spite of recent efforts, such as those of Filipescu et al., (2009), there are few studies which analyze the effect of innovative activity on the export behaviour of Spanish firms longitudinally, in a way that would make it possible to identify the effects of specific policies on firm results. In order to study these dynamic relationships, in the present analysis the data are drawn from the Spanish Business Strategy Survey corresponding to the period 2001 to 2005.

This paper is structured in the following sections: firstly, there is an explanation of the theoretical framework, developing the relationships between innovation, export behaviour, and productivity. This is followed by an explanation of the methodology employed to test the hypotheses, with a description of the variables used and the measures employed. An exposition of the results of the analysis follows, and the paper finishes with a discussion of the results and the presentation of conclusions.

## 2. Theoretical framework and hypotheses

Recent works have suggested that there is a positive effect of innovative activity on the development of exports in Spanish firms, underlining the role that innovative activity has as a source of international competitive advantage based on the differentiation of the firm (López and García, 2005; Filipescu et al., 2009). In this study, this relationship is assumed, in order to study more deeply the factors that may moderate the relationship between the innovative activity and the export behaviour of the firm. In this context, productivity is one of the determinants that may strengthen this positive relationship. Starting from the basis that there are firms that, in spite of being from the same country, or the same sector, perform differently in terms of the productivity and export activity, it is possible to rule out those traditional theories that presuppose homogeneity among firms[3], and move towards the development of new theoretical models which explain the positive relationship between productivity and exports (Álvarez and López, 2004). Thus, in recent years there have appeared a series of studies that examine

[3] Álvarez and López (1994) mention among these traditional theoretical models that of Heckscher-Olin, the theory of imperfect competition and of economies of scale.

this question at the level of the firm (for example, Aw and Hwang, 1995; Bernard and Jensen, 1999; Aw et al., 2000; Delgado et al., 2002; García and Avella, 2008). The main purpose of these studies is the explanation of the positive relationship between productivity and export behaviour, using two main theoretical models (Wagner, 2007): the self-selection hypothesis and the learning-by-exporting hypothesis.

According to the self-selection hypothesis, the pressure of competition and the high costs of the export marketing ensure that exporting firms are more productive. Owing to these factors (high costs and intense competition) export markets *select* the most efficient firms from among the potential entrants to the market. Consequently, it is the most efficient firms that penetrate foreign markets. This line of reasoning is supported by two arguments (Delgado et al., 2002):

- The first argument is based in models of the development of the economy, and suggests that the level of rivalry and competition in the export markets is significantly higher than in the domestic ones, leaving few opportunities available to the less efficient firms (Aw and Hwang, 1995). Therefore, the selection is achieved by the export market at the moment of entry.

- Secondly, exporters face unrecoverable or sunk costs[4] that arise from entry into foreign markets, and these costs are higher than those that are required to enter the domestic markets. Therefore, the firms that export must be more efficient than those that do not export in order to be able to enter those markets and obtain positive benefits from their activities. This second argument is derived from the application of models of industrial dynamics (Hopenhayn, 1992) to export markets and to the productivity of firms (Aw et al., 1997).

This hypothesis suggests that there is a causal relationship between productivity and export orientation, such that only firms that improve their productivity are able to enter and survive in

[4] Roberts and Tybout (1997) classify these sunk costs in three categories:
1) costs arising from market research (conducted or contracted);
2) costs arising from the need to adapt firm products and services to the tastes, preferences or legal constraints of the target market;
3) costs arising from the setting up of proper distribution channels for exports.

international markets. Empirically, several studies have shown that the initial level of productivity can explain the entry of firms into export markets (Clerides et al., 1998; Bernard and Jensen, 1999; Aw et al., 2000).

On the other hand, many other studies have shown that innovative activity acts as an important driver of exports (Filipescu et al., 2009). However, innovative activity implies a range of costs, and the balance of costs and benefits determines the profitability of such activity. According to the self-selection hypothesis, only those firms that are more efficient are able to bear the high unrecoverable costs of exporting, and in the same way only those more efficient firms will be able to afford to innovate. The hypothesis leads to the conclusion that the most productive firms will be better placed to export, especially if they are also innovative. This argument positions productivity as a factor with a moderating influence on the relationship between innovation and the export activity of the firm. In the light of these considerations, the following hypotheses can be stated:

*H1: Productivity is positively linked with the export activity of the firm (self-selection hypothesis).*

*H2: Productivity has a positive moderating influence on the relationship between innovation and the export activity of the firm.*

The alternative explanation of the fact that exporting firms are more productive is described as the learning-by-exporting hypothesis. The exchange of knowledge in international markets, deriving from exchanges with international buyers and competitors, benefits the firms that engage in those markets (Wagner, 2007). That is to say, access to new technologies, including the product and the production design as required by the foreign buyers, which are not available to non-exporters, contribute to raise the productivity of the firms that enter international markets (Álvarez and López, 2004). Also, exporters are exposed to more intense competition and must improve more rapidly than firms that sell their products only in domestic markets (Wagner, 2007). The participation of a firm in export markets definitely raises its level of productivity. The literature that describes the process of internationalization as a sequence of

steps for the firm, or as an innovation[5], stresses this idea of exporting as a learning process (Delgado et al., 2002).

In fact, as García and Avella (2008) indicate, an important part of the literature about the internationalization of firms has attached great importance to the learning that occurs during exporting as a necessary stage in the progress of that process. Thus, different authors think of international expansion as a gradual process of moving to higher levels under the influence of learning generated by developing foreign market activity (Johanson and Vahlne, 1977; Bilkey and Tesar, 1977).

Álvarez and López (2004) point out that, in general, the evidence in favour of this hypothesis is mixed. Clerides et al., (1998), using firm level data from Colombia, México and Morocco, did not find that entry into international markets reduce costs, as expected under this hypothesis. Aw et al., (2000) arrive at the same conclusion analyzing the export behaviour of firms in South Korea, but not in the case of Taiwanese firms. In the latter, entry into international markets did raise the productivity of firms.

