Can market competition complement the usual mechanisms of corporate governance?*

Abstract

This paper provides some empirical evidence about the impact of competition on corporate productivity. We apply the generalized method of moments of Arellano and Bond (1991) to different multiple regression models, using a data set of 4,947 Spanish firms belonging to 19 industries, during the period 1994-2003. The results suggest that, taken together, competition at the firm level, financial pressure and the largest shareholder type in each industry affect corporate productivity growth, as well as the interaction of the alternative mechanisms that would be considered for the governance of firms to increase their productivity. This is interpreted as showing that competitive pressure from product markets provides incentives for corporate governance.

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1 Introduction

According to modern financial economics, the objective of a firm is to maximize its market value. However, in practice some managers do not strive for this objective, because of the well known agency problems that occur when there is a separation between control and ownership of the firm. Problems of asymmetric information, with their moral hazard consequences and the lack of control mechanisms, can lead managers to undertake opportunistic behaviour.

Internal firm control mechanisms may not always turn out to be effective for aligning the interests of the owners of a firm and the managers who run it. Also, these mechanisms are legally formal, and they offer large differences between different firms, although they do tend to converge slowly thanks to the generalization of the Corporate Governance Codes. The internal control systems can be augmented by other external control systems based on competition in real markets (Hart, 1983) and on the pressure of debt (Jensen, 1989). The current paper focuses on the analysis of the importance of the control mechanism that is based on competition between industries for the case of Spain, under the hypothesis that competitive pressures in the marketplace, implying the threat of expulsion of the firm from the market, provides adequate incentives, both for efficient supervision of the interest groups within a firm and for the discretionality of the directors.

In short, the objectives that this paper strives to achieve are the following: firstly, to find evidence that competition in real markets can substitute for what is lacking in the usual governance mechanisms of Spanish firms. The stimulus of this competition will have a direct affect upon the productivity and growth of the firms. Secondly, we analyse the extent to which the pressure of debt also constitutes a governance control mechanism for Spanish firms, and we also look into the relationship between the two external control mechanisms to see if they are substitutes or complements. In order to do this, we have constructed a dynamic panel data model with a data set of 4,947 manufacturing firms in Spain, belonging to 19 different industries, over a period of time that goes from 1994 to 2003. The estimation of the model, given its dynamic character, was carried out using the generalized method of moments (see Arellano and Bond, 1991; Nickell, 1996).

Related to the problem that we consider in this paper, there exist several empirical papers dealing with different countries. The current paper adds the case of Spain to this collection of empirical evidence.

The paper is structured as follows: in section 2 we present a brief revision of the most relevant literature dealing with the issue under analysis; section 3 describes the statistical sources and the data base that is used in the empirical analysis. Besides, in this section we sets out the methodology used and describe the models and their estimation, Section 4 presents the main results. Finally, section 5 contains the conclusions of the paper.

2 Theoretical background

Economics has traditionally thought that competition and the free market are beneficial, because they imply that consumers have access to cheaper and better quality products. However, although we agree with this idea, one should add that this is not the only consequence of the existence of competition between firms. Indeed, not only does competition imply that firms should sell at lower prices, and thereby obtain a lower profit, but it also implies an increase in the efficiency and productivity of the firms. This, precisely, is what certain economists over time have attempted to prove. This improvement in the firm's results is due to competition acting as a disciplinary mechanism for the firm's directors, since the absence of monopoly rents implies that neither the firm's workers nor its directors can earn these rents by shirking.

The seminal theoretical paper is by Hart (1983), which studies the substitutory nature of market competition for other incentives based on financial control that can be used by investors. Both mechanisms imply cost-side competitive pressure which reduces the possibility of discretional behaviour by a firm's directors in asymmetric information environments. To Hart's paper, we should add that by Hermarlin (1992), which provides a theoretical model which identifies the different effects that competition has on the behaviour of directors and, also, on the business results, although the sign of these effects is shown to be potentially ambiguous.

