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IS THERE A PRODUCER QUALITY WAGE PREMIUM SIMILAR TO THE EXPORTER WAGE PREMIUM?*

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Abstract

Exporter wage premium has been widely studied in the literature on international trade. The aim of this paper is analyze whether there is also a producer quality wage premium at firm level, and if so, analyze whether its origin is similar to the exporter wage premium. In other words, I test whether firms that increase their product quality become more productive and pay higher wages (as with the learning by exporting hypothesis, we can speak of learning by producing quality), or, in contrast, more-productive firms with higher wages opt to increase product quality because their higher productivity means these kinds of decisions and investments can be taken with more guarantees (self-selection hypothesis). Moreover, I find on the one hand, that firms which start to increase their product quality have a higher probability of exporting than firms that never increase their product quality, and on the other, that firms which start to export increase their product quality more than firms that never export. However, in no cases do I find evidence in favour of learning by exporting or by producing quality hypotheses.

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1. INTRODUCTION

Since the pioneering paper by Bernard and Jensen (1995) many papers on exporter wage premium have appeared. Wagner (2007, 2012) and Schank et al. (2010) mention most of them and summarize their contributions. The main motivation of this paper stems from Alcalá and Hernández (2010), where we build a theoretical model that suggests that wage premium of exporter firms and their higher human capital are due to their higher product quality. More-productive firms can overcome entry costs onto international markets (and national ones[1]) and they produce higher quality goods. This relation also generates a rise in human capital and in the average wage of the firm. However, the relation between wages and product quality could not be confirmed because the dataset used in this paper held no information about quality product. Therefore, this paper attempts to mitigate this shortcoming by analyzing the correlations between the quality of the product, the exports and the average wages of the firm.

There are several papers that have analyzed empirical positive correlations between exports, quality and productivity and wages in firms or establishments. Verhoogen (2008) finds that more-productive establishments produce higher-quality goods than less-productive establishments, and they pay higher wages to maintain a higher-quality workforce. In many cases, the arguments for this empirical relation are based on the literature on firm-size wage premium (Idson and Oi, 1999) and exporter wage premium (Bernard and Jensen, 1995). Kugler and Verhoogen (2011) use a measure of the scope for quality differentiation from Sutton (1998) and find that the output price-plant size and input price-plant size elasticities are greater in sectors with more scope for quality differentiation. Verhoogen (2008) finds that more-productive plants increase the export share of sales, wages and the likelihood of ISO 9000 certification more than less-productive plants. Guadalupe (2007) argues that increased product market competition leads to higher returns to skill, because high-skilled workers produce at lower costs, and there is stronger competition between firms to attract better workers. A similar point of view is taken by Bustos (2011), who finds that

[1] Similar effects are obtained between establishments in national-market versus local-market.

trade liberalization induces the most productive firms, usually exporters, to adopt skill-intensive production technologies[2].

Most of these papers suppose that firms that increase their product quality become more productive and pay higher wages, similar to the learning-by-exporting hypothesis for exporter firms. However, the causal relation could also be the opposite. Higher productivity in exporting firms is due to self-selection of more productive firms in export markets (self-selection hypothesis). This may also be applicable to firms that increase their product quality. More-productive firms with higher wages decide to increase product quality because their higher productivity means these kinds of decisions and investments can be taken with more guarantees.

There is a wealth of literature on which hypothesis is more relevant - learning-by-exporting or self-selection - in the case of exporter firms. Singh (2010) concludes that, at firm level, the studies supporting self-selection clearly outnumber the studies supporting learning-by-exporting. But, in the case of relations between product quality and productivity or wages, there are no studies which analyze their causality. Therefore, this paper has three aims: i) to ascertain whether a producer quality wage premium exists; ii) to analyze whether firms that increase their product quality become more productive and pay higher wages (learning-by-producing-quality hypothesis), or, in contrast, more-productive firms with higher wages decide to increase their product quality (self-selection hypothesis), and iii) to investigate the potential simultaneity between exports and increases in product quality.

To carry out the latter two aims I use a methodology similar to that proposed by Schank et al. (2010) in the context of exporter firms. These authors contrast the learning-by-exporting versus self-selection hypothesis using a dataset of German linked employer-employee and obtain empirical evidence for the latter. Papers that focus on the relation between firm heterogeneity and exports (Melitz, 2003 and Greenaway and Kneller, 2007) are the theoretical basis of this result.[3].

[2] Bernard et al. (2011) review this empirical evidence on firm heterogeneity in international trade.

[3] There are several papers which have analyzed this question in Spain, paying attention to the estimated total factor productivity. Delgado et al. (2003) obtain evidence in favour of the self-selection hypothesis, but Mañez et al. (2010) find evidence in favour of the learning-by-exporting hypothesis. Manjón et al.

The Spanish dataset used to analyze the effect of product quality on wages is the *Encuesta Sobre Estrategias Empresariales* (Survey on Companies' Strategies, hereinafter, ESEE). With this dataset, I will use the measure for quality from Sutton (the R&D and advertising intensity) and information from a categorical variable which indicates whether the firm has carried out or contracted quality standardization and control works, because the dataset does not contain information about ISO certification. I will analyze whether the correlations of theses measures for quality with other variables are as expected. Subsequently, I estimate demand equations for skilled workers and wages equations, adding these measures for quality in order to test whether product quality generates the expected positive effects on human capital and average wages of the firm.

Direction of causality will be analyzed using the definition of firms that start to produce with higher quality, versus firms that do not increase their product quality. The test analyzes how higher product quality affects firms that start these actions in subsequent years. If higher product quality increases wages and productivity, we would observe a wage rise and productivity rise in subsequent years after the decision to increase product quality. In contrast, if the relevant hypothesis is that more-productive firms decide to increase product quality, we would not observe any statistically significant temporal effects. I use this same methodology in order to investigate whether there is a link between exports and product quality. Specifically, I analyze whether firms which start to increase their product quality have a higher probability of exporting than firms that never increase their product quality, and whether firms which start to export increase their product quality more than firms which never export.

The paper is organized as follows. Section 2 describes the dataset and the two indicators used to measure product quality: R&D and advertising expenditures over sales and carrying out or contracting standardization and control works. Section 3 estimates demand equations for skilled employees (college graduates and engineers) and

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(2012) indicate that the assumptions used about the evolution of productivity and the role of export status turns out to be critical in finding evidence in favour of either hypothesis. The advantage of using an observed variable, such as wages, instead of estimated productivity to test these hypotheses is that we do not need to impose additional assumptions.

wages equations. These estimations show positive correlations between exports, product quality and human capital and average wages of the firm. Section 4 studies the direction of the causality and tests the hypothesis that higher product quality increase wages and productivities or whether more-productive firms decide to raise product quality. Section 5 analyzes the link between exports and product quality, and Section 6 summarizes and concludes.