Filipescu et al., (2009) demonstrate empirically that firms that are firmly established in international markets, taking advantage of new knowledge, develop more intensive innovative activity. The analogy of learning is central to the learning-by-exporting hypothesis, which argues that the accumulation of knowledge arising from the export effort creates a range of skills and capabilities that make the firm more productive. This coincidence suggests that the intensification of the innovative activity as a result of exporting shows that the firm is able to take advantage of the learning full potential of the export markets, thereby overcoming the limits described by García and Avella (2008), therefore its productivity will be also increased. This implies that innovation exhibits a positive moderating effect on the relationship between export activity and productivity. Taking these arguments into account, the following hypotheses can be formulated:

[5] A fuller explanation of the models that represent internationalization as a stage process or as an innovation can be found in Johanson and Vahlne, (1977) and Bilkey and Tesar (1977), respectively.

*H3: The export activity of a firm is linked positively with its productivity (learning-by-exporting hypothesis).*

*H4: Innovation has a positive moderating effect on the relationship between the export activity and the productivity of the firm.*

## 3. Methodology

### Data

This study analyzes data corresponding to the period from 2001 to 2005 that are drawn from the Spanish Business Strategy Survey (SBSS), a statistical research which, since 1990, each year samples a representative panel of manufacturing firms. The ESEE has its origin in an agreement subscribed in the year 1990 between the Ministry of Science and Technology and the Fundación SEPI (formerly the Fundación Empresa Pública); the later was the responsible of its design and of controlling its execution. Since 1990, an average sample of 1,800 firms has been surveyed yearly, on the basis of a 107-question questionnaire, with over 500 fields. All the information contained in the SBSS is subject to strict controls for validity and consistency. The reference population is composed of firms with 10 or more employees in the manufacturing industry in Spain. These are further subdivided into twenty branches or sub-sectors. The SBSS takes a broad sample of firms each year. The size of this sample reached a maximum in 2005, when 2008 firms were surveyed, of which 1911 responded (95.17%[6]).

All the information included into the ESEE is subjected to validation and logical consistency controls, and in no case values are assigned when there is no answer from the company. In general, the data recording and validation procedure is made up of four phases: the recording of the questionnaire, the validation of the contents, changing the blanks to zeros and further recordings. Of these, the most complex controls are those of consistency, temporal consistency and financial. They are made up by a

[6] This high response rate can be explained by the fact that public authorities have the power and the resources to secure a high level of participation, which means that the sample it sufficiently large and representative of the population. This, together with the quality of the information collected, is the main advantage of using secondary data produced by public agencies (Dorling and Simpson, 1999).

battery with more than 100 controls regarding concrete questions of the questionnaire, which are the result of the refinement through experience of a wide range of contrasts aimed at verifying the consistency of the data. As a general rule, failure to comply with the consistency controls is not allowed. On the other hand, the temporal consistency and financial controls usually set up confidence ranges. In case of failure to comply, the data concerned are confirmed and, in case it persisted, the company which supplies the data submits the required justification. Fundación SEPI reviews and validates all these justifications.

**Measurement of variables**

There is increasing consensus in the literature on international trade that no single factor can neatly account for the trade patterns of developed countries. As a result, the empirical model considered here includes a number of different explanations for export behavior: thus, the variables used in this analysis to measure the firm export activity are export propensity (PX) and export intensity (IE). PX is a categorical variable indicating whether the firm exported during the period considered. This variable has been used in the Wakelin study (1998) regarding the relationship between innovation and the export behaviour of the firm. On the other hand, IE represents the exports made as a proportion of total sales. This ratio is used in the majority of studies about the export orientation of the firm (Katsikeas et al., 2000), and has also been used in studies like that of García and Avella (2008) to study the hypothesis of learning-by-exporting.

As for the independent variables, to measure the R & D investment of the firm a quantitative variable has been used (IDV) which expresses the total costs of R & D as a percentage of total sales. This measure has been used in the majority of previous studies, for example in Wakelin (1998) or in Eusebio and Llonch (2006). Also, and in line with the recommendations of the literature (Santamaría, 2009), this measure of innovation was complemented with an evaluation of the outputs of innovation. The use of this subjective evaluation is due to the fact that the patents and other objective measures do not really reflect the total on innovations, many of which are not registered (Rodriguez, 1999).

Moreover, as Greenghalgh et al. (1994) argue, the use of R & D expenditure alone to measure innovation is inadequate because of the "conceptual and statistical weakness of this variable in terms of the outputs of innovation, owing to the fact that this measure is rarely used, the long periods between such investments, and the exogenous relationship between coordination and the influence of the outputs". Therefore, we have measured the principal outputs of innovation – product (IP) and process (IPr) innovation– using a dichotomous variable that takes the value 1 if the firm has produced the corresponding output of innovation and 0 otherwise.

To measure productivity, we have used the value of hourly productivity (PH) and labour productivity (PL). Hourly productivity (PH) is calculated as the added value divided by the approximate Hours Effectively Worked (the units of the hourly productivity may be interpreted as thousands of Euros per 1,000 hours. This variable was only calculated for firms where the added value was not negative). Labour productivity (PL) is calculated as the value of the goods and services produced and other current income divided by the approximate average number of employees.

For control variables, the size and age of the firm were used in the first place. The size of the firm is taken as the total number of employees in the firm on the 31st December of the year considered, and age was taken as the number of years of operation of the firm. On the other hand, as García and Avella (2008) argue, the presence of temporary workers in the firm makes it less productive in the sense that those workers are not in the firm long enough to learn how to do their jobs as efficiently as possible. In addition, the lack of stability of the temporary workers can discourage them to be more implicated and commited with the improvement of the results of the organization, since they are not going to remain enough time to be able to appreciate the results of their effort. For this reason this variable can be thought to have a negative and significant effect on the firm results (García and Avella, 2008). So, we have also used the number of temporary workers as a control variable, measured as the percentage of the workforce employed in a temporary capacity on 31st December. Finally, we have also

controlled for the sub-sector in which the firm operates and for the year of operation. A dummy variable was used to control for sub-sector, based on the three digit classification of industrial activities used in the CNAE-93 classification of the twenty manufacturing sectors.