From an empirical point of view, the relationship between market competition and a firm's

productivity have been analysed in several papers. For example, Caves and Barton (1992) and Green and Mayes (1991), supply empirical evidence of the effects of competition on productivity, using a sample of north American manufacturing firms using cross-sectional models. Using a methodology of panel data at industrial level, Haskel (1991) studies the effects of competition on productivity using 81 industrial sectors in the United Kingdom during the period 1980-86. At the level of firms, Nickell *et al.* (1992) determines the growth in productivity of 100 manufacturing firms in the United Kingdom during the period 1975-1986. Concretely, this paper introduces the analysis of the effect of financial pressure on productivity. Also using firm-level data, Nickell (1996) provides evidence of how competition, measured either by an increase in the number of competitors or by a reduction in firm earnings, increases the productivity of the firms, using a model with dynamic panel data from a sample of 670 firms in the United Kingdom during the period 1972-1986. In the same way, Disney *et al.* (2000), using a sample of close to 143.000 firms in the United Kingdom (119.000 are individual firms, and 24.000 belong to multinational firms), during the period 1980-1992, show that market competition significantly increases the growth in productivity, even after controlling for possible sectorial bias.

On the importance of the impact of financial pressure on the growth of productivity, Nickell and Nicolitsas (1999) use a sample of 670 manufacturing firms in the United Kingdom during the period 1972-1986 to show that an increase in financial pressure, measured by the ratio of interest paid to the net cash flow, has a positive effect on a firm's productivity, as is evidenced by the relationship between the firm's debt and the increase in its productivity, as well as by the effect of market share on the growth in productivity.

Along the same line of papers, by introducing structural variables of ownership and governance of firms, Nickell *et al.* (1997), use a sample of 582 manufacturing firms in the United Kingdom over the period 1982-1994 to show a relationship between market competition for products, financial market pressure and shareholder control, and greater growth in productivity. They also find evidence to support the idea that financial market and shareholder controls can be substituted by competition. Other papers also incorporate variables that measure "good corporate governance", like for example Grosfeld and Tressel (2001) and Januszewski *et al.* (2001). The former uses 200

non-financial firms from the Varsovian Stock Exchange over the period 1991-98 to find a positive and significant effect of market competition on the growth of productivity, as well as reciprocal influences between good corporate governance and market competition. They find that both mechanisms tend to re-enforce each other. As far as Januszewski *et al.* (2001) is concerned, they use a panel of 491 German firms over the period 1986-1994 to show that firms' productivity grows more when they operate in markets characterised by intense competition, and that this growth in productivity is greater for the firms that operate under the supervision of a control shareholder.

There also exist papers that focus on a single industry, as is the case of Gort and Sung (1999), who analyse the telephony market in the United States of America. They find evidence from a sample of firms from this industry over the period 1952-1991 that the estimation of the growth in total productivity of factors and the analysis of changes in cost functions show changes in efficiency that are faster in a competitive market than in local monopolies.

Finally, for the case of Italy, Bottasso and Sembenelli (2001) provide empirical evidence of the impact of the Single Market Programme of the UE on market power and total factor productivity in a sample of 745 Italian firms over the period 1977-1993. Firstly, for the sample of the "most sensitive firms of 1992", when compared to previous years market power is reduced by 50 percent over the period of implementation of the Single Market Programme, while there is no clear result for the other sub-samples of firms. Secondly, the sample of the "most sensitive firms of 1992" is the only one for which an increase in the rates of growth of productivity is observed immediately after the announcement of a proposed reform. Therefore, these results confirm the hypothesis that economic integration reduces market power and increases productivity by eliminating tariff barriers.

3 Methodology and model description

The data that is used in the present paper were obtained, mainly, from the database SABI, which is collected by the firm Bureau van Dijk, and which provides information on annual accounts, ratios, sectorial activity, and ownership structure, among other indicators, of Spanish firms over

the period 1994-2003. Other sources of information used were the National Statistical Institute, and the Bank of Spain.

The sample used includes 4,947 Spanish industrial firms during the period 1994-2003. In Table 1 we present the details of the sectors and the number of firms and observations of each sector. Therefore, we have a panel of 49,470 observations corresponding to the 4,947 firms over the 10 year period.

[TABLE 1 OVER HERE]

To estimate the model, we have used the generalised method of moments (GMM) of Arellano and Bond (1991) that allows us to get consistent estimations of the parameters under the asumption that there is no second order residual correlation.