2. THE DATA

The ESEE (this survey has its origin in an agreement signed in 1990 between the Ministry of Industry and the SEPI Foundation, formerly the *Fundación Empresa Pública* (Public Firm Foundation)) is an unbalanced panel of Spanish manufacturing firms in operation since 1990. The database contains information about an average sample of 1,800 firms every year, and includes information about activity, products and manufacturing processes, customers and suppliers, costs and prices, markets covered, technological activities, income statements, accounting balance sheets, employment and foreign trade. Firms with less than 10 employees were excluded from the survey. All firms which have over 200 employees are included along with a random sample of the rest (firms with 10 to 200 employees). Most of the variables included are yearly, but there are others where the information is only updated every four years, such as the percentage of college graduates and engineers of total employees and the information about works carried out or contracted by the firms on normalization and quality control.

Table A1 in the appendix gives a brief statistical description of some interesting variables. Average wages of the firm are labour cost per employee (labour cost divided per yearly average of total employment). Exporter firms have higher wages and higher sales per employee than non-exporter firms, and are also larger. The percentage of exporter firms with more than 49 employees is 69.4%, whereas in non-exporters it is only 19.6%. The percentage of college graduates and engineers is 5.6% in exporter and 2.9% in non-exporter firms (38% of the firms do not have employees with postgraduate degrees). The percentage of total sales exported (export propensity) is 28.9% for exporter firms. We also observe that the percentage of firms which control their quality is 55.5% within exporter firms, whereas within non-exporter firms it is only 27.1%. The percentage of R&D and advertising expenditures over sales is also higher in exporter firms - 2.7% versus 1.4% for non-exporter firms.

The ESEE does not contain information about whether a firm has any ISO certification of its product quality. Therefore, we use a measure for quality from Sutton (1998) –R&D and advertising expenditures over sales- and the information obtained every four years about whether a firm has carried out or contracted quality standardization and control works (quality control). We can observe in the following tables that these measures for quality behave as expected. Table 1 shows how in all the years where information on control quality is available there is a positive relation between this variable and the percentage of college graduates and engineers, the export propensity (percentage of sales exported) and the average wage of the firm. These same positive correlations are observed between R&D and advertising expenditures over sales and the percentage of graduates and the average firm wage (for all years between 1990 and 2010 in the latter case). The positive correlations between R&D and advertising expenditures over sales and export propensity are not significant only in 1991 and 1992

Insert Table 1 about here

Table 2 also shows a positive relation between these variables by industries. In the vast majority of cases theses correlations are significant. The correlations between R&D and advertising expenditures over sales and export propensity are not significant in Meat products, Food and tobacco, Paper and Computer products, Electronics and Optical products.

Insert Table 2 about here

Table 3 shows several ratios by years between the measures of product quality, average firm wage, exporter status and percentage of college graduates and engineers of the firm. In the first three columns we can see that the firms which invest in R&D and advertising have higher percentages of college graduates, higher wages and greater export propensity than firms which do not invest, since all the ratios are higher than one. This same behaviour is observed the second three columns for firms which control their product quality versus firms which do not. Finally, the last two columns show that R&D

and advertising expenditures over sales and quality control are higher in exporter than non-exporter firms.

Insert Table 3 about here

3. HUMAN CAPITAL, WAGES AND PRODUCT QUALITY

First I estimate demand equations for skilled employees in order to analyze the correlations between theses employees and product quality. A positive correlation between exports and human capital of the firm has been pointed to in many papers since Bernard and Jensen (1997). Alcalá and Hernández (2010) cite several of them. A positive correlation between product quality and demand for skilled employees has been recently suggested by Verhoogen (2008) and Bustos (2011).

In equation (1) the dependent variable e_{jt} is the percentage of collage graduates and engineers of the firm *j* in the year *t*, and I have chosen the *tobit* specification to estimate the correlations with the age of the firm, the firm size (employees), exporter status (a dummy equal to unity when the firm has exported) and the quality indicator:

$$\begin{aligned} e^*_{jt} = \alpha_0 + \alpha_1 Age_{jt} + \alpha_2 Size2_{jt} + \alpha_3 Size3_{jt} + \alpha_4 Exporter_{jt} + \alpha_5 Quality_{jt} + \\ \alpha_6 Industry_{jt} + \gamma_t + v_{jt} \end{aligned} \quad (1)$$

$$e_{jt} = \max(0, e^*_{jt})\ ;\ v_{jt} \sim \text{Normal}(0, \sigma^2),$$

where *Size2* is a dummy variable for firm size which corresponds to firms employing between 50 and 249 workers and *Size3* corresponds to firms with more than 249 workers. *Exporter* is the dummy for exporter status and *Quality* is the quality indicator, which can be the R&D and advertising expenses over sales suggested by Sutton (1998) or a dummy variable which takes the value one when a firm has carried out or contracted quality standardization and control works (I will also estimate specifications with both quality indicators). Additionally, I include a vector of dummies for industries and another vector γ of dummies for years.

Table 4 shows the results. In column (1) we observe that exporting firms have a higher demand for college graduates and engineers (Alcalá and Hernández, 2010). The inclusion of R&D and advertising over sales in column (2) or the inclusion of the dummy for control quality in column (3) has a positive effect on demand for college graduates and engineers. Marginal effects show that firms which carry out or contract quality standardization and control works increase the percentage of college graduates and engineers by almost one percentage point. Moreover, a 10 percentage point increase in R&D and advertising over sales increases the percentage of college graduates and engineers by 1.2 percentage points. The results of interaction terms between quality indicators and export propensity and those between quality indicators and dummies for firm size are not reported as they are not statistically significant.[4]

Insert Table 4 about here

Table 5 shows the estimates of the following wage equation, where the wage of the firm, w_{jt}, is the total labour cost divided by the yearly average of total employment of the firm *j* in the year *t*.

$$\begin{aligned} \ln w_{jt} = \beta_0 + \beta_1 Age_{jt} + \beta_2 Size2_{jt} + \beta_3 Size3_{jt} + \beta_4 e_{jt} + \beta_5 Exporter_{jt} + \\ \beta_6 Quality_{jt} + \beta_7 Industry_{jt} + \delta_t + u_{jt} \end{aligned} \quad (2)$$

In column (1) we observe the standard results on positive relations between the firm size (employees), the human capital of the firm (skilled employees), the exporter status and wages. Moreover, older firms pay higher wages. A one-year increase raises average firm wages by 0.31%. The exporter wage premium is 8.6% ($e^{(0.083)}$-1). This effect is only slightly less than that obtained by Alcalá and Hernández (2010).[5]

Columns (2)-(5) include the product quality indicators. The wage effect of R&D and advertising expenses over sales is statistically significant only when the percentages of college graduates and engineers of the firm in column (4) are not included. In this case, a 10 percentage point increase in the percentage of theses expenses increases the average wage of the firm by 3%. The wage effect in column (5) of a dummy which

[4] Results are available upon request.