**Empirical Analysis**

Following the line of research of Filipescu et al. (2009), the variables related to innovation have been lagged by one period of time, because, as indicated by Greenhalgh et al., (1994), there is a lag between investment in R & D and the results of that investment[7]. In addition, by introducing the lagged variables the possible problems of covariance are reduced (Bernard and Jensen, 1999), at the same time as possible inferences of a causal relationship are improved (Baum, 2006). Also, some other variables have been lagged in the expression of the hypotheses that are to be tested here. For the hypothesis of self-selection, the two dimensions of productivity have been lagged, while the two indicators of export activity (propensity and intensity) have not, nor have the control variables. With respect to the hypothesis of learning-by-exporting, as it was suggested that the learning occurred during the export activities making the firm more productive, the propensity and intensity of exports has been lagged by one period, while hourly productivity, labour productivity and the control variables have not.

To analyze the relationships between productivity, innovation and the firm export activity we have tested for two kinds of effects, direct and moderated. Following Sterlacchini (2001) and Roper and Love (2002), to estimate the dependent variable *probit* and *tobit* regressions were used[8] : when the dependent variable is categorical (in this case, export propensity) *probit* regression is used, while when the dependent variable is quantitative (in this work, export intensity, hourly productivity, and labour

[7] Following the recommendations of Filipescu at al., (2009), in the relationship between innovation and the firm export behaviour, lagging the independent variables for longer periods does not have a significant effect.

[8] In the different regressions the tests of Breusch-Pagan-Godfrey, of White and of Levene have been applied, confirming that the estimation of the errors are random, which is to say there is heteroskedasity. To correct for this, robust estimates of error have been used to calculate the coefficients using ordinary least squares.

productivity), *tobit* is the appropriate model to use (Roper and Love, 2002)[9]. When trying to explain the export intensity, the firms that have not exported at all in the period under consideration are omitted.

In order to test the self-selection hypothesis, the *probit* model is specified as follows:

$$Px_t = \begin{cases} 1, if\ \beta_0 + \beta_1 Cont_t + \beta_2 IDV_{t-1} + \beta_3 IP_{t-1} + \beta_4 IPr_{t-1} + \beta_j Prod_{t-1} + \\ \qquad +\propto_i + \varepsilon_{it} \geq 0;\ i = 1, \dots, n;\quad j = PH, PL;\quad t = 1, \dots, T_i; \\ 0, otherwise \end{cases}$$

where $PX_t$ represents the propensity to export in the period t; $Cont_t$ are the control variables (age, size, percentage of temporary workers, and *dummies* for sectors and years, all for the period t); the explanatory variables correspond to the period t-1 and are: investment in R & D ($IDV_{t-1}$), product innovation ($IP_{t-1}$), process innovation ($IPr_{t-1}$) and productivity of the firm -$Prod_{t-1;}$ either the estimate of hourly productivity (PH) or of labour productivity (PL)-; $\alpha_i$ captures the unobservable differences between firms; and, finally, $\varepsilon_{it}$ is the error term. It is assumed that $\alpha_i$ and $\varepsilon_{it}$ are uniformly, independently and normally distributed with a mean of zero and variance $\sigma_\alpha^2$ and $\sigma_\varepsilon^2$ respectively, and are independent of $(x_{i1}, x_{i2}, \dots, x_{iT})$. The measures for each of these variables are explained below.

Continuing the study of the self-selection hypothesis, taking the export intensity (IE) as the dependent variable suggests the use of a *tobit* model, with the same explanatory variables as in the *probit* model, and whose form is the following:

$$IE_{t=}\ \beta_0 + \beta_1 Cont_t + \beta_2 IDV_{t-1} + \beta_3 IP_{t-1} + \beta_4 IPr_{t-1} + \beta_j Prod_{j,t-1} + \propto_i + \varepsilon_{it};$$
$$i = 1, \dots, n;\quad j = PH, PL;\quad t = 1, \dots, T_i;$$

On the other hand, the hypothesis of learning-by-exporting, which suggests a causal relationship between export activity and the firm productivity, taking into account the innovative activity of the firm, suggests the use of a *tobit* model, specified as follows:

[9] Like Wakelin (1998), Sterlacchini (2001) and Roper and Love (2002), to contrast the convenience of a *tobit* analysis for both types of dependent variables, a test has been employed based on the likelihood ratio (LR). The result of the LR test is in agreement with the findings of earlier works, overcoming the implicit restriction in the *tobit* estimator, and in that way indicating the need to use a separate (unrestricted) *probit* model, and another (restricted) *tobit* model.

$$PROD_{j,t=}\ \beta_0+\beta_1 Cont_t + \beta_2 IDV_{t-1} + \beta_3 IP_{t-1} + \beta_4 IPr_{t-1}+\beta_k EXP_{j,t-1} + \\ +\propto_i+\varepsilon_{it};\ \ i=1,\dots,n;\ \ j=PH\ ,PL\ ;\ \ k=PX,IE;\ \ t=1,\dots,T_i;$$

where $EXP_{t-1}$ is the export activity in the period t-1, corresponding to $PX_{t-1}$ when this is estimated by means of the export propensity, or $IE_{t-1}$ when export intensity is used.

The analysis of the moderating effect is conducted by studying the possible interactions between the different indicators of the innovative activity and the productivity of the firm (self-selection hypothesis), and between the indicators of innovation and the firm export activity (the learning-by-exporting hypothesis).

All the statistical tests were carried out using the statistical package, Stata 10.0 *Special Edition* in its Windows version.

**4. Results**

Table 1 provides information about the means, standard deviations, and correlations between the variables. Most of the values are below 0.56, which is the maximum value recommended for the test of multi-colinearity (Leiblein et al., 2002; Filipescu et al., 2009). In no case are correlations found to be higher than that level. Therefore, it can be presumed that the impact of these correlations can be evaluated using a test for inflation of variance[10]. It can be seen that the maximum variance inflation factor (VIF) is around 2.0. These levels are considerably lower than 10, a level that suggests that the results are not biased by multi-colinearity (Baum, 2006).

As a point of departure for this analysis, an analysis of variance (ANOVA) was conducted to compare the average values of productivity in firms that were innovative exporters, as compared with those that were innovative non-exporters. As can be seen in Table 2, the productivity of exporting firms that undertook the innovation activities considered (above average investment in R & D, product innovation and process innovation) is significantly higher than that of firms that innovate but do not

[10] VIF for each variable: Size= 1.1; Age= 1.1; Temporary Personnel = 1.1; Investment in R & D= 1.1; Product innovation = 1.3; Process innovation = 1.2; Hourly productivity=2.0; Labour productivity=2.0.

export. Thus, the hourly productivity of the former has a mean value of 32, while that of the latter has a mean value of 22. The values for labour productivity show a similar pattern, with values of 200 and 122 respectively.

Table 1: Means, standard deviations and correlations

| | Media | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. PE** | .64 | .48 | | | | | | | | | |
| **2. IE** | 19.66 | 26.47 | .56* | | | | | | | | |
| **3. Size[1]** | 4.33 | 1.52 | .51* | .44* | | | | | | | |
| **4. Age[1]** | 2.87 | .86 | .21* | .15* | .29* | | | | | | |
| **5.Temporary Personnel** | 15.14 | 19.23 | -.14* | -.09* | -.05* | -.21* | | | | | |
| **6. IDV** | .73 | 3.06 | .08* | .09* | .14* | .06* | -.05* | | | | |
| **7. IP** | .22 | .42 | .24* | .18* | .29* | .11* | -.06* | .17* | | | |
| **8. IPr** | .29 | .45 | .20* | .16* | .28* | .05* | .00 | .09* | .38* | | |
| **9. PH** | 25.69 | 20.00 | .25* | .17* | .39* | .19* | -.17* | .08* | .13* | .15* | |
| **10. PL** | 156.32 | 133.19 | .30* | .18* | .43* | .17* | -.13* | .03* | .13* | .17* | .69* |

*$p<0.05$
[1] Size and Age are taken as natural logarithms.
NOTE: PE= propensity to export; IE= intensity of exports; IDV= investment in R & D; IP= Innovation of products; IPr= innovation of processes; PH= hourly productivity; PL= labour productivity.

Table 2: Productivity of firms according to whether they export or do not

| | Hourly Productivity | | Labour Productivity | |
|---|---|---|---|---|
| **Innovation Activity** | **Exporting** | **Not Exporting** | **Exporting** | **Not Exporting** |
| **IDV> media** | 32.69*** | 20.75*** | 192.61*** | 112.74*** |
| **IP** | 31.53*** | 22.64*** | 196.33*** | 126.50*** |
| **IPr** | 32.58*** | 22.15*** | 207.92*** | 123.88*** |

ANOVA significance of the F test: *** P<0.01; ** P<0.05; * P<0.1
NOTE: IDV= investment in R & D; IP= product innovation; IPr= process innovation.

To contrast the self-selection hypothesis, the fulfilment of two conditions is verified: on the one hand, if productivity favours the development of more exports, and, on the other, if the innovative activity of the firm moderates that relationship in a positive way. In table 3 it can be seen that the results of the *probit* regression (export propensity as dependent variable) for the six models show that productivity, of both hourly and labour kinds, significantly favour the export propensity of the firm. When one considers the export intensity as the dependent variable (table 4) labour productivity has a positive and significant influence on the export intensity of the firm (models 4, 5 and 6), while this

effect is reduced or diluted in the case of hourly productivity (models 1,2 and 3). In summary, hypothesis 1 is supported (the self-selection hypothesis) on the grounds that the export propensity is favoured by both dimensions of productivity, while the export intensity is also favoured by high productivity, so long as productivity is defined in terms of labour productivity. On the other hand, the analysis of the different interactions between innovation and productivity produce the following results: 1) as can be seen from table 3, the interaction between productivity, both hourly and labour, and the input of the innovative activity (investment in R & D) favours the export propensity in an important way, and in the way expected; and 2) in relation to the export intensity (table 4) only the interaction between the investment in R & D and the labour productivity is significant and in the expected direction, which indicates that, in a general way, the productivity does not have an intensifying effect on the influence of innovation on the export intensity of the firm. Certainly, hypothesis 2 is only partially supported in the sense that the positive moderating effect on innovative activity on the relationship between productivity and export activity is limited to the interaction that arises between the R & D investment and the productivity of the firm on its export propensity.