[5] The exporting wage premium obtained with hourly wages with ESEE -9.3%- is very similar to the figure obtained with yearly wages, but I prefer to use yearly wages because the information about the number of yearly worked hours in 1990 is very scarce and it reduces the number of observations. Nevertheless, those estimates are available upon request.

takes the value one when the firm has invested in R&D and advertising and zero otherwise has an important and statistically significant effect, because it represents a 4.4% wage increase. The dummy for quality control is also statistically significant and has a similar wage impact. According to column (3), the firms which control their product quality pay wages 4.7% higher than firms which do not carry out this control. As estimations of demand of college graduates and engineers, the interaction terms between quality indicators, exporter status, percentage of college graduates and engineers and dummies variables for firm sizes are not statistically significant.

Insert Table 5 about here

4. CAUSALITY

The direction of the causality between product quality and wages may not be the same as in the previous analysis, but it is possible that, instead of higher product quality increasing productivity and wages of the firms, the more-productive firms –and the firms that pay higher wages- decide to increase their product quality.

To carry out this analysis I use a methodology similar to that proposed by Schank et al. (2010) in the context of exporter wage premium. Theses authors observe how firms behave in periods of consecutive years. They start at a point in time when none of the firms exported and end when some have been exporting for a while. The latter are called export starters. Estimates of Schank et al. (2010) indicate that wages and labour productivity (sales per employee) of exporter starters are higher than non-exporter firms but that temporal effects are not statistically significant. In other words, neither the difference in the wages nor the difference in productivity changes over the years either in the years before the starters begin to export or the years after starting to export. According to these results, these authors conclude that firms with a higher productivity (and higher wages) self-select into export markets. This result is in line with the main idea of the model of Melitz (2003), who emphasizes that firm heterogeneity is a phenomenon that can help explain the distribution of trade flows. Greeneway and Kneller (2007) state that only more-productive firms can bear the higher cost of entering international markets.

This methodology can be applied to the causality relation between product quality and wages. I can define a set of firms which start to increase their product quality versus firms which never do. The test also analyzes the evolution of the labour productivity and wages of starters before and after the decision to control the quality. If this evolution shows a positive increase, we will conclude that higher product quality increases productivity and wages. However, if these variables are not affected in the years after the increase in quality, even though they are higher than those observed in firms which do not increase their product quality, we will conclude that more productive firms decide to improve their product quality and, therefore, the direction of causality is the opposite. In other words, product quality does not increase productivity, but the more productive firms do decide to improve their product quality.

Using R&D and advertising expenses over sales as a measure of product quality (Sutton, 1998), we define a firm as starting to improve its product quality if in the four-year period considered it does not carry out R&D and advertising expenses in the two first years and has positive values for this variable in the two following. Moreover, if a firm has been observed more than four times in the sample, then in all observed years after $t = 4$ it must have been a quality producer (one investing in R&D and advertising) and in all the observed years before $t = 1$ it must have not invested. If this is not the case, the firm must be dropped form the sample. Obviously, we define a firm as not improving its product quality when it presents zero values of this variable for all the four-year periods considered. With the ESEE data from 1990 to 2010, we can define 18-year windows (from 1990 to 1993, from 1991 to 1994, …, from 2007 to 2010). These data for quality producer starters and non-quality-producer are pooled over these eighteen cohorts. So, it is possible that a firm was first a non-quality-producer and then a quality producer starter, but not vice versa.

With the other measure of product quality –whether the firm has carried out or contracted quality standardization and control works (quality control)- we can only ascertain the above for every four years (1990, 1994, 1998, 2002, 2006 and 2010). Therefore, in this case, I have defined three cohorts of 4 years (from 1990 to 2002, from 1994 to 2006 and from 1998 to 2010), where I have supposed that a firm starts to increase its product quality when it does not control it in the two first years but does in the two following years. A firm never increases its product quality if it does not control it in all the 4 years considered.

Table 6 shows the average labour productivity (sales per employee) obtained and average firm wages (labour cost per employee) and the statistic test which controls whether these averages are statistically identical between the firms which either start to invest in R&D and advertising or start to control their product quality, versus the firms which neither invest in R&D and advertising nor control their product quality. Using ESEE data from 1990 to 2010 we obtain 299 investor starters and 2,248 non-investors. With the other measure of product quality –whether the firm has carried out or contracted quality standardization and control works- we obtain 199 firms that start to control their product quality and 558 non-controllers.

Labour productivity and average wages of firms which start to invest in R&D and advertising are higher than in firms which do not invest. These differentials are statistically significant, except in labour productivity in $t = 3$. In the case of firms which start carrying out or contracting quality standardization and control works, wages and labour productivity are higher than in firms which do not, and these differences are all statistically significant.

Insert Table 6 about here

Table 7 shows the results of estimated wages and productivity equations for investor starter and non-investor firms. These equations are also estimated with another overlap sample of firms in order to avoid the problem of some firms' not being comparable to others due to lack of overlap in the distribution of firms' characteristics between investor starters and non-investors. I use the methodology proposed by Crump et al. (2009), who discard all firms with estimated propensity scores outside the range [0.1, 0.9]. Table A2 of the appendix shows the *probit* model that estimates the probability of starting to invest in R&D and advertising. This probability has been estimated with characteristics of the firms in $t = 1$ (two years before the starters begin to invest).

The quality producer wage premium for starters is 9.1% in specification (1) of the full sample and 11.7% in specification (2), where I exclude the exporter dummy and the percentage of college graduates in order to prevent these variables possibly capturing some learning effect. The investor starters pay higher wages and also present higher labour productivity (sales per employee) than non-investors with 38.4% increase in specification (1) and 50.7% in specification (2). However, the interaction terms between the starter dummy variable and dummies for the four periods considered are not statistically significant in any case. Consequently, neither wages nor productivity shows significant increases in years before and after the decision to invest in R&D and advertising. Therefore, the causality relation is not due to the learning-by producing quality hypothesis (a higher product quality generates higher productivity and higher wages), but to the self-selection hypothesis. That is to say, more-productive firms decide to invest in R&D and advertising in order to increase their product quality, perhaps because this higher productivity means these kinds of investments can be taken with more guarantees.

In the overlap sample there are 64 investor starters (out of 299). Due to the common support condition neither wages nor productivity are statistically different between investor starters and non-investors in $t = 1$. The interaction terms between the dummy of starting to invest and dummies for the subsequent three considered periods are not statistically significant in any case. Therefore, once again wages and productivity do not show significant increases in the years before and after the decision to invest.

Insert Table 7 about here

Table 8 shows the results when we use quality control as a measure of product quality. The results point in the same line in the case of wages. Firms which start to control their product quality pay higher wages than firms which do. The quality producer wage premium is 9.1% in the specification (1) and 9.5% in specification (2), but the interaction terms between the dummies for starter firms and dummies for the 4 periods considered are not statistically significant. In the overlap sample there are 141 controller starters (out of 199) and, once again, these interaction terms are not statistically significant. However, in the case of productivity, the results are slightly different. There are no statistically significant differences between control starters and non-controllers in the full sample, and the interaction term between the dummy control starter and dummy for t = 2 is not statistically significant. But the interaction terms between the dummies for starter firms and dummies for t = 3 and t =4 are positive and statistically significant. This is the only case where we find some evidence in favour of the learning by producing quality hypothesis, so productivity increases after the decision to control product quality. In all others cases we can conclude that more-productive firms with higher wages decide to increase product quality (perhaps because their higher productivity means these kinds of decisions and investments can be taken with more guarantees). Hence, I find evidence for the self-selection hypothesis.

Insert Table 8 about here

5. THE LINK BETWEEN EXPORTS AND PRODUCT QUALITY

The previous pages show many similarities between exporter wage premium and the producer quality wage premium. Moreover, we can also investigate the simultaneity between the decisions to export and to increase the product quality. Table 9 shows probit models of probability of exporting for firms which start to increase their product quality and firms which do not when we use the measure of Sutton (R&D and advertising expenditures over sales). In the first four columns I use the same definition of investor starter that I have used in previous pages: a firm which starts to increase its product quality is a firm which invests any positive amount in R&D and advertising. In this case, the dummy variable of starter is not statistically significant in the full sample (neither is the interaction terms between this dummy and temporal dummies).

It is possible that to find this relation is necessary to overcome a positive critical value of R&D and advertising expenditures.[6] For example, if we use the median of the distribution of R&D and advertising expenditures over sales (as a percentage), we can define a firm which starts to increase its product quality as a firm which invests more than the median in t = 3, 4 (and less than the median in t = 1, 2), and a firm which does not start to increase its product quality as a firm which invests less than the median in

[6] The distribution of R&D and advertising expenditures over sales (as a percentage) is skewed to the right. Its median is 0.59 and its mean is 2.17.

t=1;…,4. The second four columns show the probit models with that definition. The dummy variable of starter is positive and statistically significant in the full sample, and its marginal effect is 0.272. In others words, a firm which starts to increase its product quality has a 27.2% higher probability of exporting than a firm which does not increase its product quality. However, the interaction terms between that dummy and dummies for considered periods are not statistically significant. In the overlap sample the starter dummy is not statistically significant by construction and neither are the temporal effects. Again, this result shows that firms that start to increase their product quality have a higher probability of exporting than firms that never increase their product quality, but there is no evidence of learning by producing quality. As more productive firms opt to increase product quality they also decide to export, but there is no evidence that this increase of product quality generates an increase of probability of exporting in subsequent years.

Insert Table 9 about here

Table 10 shows similar estimations when we use the quality control as measure of quality product, but in this case the starter dummy is not statistically significant in the specification (1). The quality control is a dichotomy variable and we can not do the same as with the percentage of R&D and advertising expenditures over sales. In this case, in order to find a positive effect of starter dummy in full sample it is necessary to exclude the dummies for size in the specification (2), where a firm which starts to control its product quality has a 17% higher probability of exporting than a firm which does not[7], and the interaction terms between the starter dummy and dummies for the periods considered are again not statistically significant. As with previous estimations, in the overlap sample these coefficients are not statistically significant.

Insert Table 10 about here

Table 11 shows this link between export and product quality from the perspective of firms which start to export and firms which never export. As with the definition of a firm which starts to increase its product quality, using observation

[7] The marginal effect is 0.17 in this case.

periods of 4 years, I define an export starter as a firm which does not export in t = 1, 2 and exports in t = 3, 4. Obviously, non-exporters are firms that do not export in any of the years t = 1,…,4. Table 11 shows the estimated effect of starting to export as percentage of R&D and advertising expenditures over sales by means of tobit estimates. In specification (1) of the full sample this effect is an increase of 0.38 percentage points (the marginal effect is 0.387), and the interaction terms between the starter dummy and dummies for considered periods are not statistically significant. This lack of significance is also obtained in the overlap sample[8]. Therefore, firms which start to export increase their product quality –measured as the percentage of R&D and advertising expenditures over sales-, but there is no evidence of learning by exporting, because the temporal effects in subsequent years are not statistically significant.

Insert Table 11 about here

Finally, Table 12 show the same effect when we use the control quality as measure of product quality by means of probit estimates. This effect is not statistically significant when we use the last definition of export starter. However, in this case we can do the same as in Table 9. That is, the distribution of export propensity (percentage of sales exported) is also skewed to the right (with median equal to 3% and mean equal to 17.37%), so we can consider that a firm which starts to export is a firm which does not export or, if it does, its export propensity is less than the median in t = 1, 2 and has an export propensity higher than the median in t = 3, 4. A firm never exports in this case if does not export or, if it does, its export propensity is less than the median in the four periods considered. With this definition we find a positive and statistically significant effect for starter dummy, but in any case, the interaction terms between starter dummy and dummies for considered period are not statistically significant, as in the overlap sample. Consequently, we obtain the same conclusion. Firms which start to export increase their quality control, but there is no evidence of learning by exporting, because the temporal effects in subsequent years on the probability of quality control are not statistically significant.

Insert Table 12 about here

[8] Table A2 in appendix shows the probit model that estimates the probability of start to export.