Table 3: Self-selection hypothesis

| | **Model 1 (n=1,678)** | **Model 2 (n=1,674)** | **Model 3 (n=1,674)** | **Model 4 (n=1,681)** | **Model 5 (n=1,677)** | **Model 6 (n=1,677)** |
|---|---|---|---|---|---|---|
| **Constant** | -10.29$^{***}$(.00) | -10.30$^{***}$(.00) | -10.50$^{***}$(.00) | -10.23$^{***}$(.00) | -10.19$^{***}$(.00) | -10.30$^{***}$(.00) |
| **$IDV_{t-1}$** | | .01 (.83) | .04 (.27) | | .01 (.94) | .06 (.15) |
| **$IP_{t-1}$** | | .57$^{***}$(.00) | .63$^{***}$(.00) | | .61$^{***}$(.00) | .61$^{***}$(.00) |
| **$IPr_{t-1}$** | | .28$^{**}$ (.05) | .26$^{*}$ (.07) | | .26$^{*}$ (.07) | .23 (.11) |
| **$PH_{t-1}$** | .01$^{**}$ (.02) | .01$^{**}$ (.03) | .02$^{***}$(.00) | | | |
| **$PH_{t-1}$ X $IDV_{t-1}$** | | | .01$^{**}$ (.02) | | | |
| **$PH_{t-1}$ X $IP_{t-1}$** | | | .01 (.83) | | | |
| **$PH_{t-1}$ X $IPr_{t-1}$** | | | | | | |
| **$PL_{t-1}$** | | | | .01$^{***}$(.00) | .01$^{***}$(.00) | .01$^{***}$(.00) |
| **$PL_{t-1}$ X $IDV_{t-1}$** | | | | | | .01$^{**}$ (.03) |
| **$PL_{t-1}$ X $IP_{t-1}$** | | | | | | -.01 (.70) |
| **$PL_{t-1}$ X $IPr_{t-1}$** | | | | | | -.01$^{*}$ (.01) |
| **Size[1]** | 2.42$^{***}$(.00) | 2.37$^{***}$(.00) | 2.37$^{***}$(.00) | 2.37$^{***}$(.00) | 2.31$^{***}$(.00) | 2.29$^{***}$(.00) |
| **Age[1]** | .67$^{***}$(.00) | .68$^{***}$(.00) | .69$^{***}$(.00) | .67$^{***}$(.00) | .68$^{***}$(.00) | .68$^{***}$(.00) |
| **Temp. Pers.** | -.02$^{***}$(.00) | -.02$^{***}$(.00) | -.02$^{***}$(.00) | -.02$^{***}$(.00) | -.02$^{***}$(.00) | -.02$^{***}$(.00) |
| **Variance of u** | 4.74 | 4.73 | 4.73 | 4.72 | 4.69 | 4.66 |
| **Log-likelihood** | -1,515.54 | -1,504.89 | -1,499.13 | -1,511.62 | -1,500.06 | -1,493.66 |
| **Wald chi[2]** | 715.50$^{***}$(.00) | 718.28$^{***}$(.00) | 708.61$^{***}$(.00) | 739.34$^{***}$(.00) | 717.16$^{***}$(.00) | 699.78$^{***}$(.00) |

$^{***}$ P<0.01; $^{**}$ P<0.05; $^{*}$P<0.1.

Dependent Variable = Propensity to export (*probit* regression)

(*p-value* in brackets)
Sectorial and annual dummies were included in the regressions but are not reported in the table.
[1] Size and Age are taken as natural logarithms.
NOTE: IDV= investment in R & D; IP= Product innovation; IPr= process innovation; PH= hourly productivity; PL= labour productivity.

Table 4: Self-selection hypothesis

| | **Model 1 (n=1,678[1])** | **Model 2 (n=1,674[2])** | **Model 3 (n=1,674[2])** | **Model 4 (n=1,681[3])** | **Model 5 (n=1,677[4])** | **Model 6 (n=1,677[4])** |
|---|---|---|---|---|---|---|
| **Constant** | -45.67$^{***}$(.00) | -45.63$^{***}$(.00) | -46.07$^{***}$(.00) | -46.04$^{***}$(.00) | -45.88$^{***}$(.00) | -46.59$^{***}$(.00) |
| **$IDV_{t-1}$** | | .08 (.29) | .09 (.26) | | .06 (.40) | .06 (.15) |
| **$IP_{t-1}$** | | 1.28$^{**}$ (.01) | 1.45$^{***}$(.01) | | .29$^{**}$ (.01) | .61$^{***}$(.00) |
| **$IPr_{t-1}$** | | .78$^{*}$ (.08) | .89$^{*}$ (.05) | | .78$^{*}$ (.08) | .23 (.11) |
| **$PH_{t-1}$** | .01 (.33) | .01 (.40) | .03$^{**}$ (.03) | | | |
| **$PH_{t-1}$ X $IDV_{t-1}$** | | | .01 (.36) | | | |
| **$PH_{t-1}$ X $IP_{t-1}$** | | | -.03 (.15) | | | |
| **$PH_{t-1}$ X $IPr_{t-1}$** | | | -.03 (.12) | | | |
| **$PL_{t-1}$** | | | | .05$^{**}$(.02) | .01$^{**}$ (.01) | .01$^{***}$(.00) |
| **$PL_{t-1}$ X $IDV_{t-1}$** | | | | | | .01$^{**}$ (.03) |
| **$PL_{t-1}$ X $IP_{t-1}$** | | | | | | -.01 (.70) |
| **$PL_{t-1}$ X $IPr_{t-1}$** | | | | | | -.01$^{*}$ (.01) |
| **Size[5]** | 10.39$^{***}$(.00) | 10.23$^{***}$(.00) | 10.20$^{***}$(.00) | 10.27$^{***}$(.00) | 10.07$^{***}$(.00) | 10.06$^{***}$(.00) |
| **Age[5]** | 2.43$^{***}$(.00) | 2.54$^{***}$(.00) | 2.55$^{***}$(.00) | 2.53$^{***}$(.00) | 2.63$^{***}$(.00) | 2.59$^{***}$(.00) |
| **Temp. Pers.** | -.04$^{**}$ (.04) | -.01$^{*}$ (.05) | -.04$^{**}$ (.00) | -.04$^{**}$ (.05) | -.04$^{**}$ (.06) | -.04$^{*}$ (.07) |
| **Variance of u** | 31.03$^{***}$(.00) | 31.08$^{***}$(.00) | 31.05$^{***}$(.00) | 31.11$^{***}$(.00) | 31.03$^{***}$(.00) | 31.09$^{***}$(.00) |
| **Variance of e** | 9.13$^{***}$(.00) | 9.05$^{***}$(.00) | 9.13$^{***}$(.00) | 9.16$^{***}$(.00) | 9.13$^{***}$(.00) | 9.02$^{***}$(.00) |
| **Log-likelihood** | -17.352.54 | -17.177.60 | -17.352.44 | -17.379.90 | -17.146.49 | -17.178.17 |
| **Wald chi[2]** | 715.50$^{***}$(.00) | 838.70$^{***}$(.00) | 846.57$^{***}$(.00) | 830.94$^{***}$(.00) | 854.79$^{***}$(.00) | 869.06$^{***}$(.00) |

$^{***}$ P<0.01; $^{**}$ P<0.05; $^{*}$P<0.1.
Dependent Variable = export intensity (*tobit* regression)
(*p-value* in brackets)
*Sectoral and annual dummies* were included in all regressions but are not reported here.
[1]1,678 firms corresponding to 6,281 observations, of which 2,251 were excluded from the left hand side.
[2]1,674 firms corresponding to 6,242 observations, of which 2,249 were excluded from the left hand side.
[3]1,681 firms corresponding to 6,288 observations, of which 2,254 were excluded from the left hand side.
[4]1,677 firms corresponding to 6,248 observations, of which 2,252 were excluded from the left hand side.
[5] Size and Age are taken as natural logarithms.
NOTE: IDV= investment in R & D / sales; IP= product innovation; IPr= process innovation; PH= hourly productivity; PL= labour productivity.

In relation to the learning-by-exporting hypothesis, it is tested whether the firm export activity in the preceding period (export propensity shown in table 5 and export intensity shown in table 6) has a positive effect on the productivity of the firm in the present period, taking into account its innovation activity. As can be seen, the export propensity (table 5) has a significant supportive effect on the productivity of the firm, while the export intensity (table 6) has no significant effect on either of the dimensions of productivity considered, either when the impact of that variable is examined in isolation from the other variables (models 1 and 4), or when that variable is taken in conjunction with the other independent variables (models 2, 3, 5 and 6). These results confirm that the hypothesis of learning-by-

exporting is supported in terms of the fact of whether the firm has exported before or not, while it is unimportant the level of export activity in which the firm was involved, which leads us to a partial acceptance of hypothesis 3. On the other hand, the regressions that include the interactions between the export propensity and the different indicators of the innovative activity of the firm (models 3 and 6) do not give any indications of significant relationships in the sense expected, which leads us to reject hypothesis 4.

Table 5: Learning-by-exporting hypothesis

| | **Model 1[1] (n=1,677)** | **Model 2[1] (n=1,673)** | **Model 3[1] (n=1,673)** | **Model 4[2] (n=1,679)** | **Model 5[2] (n=1,675)** | **Model 6[2] (n=1,675)** |
|---|---|---|---|---|---|---|
| **Constant** | 3.52$^{***}$(.00) | 5.23$^{***}$(.00) | 4.91$^{***}$(.00) | 66.23$^{***}$(.00) | 68.26$^{***}$(.00) | 66.49$^{***}$(.00) |
| **$IDV_{t-1}$** | | -.04 (.55) | -.03 (.70) | | .31 (.12) | .83$^{***}$(.00) |
| **$IP_{t-1}$** | | .03 (.95) | .56 (.61) | | .34 (.85) | 1.16 (.77) |
| **$IPr_{t-1}$** | | .25 (.54) | 1.47$^{**}$ (.05) | | -.81 (.55) | 2.64 (.33) |
| **$PX_{t-1}$** | 1.83$^{***}$(.90) | 1.63$^{***}$(.98) | 2.04$^{***}$(.00) | 9.88$^{***}$(.00) | 9.12$^{***}$(.00) | 9.87$^{***}$(.00) |
| **$PX_{t-1}$ X $IDV_{t-1}$** | | | -.02 (.89) | | | -1.16$^{***}$(.00) |
| **$PX_{t-1}$ X $IP_{t-1}$** | | | -.55 (.65) | | | -.50 (.91) |
| **$PX_{t-1}$ X $IPr_{t-1}$** | | | -1.67$^{*}$ (.06) | | | -4.81 (.13) |
| **Size[3]** | 3.61$^{***}$(.00) | 3.68$^{***}$(.00) | 3.69$^{***}$(.00) | 15.27$^{***}$(.00) | 15.01$^{***}$(.00) | 15.10$^{***}$(.00) |
| **Age[3]** | 1.03$^{**}$ (.02) | .73$^{*}$ (.10) | .75$^{*}$ (.09) | 4.41 (.13) | 4.07 (.16) | 4.15 (.15) |
| **Temp. Pers.** | -.03$^{***}$(.00) | -.09$^{***}$(.00) | -.09$^{***}$(.00) | -.26$^{***}$(.00) | -.26$^{***}$(.00) | -.26$^{***}$(.00) |
| **Variance of u** | 13.57$^{***}$(.00) | 13.43$^{***}$(.00) | 13.44$^{***}$(.00) | 111.22$^{***}$(.00) | 111.18$^{***}$(.00) | 111.16$^{***}$(.00) |
| **Variance of e** | 10.05$^{***}$(.00) | 10.04$^{***}$(.00) | 10.04$^{***}$(.00) | 34.85$^{***}$(.00) | 34.72$^{***}$(.00) | 34.68$^{***}$(.00) |
| **Log-likelihood** | -25.133.62 | -24.959.10 | -24.956.85 | -34.297.32 | -34.070.05 | -34.064.42 |
| **Wald chi[2]** | 779.33$^{***}$(.00) | 822.06$^{***}$(.00) | 826.22$^{***}$(.00) | 701.18$^{***}$(.00) | 689.86$^{***}$(.00) | 701.52$^{***}$(.00) |

$^{***}$ P<0.01; $^{**}$ P<0.05; $^{*}$P<0.1

(*p-value* in brackets)

*Sectorial and annual dummies* were included in all regressions but are not reported here.

[1]PH as dependent variable (*tobit* regression)

[2]PL as dependent variable (*tobit* regression)

[3] Size and Age are taken as natural logarithms.

NOTE: IDV= investment in R & D / sales; IP= Innovation of products; IPr= innovation of processes; PH= hourly productivity; PL= labour productivity.