6. CONCLUSIONS

The main finding of this paper is that there is a quality producer wage premium similar to the exporter wage premium. Firms which carry out or contract quality standardization and control works increase their percentage of college graduates and engineers by almost one percentage point. Moreover, a 10 percentage-point increase in R&D and advertising in sales (Sutton's measure for product quality) increases the percentage of college graduates and engineers by 1.2 percentage points. Consequently, firms with greater product-quality pay higher wages. The estimated quality producer wage premium with this Spanish dataset is around 4.4%-4.7%, but it can reach more than 9% for firms which start to improve their product quality.

I have used a methodology similar to that proposed by Schank et al. (2010) in order to ascertain the origin of the quality producer wage premium. Most of the results point in the same line. I do not find evidence in favour of firms which increase their product quality becoming more productive and paying higher wages. In other words, I find no evidence in favour of the learning-by-producing quality hypothesis. The results indicate that more-productive firms with higher wages decide to increase product quality, that is, the evidence favours the self-selection hypothesis. This result is also a majority finding in studies that analyze the origin of the exporter wage premium (Singh, 2010). But there are other similarities between these two wage premiums. On the one hand, I find that firms that start to increase their product quality have a higher probability of exporting than firms that never increase their product quality, and on the other, I obtain that firms that start to export increase their product quality more than firms that never export. But in all these cases, the temporal effects in subsequent years are not statistically significant, so I do not find evidence for either the learning by exporting hypothesis on probability to increase the product quality or for the learning by producing quality hypothesis on probability to export. All the results are in favour of the self-selection hypothesis. That is to say, more-productive firms with higher wages manage to break into international markets and decide to increase product quality.

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APPENDIX

Table A1. Survey on Companies' Strategies 1990-2010

	All firms		**Exporters**		**Non-exporters**	
	Average	Observat.	Average	Observat.	Average	Observat.
Average wages	25655.8 (12416.6)	38549	29123.4 (12600.1)	23078	20443.3 (10095.9)	15364
Sales per employee	138957.7 (177153.2)	38559	172128.4 (203636.5)	23083	88936.8 (109084.6)	15371
Age	34.19 (21.76)	47442	39.07 (23.86)	22553	28.95 (17.14)	15371
Size (employees)						
Less than 50	0.504	38637	0.305	23083	0.804	15371
Between 50-249	0.248	38637	0.320	23083	0.142	15371
More than 249	0.247	38637	0.374	23083	0.054	15371
Percentage of graduates	4.550 (7.471)	47186	5.641 (7.147)	22360	2.914 (7.130)	15110
Export propensity	17.370 (25.380)	38671	28.953 (27.173)	23201		
R+D and advertising over sales (%)	2.175 (19.721)	38223	2.694 (4.848)	22781	1.404 (30.533)	15355
Quality control	0.434	47494	0.555	22548	0.271	15142

Standard deviations are in brackets.

Table A2. Probit models

	Probability of starting to export	**Probability of starting to invest in R&D and advertising**	**Probability of starting to control the product quality**
Log (productivity)	0.311 (5.75)	0.285 (4.23)	0.323 (1.83)
Percentage of graduates	-0.002 (0.31)	0.010 (0.79)	0.016 (0.68)
Size (employees)			
Between 50-249	0.205 (2.08)	-0.007 (004)	0.950 (3.28)
More than 249	0.677 (4.77)	-0.498 (1.74)	1.915 (4.59)
Exporter		0.100 (0.75)	-0.022 (0.10)
Age/10	-0.023 (1.01)	-0.025 (0.67)	-0.156 (2.09)
Observations	7,918	2,257	541
Pseudo R^2	0.096	0.119	0.259

All estimated models include a constant, dummies for industries and years. $|z|$-statistics are in brackets.

Table 1. Correlations between the quality measures and the percentage of college graduates, the export propensity and the average firm wages by year

	Quality control			R&D and advertising expenditures over sales (%)		
	Percentage of graduates	Export propensity	Average firm wage	Percentage of graduates	Export propensity	Average firm wage
1990	0.1302*	0.1378*	0.2312*	0.2980*	0.0548*	0.1957*
1991					0.0332	0.2534*
1992					0.0324	0.2715*
1993					0.0436**	0.2614*
1994	0.2110*	0.2471*	0.3635*	0.3335*	0.0668*	0.3026*
1995					0.2663*	0.2779*
1996					0.1117*	0.2987*
1997					0.0814*	0.296*
1998	0.1688*	0.2683*	0.3502*	0.3360*	0.0845*	0.2927*
1999					0.1260*	0.2852*
2000					0.0801*	0.2602*
2001					0.0603*	0.2568*
2002	0.1761*	0.2131*	0.3160*	0.3174*	0.0806*	0.2447*
2003					0.0525*	0.2701*
2004					0.0634*	0.2974*
2005					0.2663*	0.0657*
2006	0.1156*	0.1166*	0.1837*	0.3370*	0.0709*	0.2505*
2007					0.0871*	0.2587*
2008					0.1002*	0.2251*
2009					0.1231*	0.2006*
2010	0.1711*	0.1940*	0.2367*	0.2364*	0.1171*	0.1705*

* Means significant at 5%. ** Means significant at 10%.

Table 2. Correlations between the quality measures and the percentage of college graduates, and the export propensity and the average firm wages by industries

	Quality control			R&D and advertising expenditures over sales (%)		
	Percentage of graduates	Export propensity	Average firm wage	Percentage of graduates	Export propensity	Average firm wage
1	0.2030*	0.1153*	0.2310*	0.3422*	-0.0282	0.4189*
2	0.2225*	0.1737*	0.2098*	0.2512*	0.0023	0.3059*
3	0.2124*	0.1059**	0.1448*	0.1824*	0.2297*	0.3894*
4	0.0903*	0.2381*	0.1941*	0.0771*	0.114*	0.1069*
5	0.1631*	0.1816*	0.1401*	0.0701*	0.1976*	0.1878*
6	0.1407*	0.0512	0.1578*	0.1649*	0.0506**	0.1146*
7	0.2112*	0.2965*	0.2266*	0.0838*	-0.031	0.1291*
8	-0.0804	0.1674*	0.1170*	0.4497*	-0.0905*	0.3046*
9	0.1352*	0.0087	0.1861*	0.3168*	-0.2047*	0.1781*
10	0.1844*	0.2345*	0.1812*	0.1986*	0.1142*	0.0739*
11	0.1569*	0.0942*	0.1998*	0.1112*	0.3648*	0.103*
12	0.1082*	0.0955**	0.1013*	0.0628*	0.1603*	-0.0738*
13	0.1475*	0.1996*	0.1534*	0.1113*	0.1717*	0.117*
14	0.1849*	0.2074*	0.1756*	0.1087*	0.1418*	0.0686*
15	0.0962**	0.1047**	0.0633	0.2809*	0.0186	0.1277*
16	0.0709**	0.1617*	0.1199*	0.1707*	0.1495*	0.1256*
17	0.1146*	0.1222*	0.0932*	0.1392*	0.1448*	0.0830*
18	0.1734*	0.1411*	0.1973*	0.3382*	0.1481*	0.1061*
19	0.2295*	0.1599*	0.2503*	0.1473*	0.168*	0.1640*
20	0.0875	0.1601*	0.1231*	0.0146	0.2509*	0.1623*