In relation to the control variables used in all the tests, the high explanatory power of size can be seen in every test, confirming that it is positively related to both the export activity and the productivity of the firm. In connection with the first relationship, Wakelin (1998) observes that smaller innovative firms have a greater likelihood of entering the domestic market rather than the export market, explaining this result in terms of the fixed costs of exporting, which are relatively higher for small firms, so that it is harder for small firms to bear them. On the other hand, various authors argue that large exporting firms are more productive on account of the existence of fixed costs and the consequent advantages of

economies of scale at the time of exporting (Roberts and Tybout, 1997). In relation to the age of the firm and the proportion of temporary workers, their effect is positive and significant, in line with the bulk of the literature on exporting (Leonidou et al., 2007).

Table 6: Learning-by-exporting hypothesis

| | **Model 1[1] (n=1,677)** | **Model 2[1] (n=1,673)** | **Model 3[1] (n=1,673)** | **Model 4[2] (n=1,678)** | **Model 5[2] (n=1,674)** | **Model 6[2] (n=1,677)** |
|---|---|---|---|---|---|---|
| **Constant** | 5.08*** (.00) | 5.16*** (.00) | 4.95*** (.00) | 67.52*** (.00) | 69.48*** (.00) | 69.12*** (.00) |
| **$IDV_{t-1}$** | | -.04 (.56) | -.04 (.56) | | .32 (.11) | .35* (.08) |
| **$IP_{t-1}$** | | .17 (.73) | .22 (.65) | | .99 (.58) | 1.77 (.33) |
| **$IPr_{t-1}$** | | .33 (.42) | .42 (.30) | | -.48 (.74) | -.23 (.88) |
| **$IE_{t-1}$** | .01 (.90) | .01 (.98) | .01 (.23) | -.01 (.98) | -.02 (.68) | .05 (.24) |
| **$IE_{t-1}$ X $IDV_{t-1}$** | | | .01 (.21) | | | -.01 (.69) |
| **$IE_{t-1}$ X $IP_{t-1}$** | | | -.01 (.76) | | | -.10* (.09) |
| **$IE_{t-1}$ X $IPr_{t-1}$** | | | -.03** (.02) | | | .01*** (.00) |
| **Size[3]** | 3.95*** (.00) | 3.88*** (.00) | 3.86*** (.00) | 16.03*** (.00) | 15.67*** (.00) | 15.51*** (.00) |
| **Age[3]** | .79* (.07) | .80* (.07) | .81* (.07) | 5.07*** (.00) | 4.75* (.10) | 4.71 (.11) |
| **Temp. Pers.** | -.09*** (.00) | -.09*** (.00) | -.09*** (.00) | -.27*** (.00) | -.27*** (.00) | -.27*** (.00) |
| **Variance of u** | 13.49*** (.00) | 13.47*** (.00) | 13.46*** (.00) | 111.84*** (.00) | 111.78*** (.00) | 111.79*** (.00) |
| **Variance of e** | 10.05*** (.00) | 10.05*** (.00) | 10.04*** (.00) | 34.57*** (.00) | 34.42*** (.00) | 34.39*** (.00) |
| **Log-likelihood** | -25.096.07 | -24.939.09 | -24.935.19 | -34.221.46 | -33.991.67 | -33.986.89 |
| **Wald chi[2]** | 812.78*** (.00) | 808.94*** (.00) | 817.55*** (.00) | 677.34*** (.00) | 670.83*** (.00) | 680.56*** (.00) |

*** P<0.01; ** P<0.05; * P<0.1
(*p-value* in brackets)
*Sectorial and annual dummies* were included in all regressions but are not reported here.
[1]PH as dependent variable (*tobit* regression)
[2]PL as dependent variable (*tobit* regression)
[3] Size and Age are taken as natural logarithms.
NOTE: IDV= investment in R & D / sales; IP= Innovation of products; IPr= innovation of processes; PH= hourly productivity; PL= labour productivity.

By way of synthesis, it is possible to affirm the following:

1) firms that are innovative beforehand become more productive as they develop their export activity, along the lines suggested by the self-selection hypothesis, for which reason we accept hypothesis 1;

2) with respect to the converse relationship, which is to say in relation to the question of whether the export activity makes the innovative firm more productive, the tests indicate that the firm that has a greater propensity to export will be more productive, but, so long as a firm has started to export, the intensity of its exports do not increase its productivity, for which reason we accept the hypothesis of learning-by-exporting (hypothesis 3) only partially;

3) in relation to the various interactions, the only positive and significant relationship that operates consistently is the joint effect of productivity *ex ante* and investment in R & D on the export activity of the firm, for which reason we partially accept hypothesis 2. None of the interactions between the export activity and the different indicators of innovation is positive and significant, for which reason we reject hypothesis 4.

## 5. Conclusions and discussion

There is a consensus in the literature in highlighting the innovative activity as a central element in the export markets competitiveness (Porter, 1998). From this point of view, the identification of factors that strengthen this positive effect of innovation on firms export behaviour is a matter of considerable interest. In this context, the large number of studies that provide evidence of higher productivity in exporters (Aw and Hwang, 1995; Bernard and Jensen, 1999; Aw et al., 2000; Delgado et al., 2002) suggest that this could be one of the variables that have an important effect on the relationship between innovation and the firm export behaviour.

The present study analyzes the interactions between productivity (distinguishing between hourly and labour productivity), innovation and the export activity of the firm (distinguishing between export propensity and export intensity). In addition, the analysis of the innovative activity, due to the limitations that attach to use only investment in R & D as a measure of that concept (Greenghalgh et al., 1994; Rodríguez, 1999; Santamaría, 2009), has broadened the notion of innovation by including different outputs of innovation (product and process innovation). On the other hand, the longitudinal analysis makes it possible to analyze the effect of the variables considered over time in a dynamic way, lagging the measures of innovation in one period in order to follow the logic that investment in R & D and the outputs of innovation do not have an immediate effect, but they have an impact on the activities of the firm at a later date (Filipescu et al., 2009). Similarly, García and Avella (2008) indicate that the results of exporting are not immediate either, but take between one and three years to become evident.