* Means significant at 5%. ** Means significant at 10%. The correlations of quality control only include the years information is available (1990, 1994, 1998, 2002 and 2006). Industries: 1 Meat products; 2 Food and tobacco; 3 Beverage; 4 Textiles and clothing; 5 Leather, fur and footwear; 6 Timber; 7 Paper; 8 Printing and Edition; 9 Chemicals products; 10 Plastic and rubber products; 11 Non-metal mineral products; 12 Basic metal products; 13 Fabricated metal products; 14 Machinery and equipment; 15 Computer products, electronics and optical; 16 Electric materials and accessories; 17 Vehicles and accessories; 18 Other transport equipment; 19 Furniture; 20 Other manufacturing

Table 3. Ratios

	Firms with R&D and advertising expenditures versus firms without these expenditures			Firms which control their product quality versus firms which do not			Exporter versus non-exporter	
	Percentage of graduates	Average firm wage	Export propensity	Percentage of graduates	Average firm wage	Export propensity	R&D and advertising expenditures over sales	Quality control
1990	2.25	1.31	1.93	1.66	1.25	1.72	2.11	1.84
1991		1.32	2.00				2.38	
1992		1.31	2.47				2.31	
1993		1.39	2.49				2.80	
1994	2.76	1.43	2.36	1.79	1.39	2.15	2.92	2.61
1995		1.39	2.28				3.20	
1996		1.38	2.14				3.02	
1997		1.33	1.88				2.76	
1998	2.09	1.29	1.82	1.57	1.36	2.11	2.91	2.32
1999		1.33	2.27				2.91	
2000		1.35	2.09				2.49	
2001		1.34	2.25				2.15	
2002	2.26	1.33	2.34	1.63	1.30	1.77	2.55	2.29
2003		1.28	1.72				2.32	
2004		1.26	1.83				2.49	
2005		1.24	2.04				2.55	
2006	1.96	1.19	1.96	1.42	1.17	1.39	2.37	1.71
2007		1.18	1.74				2.69	
2008		1.21	1.86				2.96	
2009		1.18	1.84				3.09	
2010	1.89	1.21	1.84	1.54	1.20	1.67	2.69	1.86

Table 4. Tobit estimates of the demand of skilled employees. Dependent variable: percentage of college graduates and engineers.

	Coefficients			Marginal effects		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Percentage of R&D and advertising expenses over sales		0.260 (13.94)			0.126	
Quality control			1.858 (9.52)			0.905
Exporter	2.894 (12.88)	2.664 (11.91)	2.674 (11.92)	1.411	1.287	1.302
Size (employees)						
50-249 employees	4.568 (19.38)	4.391 (18,76)	4.194 (17.79)	2.227	2.121	2.042
More than 249 employees	6.046 (22.44)	5.616 (20,86)	5.496 (20.23)	2.947	2.7132	2.676
Age	0.027 (5,95)	0.023 (5.16)	0.026 (5.88)			
Observations	11,240	11,115	11,223			
Firms	4,660	4,639	4655			

Only observations of years where information about percentage of college graduates and engineers and quality control is updated are included: 1990, 1994, 1998, 2002, 2006 and 2010. All estimated equations include a constant and dummies for industries and years. |*t*|-statistics are in brackets.

Table 5. OLS estimates of wage equation. Dependent variable: logarithm of average firm wage.

	(1)	(2)	(3)	(4)	(5)
Percentage of R&D and advertising expenses over sales		0.0006 (0.62)		0.003 (2.13)	
Dummy=1 if R&D and advertising expenses>0					0,043 (4,81)
Quality control			0.046 (6.81)		
Size (employees)					
50-249 employees	0.199 (17.82)	0.198 (17.79)	0.189 (16.89)	0.212 (18.10)	0.195 (17.52)
More than 249 employees	0.332 (25.88)	0.332 (25.75)	0.318 (24.70)	0.359 (25.85)	0.327 (25.53)
Percentage of college graduates and engineers	0.012 (15.09)	0.012 (14.69)	0.012 (15.24)		0.012 (14.90)
Exporter	0.083 (8.62)	0.083 (8.51)	0.077 (8.05)	0.091 (8.95)	0.076 (7.85)
Age/10	0.031 (14,35)	0.031 (14.42)	0.031 (14.34)	0.032 (14.30)	0.030 (14.20)
R^2	0.640	0.641	0.641	0.619	0.641
Observations	11,235	11,110	11,218	11,193	11,235
Firms	4,659	4,638	4,654	4,649	4,659

Only observations of years where information about percentage of college graduates and engineers and quality control is updated are included: 1990, 1994, 1998, 2002, 2006 and 2010. All estimated equations include a constant and dummies for industries and years. |*t*|-statistics are in parentheses. Standard errors are corrected for heteroskedascity and for the clustered sampling scheme.

Table 6. Labour productivity and average wages

	R&D and advertising expenses over sales			Carrying out or contracting quality standardization and control works		
	Starters (N=299)	Non-investors (N=2248)	Prob-value for differences of means=0	Starters (N=199)	Non-controllers (N=558)	Prob-value for differences of means=0
Labour productivity						
t = 1	106,359.8	73,663.3	0.02	78,993.2	53,864.5	0.00
t = 2	102,690.4	75,021.2	0.06	84,098.3	52,098.7	0.00
t = 3	95,683.6	74,946.6	0.14	102,558.6	53,918.1	0.00
t = 4	96,467.3	76,352.5	0.05	106,046.7	51,898.1	0.00
Wages						
t = 1	14,647.7	13,357.1	0.03	15,817.3	12,408.9	0.00
t = 2	14,474.5	13,432.0	0.06	16,075.7	12,538.6	0.00
t = 3	14,870.0	13,504.6	0.02	16,773.8	13,032.3	0.00
t = 4	14,723.0	13,602.4	0.05	17,661.4	13,532.9	0.00

Wages and sales are deflated by the aggregate consumer price index.