Again, the use of lagged variables makes it possible to improve the evaluation of the causal relationships under review (Baum, 2006).

The results of the analysis confirm, in the first instance, that there is a difference in productivity between exporting and non-exporting firms. This result is similar to that which has been found in many other studies (Aw and Hwang, 1995; Bernard and Jensen, 1999; Aw et al., 2000; Delgado et al., 2002; García and Avella, 2008), which offer a variety of explanations for the higher productivity of exporters compared with non-exporters. In addition to all this literature, this work studies the firm innovative activity as a differentiating factor, providing evidence of the greater productivity of the firms that develop different types of innovation.

The second stage of the analysis consists in testing the main theories offered in the literature about the way in which innovative activity causes this difference in productivity between exporters and non-exporters (Wagner, 2007): the self-selection hypothesis (productivity leads to export activity improvements) and the learning-by-exporting hypothesis (export activity enhances the firm productivity), but including innovative activity as a factor that can exercise an influence over the corresponding dependent variable, as well as moderate the relationship under study.

As far as the direct effect between variables is concerned, the results show that productivity increases both the firm export propensity and intensity, which confirms the self-selection hypothesis. On the other hand, if the firm has exported in the previous period, it achieves higher levels of productivity, while the export intensity does not have an impact on productivity. For that reason, the learning-by-exporting hypothesis is only partially supported.

In relation to the moderating effect, the analysis provides firm evidence that the effect of export activity is more intense if the productivity enhancement is combined with improvements in innovation, as indicated by investment in R & D. This result implies that the self-selection hypothesis holds more strongly for more productive firms, which, at the same time, direct resources to R & D. That is to say, export markets *select* those firms whose productivity makes it possible for them compete effectively,

and which can still make an effort to invest in R & D, quite independently of whether those efforts are translated into outputs of innovation. On the other hand, but consistent with this result, none of the interactions between the different types of innovation and the firm export activity is significant and in the direction expected. From this, it is possible to conclude that innovation does not have any supportive role to the learning-by-exporting hypothesis.

These results are consistent with those that are found in the literature on this issue, which suggests that the available evidence supports the self-selection hypothesis more strongly than the learning-by-exporting hypothesis (Bernard and Jensen, 1999; Delgado et al., 2002; Fariñas and Martín-Marcos, 2007)[11]. In fact, as García and Avella (2008) indicate, although the learning-by-exporting hypothesis has been given as a theoretical and potential effect in these relationships, few studies provide empirical support that exporting firms benefit from the learning generated in the process of international expansion.

Limited evidence in favour of the learning-by-exporting hypothesis is also found in the studies of this issue in Spain (Delgado et al., 2002, Fariñas and Martín-Marcos, 2007 and García and Avella, 2008), in which it is suggested that it is not easy for firms to take full advantage of the potential learning that is generated in export markets. This may be because firms that increase the intensity of their exports may simply focus on those markets that they have already entered in the early part of their export activity. In that way, firms may have exhausted the potential for learning in those markets, and are not inclined to enter new markets that could contribute to improving their results. Moreover, the application of the same strategies that have been developed for the domestic market will produce poor results if the firm moves into international markets (García and Avella, 2008**).** For this reason, a firm should not only learn about foreign markets, but should also use its own resources, capabilities and, above all, learn how these can be employed in new problem situations that arise in the course of activities abroad (Madhok, 1997).

[11] An exhaustive review of the evidence for both hypotheses can be found in Wagner (2007).

Analyzing the effect of innovation on its own, it can be seen that new products have a positive effect on later export activity, while new processes have an impact in both directions, on productivity and on export activity, which is consistent with the findings of Filipescu et al., (2009). In this sense, Filipescu et al., (2009), while recognising the difficulty of finding studies that distinguish clearly between these two types of innovation, derive their conclusion primarily from the work of Becker and Egger (2007), who argue that firms that are more interested in developing successful exports focus on process innovation, while a focus on product innovation is more important for firms that intend to maintain their international position. This argument of Becker and Egger (2007) is consistent with the evidence found in the present study, which shows that export success can have an effect on the development of the firm (for example, on its productivity, reason why the firm that wishes to secure success internationally concentrate its efforts on process innovation), while the maintenance of an international position translates into a focus on continuing to export, independently of the impact that activity has on the firm results (which is why firms with this aim focus on product innovation).

In terms of the implications of this study, the results can serve to direct the attention of firms when they design strategies to improve their results. In this sense, an organization that wants to increase its export activity ought to combine innovative policies, above all investment in R & D, with policies that promote productivity. On the other hand, as shown in this study, this international activity, and in particular the entry into export markets, imply new productivity improvements. Thus, there takes place a cyclical process that feeds back and improves the firm performance. At an institutional level, the information provided by this study can be used to design policies that support international competitiveness of Spanish firms. The results suggest that such measures as encouraging new investments in R & D, promoting the reduction of temporary workers and supporting increases in the firm export propensity (to a greater extent than increases of the export intensity of firms that already export) contribute to improve the firm performance.

Finally, some limitations of this study should be mentioned. In the first place, the variable of export activity is affected by many variables which cannot be easily controlled, which mean that the results of

this study, like those of other investigations, should be treated with caution. Another factor that limits the generalizability of these results is that the study focused on the manufacturing sector. On the other hand, the analysis concentrated on the mode of entry into international markets which is most common and most appropriate for Spanish firms, namely exporting. However, it leaves untouched other areas of activity that would be interesting areas of study, especially in relation to other industries, markets and international modes of entry (FDI, alliances, licensing and joint ventures). All these limitations are a consequence of the nature of the information available in the SBSS, for which reason we intend, in the future, to use other methods of data collection, such as surveys and personal interviews.

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