Table 7. Firms which start to invest in R&D and advertising and firms which do not. Dependent variables: logarithm of average firm wage and logarithm of firm labour productivity (sales per employee)

	log (wage)				**log(productivity)**			
	Full sample		Overlap sample		Full sample		Overlap sample	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Starter	0.087 (2.91)	0.111 (3.40)	0.022 (0.31)	0.014 (0.21)	0.325 (3.79)	0.410 (4.35)	0.102 (0.79)	0.104 (0.81)
(t = 2)*Starter	-0.034 (0.78)	-0.027 (0.59)	-0.104 (0.77)	-0.076 (0.56)	-0.022 (0.19)	0.001 (0.01)	-0.107 (0.45)	-0.116 (0.49)
(t = 3)*Starter	-0.027 (0.59)	-0.022 (0.45)	-0.169 (1.66)	-0.156 (1.54)	-0.015 (0.13)	0.003 (0.03)	0.019 (0.10)	0.015 (0.08)
(t = 4)*Starter	-0.026 (0.58)	-0.018 (0.38)	-0.016 (0.16)	-0.018 (0.18)	0.004 (0.03)	0.032 (0.26)	-0.065 (0.35)	-0.064 (0.34)
Size (employees)								
50-249 employees	0.194 (22.61)	0.254 (29.58)	0.179 (5.63)	0.193 (6.54)	0.310 (13.70)	0.499 (21.11)	0.205 (3.58)	0.202 (3.65)
More than 249 employees	0.301 (24.43)	0.388 (30.14)	0.412 (5.94)	0.473 (6.85)	0.491 (13.64)	0.779 (18.82)	1.578 (8.14)	1.560 (8.19)
Percentage of college graduates and engineers	0.017 (21.63)		0.008 (3.69)		0.057 (26.23)		-0.003 (0.80)	
Exporter	0.142 (17.90)		0.045 (1.62)		0.500 (25.08)		-0.010 (0.20)	
Age/10	0.034 (15.72)	0.038 (17.01)	0.028 (3.44)	0.035 (4.22)	0.006 (1.08)	0.022 (3.71)	0.085 (4.84)	0.083 (4.97)
R^2	0.514	0.475	0.490	0.477	0.449	0.553	0.709	0.709
Observations	10,032	10,059	695	695	10,034	10,061	695	695
Firms	2,547	2547	582	582	2,547	2,547	582	582

Wages and sales are deflated by the aggregate consumer price index. All estimated equations (OLS) include a constant and dummies for industries, years and periods *t*. |*t*|-statistics in brackets. Standard errors are corrected for heteroskedascity and for the clustered sampling scheme

Table 8. Firms which start to control their product quality and firms which do not. Dependent variables: logarithm of average firm wage and logarithm of firm labour productivity (sales per employee)

	log (wage)				**log(productivity)**			
	Full sample		Overlap sample		Full sample		Overlap sample	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Starter	0.087 (2.09)	0.091 (2.14)	0.063 (1.25)	0.070 (1.31)	0.118 (1.48)	0.128 (1.61)	0.017 (0.17)	0.003 (0.03)
(t = 2)*Starter	0.022 (0.41)	0.024 (0.43)	-0.001 (0.01)	-0.011 (0.16)	0.098 (0.94)	0.128 (1.21)	0.042 (0.34)	0.066 (0.51)
(t = 3)*Starter	0.005 (0.09)	0.016 (0.26)	-0.020 (0.28)	-0.016 (0.21)	0.202 (1.85)	0.232 (2.07)	0.273 (2.13)	0.290 (2.18)
(t = 4)*Starter	0.004 (0.09)	0.017 (0.31)	0.028 (0.43)	0.035 (0.52)	0.211 (1.96)	0.257 (2.36)	0.314 (2.45)	0.348 (2.65)
Size (employees)								
50-249 employees	0.163 (8.57)	0.214 (13.24)	0.945 (3.04)	0.094 (2.94)	0.229 (6.22)	0.402 (10.81)	-0.180 (3.09)	-0.128 (2.26)
More than 249 employees	0.303 (11.41)	0.376 (13.24)	0.197 (4.17)	0.218 (4.52)	0.400 (5.17)	0.643 (7.22)	-0.015 (0.15)	0.097 (0.94)
Percentage of college graduates and engineers	0.010 (7.67)		0.007 (3.00)		0.014 (6.02)		0.001 (0.37)	
Exporter	0.078 (6.05)		0.032 (1.22)		0.406 (15.83)		0.175 (3.81)	
Age/10	0.035 (10.56)	0.039 (11.56)	0.042 (4.48)	0.045 (4.77)	0.014 (2.68)	0.027 (4.99)	0.067 (5.36)	0.065 (5.29)
R^2	0.411	0.377	0.513	0.499	0.337	0.265	0.413	0.400
Observations	2853	2853	693	693	2854	2854	693	693
Firms	757	757	476	476	757	757	476	476

Wages and sales are deflated by the aggregate consumer price index. All estimated equations (OLS) include a constant and dummies for industries, years and periods *t*.
|*t*|-statistics are in brackets. Standard errors are corrected for heteroskedascity and for the clustered sampling scheme.

Table 9. Probit models. Probability of exporting. Firms which start to invest in R&D and advertising and firms which do not

	Firms which start to invest in R&D and advertising (any positive amount) and firms which do not				**Firms which start to invest in R&D and advertising more than the median and firms which do not invest or invest less than the median**			
	Full sample		Overlap sample		Full sample		Overlap sample	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Starter	0.217 (1.29)	0.258 (1.53)	-0.293 (0.85)	-0.291 (0.85)	0.706 (4.58)	0.687 (4.42)	-0.178 (0.45)	-0.172 (0.43)
(t = 2)*Starter	0.181 (0.78)	0.175 (0.75)	0.462 (0.80)	0.466 (0.81)	0.022 (0.10)	0.030 (0.14)	0.678 (1.06)	0.693 (1.06)
(t = 3)*Starter	0.084 (0.37)	0.088 (0.39)	0.141 (0.26)	0.153 (0.29)	0.045 (0.21)	0.063 (0.29)	-0.426 (0.80)	-0.444 (0.81)
(t = 4)*Starter	0.191 (0.86)	0.190 (0.85)	-0.223 (0.48)	-0.207 (0.45)	0.127 (0.59)	0.143 (0.67)	0.004 (0.01)	-0.001 (0.00)
Size (employees)								
50-249 employees	0.718 (18.25)	0.744 (19.11)	1.198 (9.11)	1.184 (9.32)	0.883 (26.49)	0.929 (28.45)	0.938 (4.48)	1.070 (5.25)
More than 249 employees	1.286 (20.84)	1.319 (21.95)	1.626 (4.19)	1.566 (4.52)	1.379 (25.19)	1.414 (26.35)	0.693 (4.84)	0.924 (5.35)
Percentage of college graduates and engineers	0.044 (10.87)		-0.006 (0.71)		0.044 (12.41)		0.050 (2.22)	
Age	0.014 (12.07)	0.013 (12.10)	0.016 (4.62)	0.045 (3.77)	0.014 (15.04)	0.013 (14.98)	0.026 (5.36)	0.024 (3.80)
Pseudo R^2	0.248	0.235	0.162	0.162	0.264	0.252	0.169	0.161
Observations	10,034	10,061	695	695	13,393	13,726	849	849
Firms	2,547	2,547	584	584	3,468	3,468	733	733

Estimated equations in the full sample include a constant and dummies for industries, years and periods *t*. The dummies for industries and years have been excluded in the overlap sample due to collinearity problems. |*t*|-statistics are in brackets. Standard errors are corrected for heteroskedascity and for the clustered sampling scheme.

Table 10. Probit models. Probability of exporting.
Firms which start to control their product quality and firms which do not

	Full sample		**Overlap sample**	
	(1)	**(2)**	**(1)**	**(2)**
Starter	-0.026	0.433	-0.412	0.116
	(0.12)	(2.10)	(1.31)	(0.44)
(t = 2)*Starter	0.358	0.175	0.619	0.290
	(1.26)	(0.64)	(1.54)	(0.83)
(t = 3)*Starter	0.215	0.105	0.439	0.148
	(0.76)	(0.38)	(1.10)	(0.43)
(t = 4)*Starter	0.397	0.318	0.782	0.508
	(1.36)	(1.13)	(1.97)	(1.42)
Size (employees)				
50-249 employees	0.961		0.752	
	(11.37)		(6.67)	
More than 249 employees	1.578		2.010	
	(8.52)		(7.68))	
Percentage of college graduates and engineers	0.002		-0.007	
	(0.41)		(1.33)	
Age	0.008	0.014	-0.003	0.012
	(5.12)	(8.43)	(0.97)	(3.68)
Pseudo R^2	0.181	0.128	0.129	0.039
Observations	2,858	2,875	693	693
Firms	757	757	476	476

Estimated equations in the full sample include a constant and dummies for industries, years and periods *t*. The dummies for industries and years have been excluded in the overlap sample due to collinearity problems. |*t*|-statistics are in brackets. Standard errors are corrected for heteroskedascity and for the clustered sampling scheme.

Table 11. Tobit models of R&D and advertising expenditures over sales. Firms which start to export and firms which never export

	Full sample		Overlap sample	
	(1)	(2)	(1)	(2)
Starter	0.786 (3.36)	0.777 (3.25)	0.711 (0.45)	1.200 (0.72)
(t = 2)*Starter	-0.318 (0.96)	-0.283 (0.84)	0.704 (0.32)	0.702 (0.30)
(t = 3)*Starter	0.103 (0.31)	0.162 (0.48)	0.116 (0.05)	-0.645 (0.28)
(t = 4)*Starter	0.126 (0.38)	0.133 (0.40)	1.294 (0.56)	-0.644 (0.27)
Size (employees)				
50-249 employees	0.714 (13.27)	0.918 (16.76)	1.016 (1.06)	0.192 (0.19)
More than 249 employees	2.554 (27.12)	3.135 (34.29)	3.812 (2.81)	1.080 (0.79)
Percentage of college graduates and engineers	0.080 (30.22)		0.323 (6.84)	
Age	0.016 (14.39)	0.018 (16.35)	0.141 (7.03)	0.128 (6.06)
Pseudo R^2	0.041	0.035	0.093	0.079
Observations	31,610	31,745	532	532
Firms	8,051	8,051	512	512

All estimated equations include a constant and dummies for industries, years and periods *t*.
|*t*|-statistics are in brackets.

Table 12. Probit models of quality control. Firms which start to export and firms which never export

	Firms which start to export (any positive amount) and firms which do not				Firms which start to export with an export propensity more than the median and firms which do not export or have an export propensity less than the median			
	Full sample		Overlap sample[1]		Full sample		Overlap sample	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Starter	0.106 (0.97)	0.108 (0.99)	-0.163 (0.53)	-0.181 (0.58)	0.356 (3.68)	0.349 (3.60)	0.153 (0.79)	0.153 (0.79)
(t = 2)*Starter	0.049 (0.32)	0.062 (0.41)	-0.260 (0.59)	-0.259 (0.59)	0.081 (0.60)	0.081 (0.60)	0.071 (0.25)	0.071 (0.25)
(t = 3)*Starter	0.135 (0.88)	0.142 (0.93)	0.136 (0.31)	0.153 (0.35)	0.088 (0.65)	0.087 (0.65)	0.320 (1.10)	0.320 (1.10)
(t = 4)*Starter	0.069 (0.45)	0.084 (0.55)	0.509 (1.12)	0.545 (1.20)	0.027 (0.20)	0.019 (0.14)	0.121 (0.43)	0.121 (0.43)
Size (employees)								
50-249 employees	0.608 (25.03)	0.617 (25.65)	1.044 (5.85)	1.066 (6.00)	0.610 (27.03)	0.616 (27.52)	0.494 (3.23)	0.493 (3.24)
More than 249 employees	0.675 (16.58)	0.774 (19.91)	1.425(8.44)	1.368 (8.56)	0.746 (20.41)	0.823 (23.49)	0.719 (4.40)	0.719 (4.40)
Percentage of college graduates and engineers	0.008 (6.51)		-0.009 (1.74)		0.007 (6.72)		0.0002 (0.05)	
Age/10	-0.004 (0.85)	0.003 (0.07)	0.001 (0.04)	0.002 (0.06)	0.001 (0.13)	0.005 (1.10)	0.053 (2.36)	0.053 (2.40)
Pseudo R^2	0.090	0.090	0.129	0.124	0.100	0.099	0.174	0.174
Observations	31,768	31,904	540	540	35,103	35,254	1,316	1,316
Firms	8,051	8,051	520	520	8,889	8,889	1,246	1,246

(1) The dummies for industries and years have been excluded due to collinearity problems.The rest of the estimated equations include dummies for industries, years and periods *t*. |*t*|-statistics are in brackets. Standard errors are corrected for heteroskedascity and for the clustered sampling scheme.