In particular, we estimate the linear factorization of total factor productivity. Starting from a Cobb-Douglas production function we evaluate several models that measure productivity growth by adding different explanatory variables that allow us to quantify the impact of different corporate governance mechanisms on company productivity.

In the following lines we describe the model, the estimation results are presnted in the next section.

As is habitual in the literature (see Nickell (1996), Nickell *et al.* (1997)), our model is based on a Cobb-Douglas production function of the form:

$$Y_{it} = A_{it} L_{it}^{\beta_l} K_{it}^{\beta_k} \tag{1}$$

where Y_{it} is the net sales income of firm i at moment t, L_{it} is the number of employees, K_{it} is capital, represented by the net value of fixed material, the coefficients β_l and β_k represent the elasticities of sales with respect to employment and capital respectively. Finally, A_{it} is a measure of total productivity of the factors of firm i in period t. Taking the logarithm of (1) we get:

$$y_{it} = \lambda y_{it-1} + (1-\lambda) a_{it} + (1-\lambda)\beta_l l_{it} + (1-\lambda)\beta_k k_{it} + \alpha_i + \varepsilon_{it} \tag{2}$$

in which we introduce the lagged dependent variable, y_{it-1}, weighted by a factor of λ, as an explanatory variable that reflects the effect over time of the impact of factors of production on

the level of production in each period, thereby allowing endogenous persistence in the model. The productivity, or efficiency, of the firm is captured by the variable a_{it}. The coefficient α_i captures the individual fixed effects that are reflected by non-observable factors, and the error term ϵ_{it} captures other alterations in the firm's productivity. We assume the absence of autocorrelation in the error term as a consequence of the inclusion of the lagged dependent variable, y_{it-1} (see Nickell (1996)). The existence of correlation between the explanatory variables and the variable α_i can be measured by taking first differences in (2) which yields the expression:

$$\Delta y_{it} = \lambda \Delta y_{it-1} + (1-\lambda)\Delta a_{it} + (1-\lambda)\beta_l \Delta l_{it} + (1-\lambda)\beta_k \Delta k_{it} + \Delta \varepsilon_{it} \tag{3}$$

The variable Δa_{it} in (3) represents the growth of the firm's productivity and we assume that this is determined by the types of control mechanisms that monitor firms, at an individual level, represented by both the level of competition in the product market, $CDMDO_{it}$, and at a sectorial level, $CSECT_t$ (defined by indexes of concentration at the sectorial level). Also, it is interesting to explore the possible effects on the growth of productivity, Δa_{it}, of the financial pressure implied by debt, represented by the variable D_{it}. Finally, we introduce as control variables within the model the size of the firm TA_{it}, and dummy sectorial and temporal variables, which are designed to capture the effect of the economic cycle. In short, the growth of productivity is modelled as follows[1] :

$$\begin{aligned} \Delta a_{it} = \gamma_2 CSECT_{t-i} + \gamma_1 CDMDO_{t-1} + \\ \gamma_5 \Delta D_{it} + \gamma_7 \Delta TA_{it} \end{aligned} \tag{4}$$

where $CSECT_{t-1} = (HI_{t-1}, Gini_{t-1})$ depending on which model is being studied. Therefore, we begin with the hypothesis that sectorial concentration will influence the growth of productivity (and so it does not appear in differences), and the same occurs with the influence of market shares on productivity. On the other hand, both debt pressure and the size of the firm influence the "level" of productivity, and so changes in these variables affect the growth of productivity.

As a consequence of this, the model to be estimated is given by substituting (4) into (3), from which we get the following expression:

[1] The definitions of these variables are set out in the appendix. The estimation of the model is done by progressively adding the different variables that define the growth of productivity Δa_{it}.

$$\Delta y_{it} = \lambda \Delta y_{it-1} + (1-\lambda)(\gamma_2 CSECT_{t-1} + \gamma_1 \Delta CDMDO_{it-1} + \gamma_5 \Delta D_{it} + \gamma_7 \Delta TA_{it}) + (1-\lambda)\beta_l \Delta l_{it} + (1-\lambda)\beta_k \Delta k_{it} + \Delta \varepsilon_{it} \quad (5)$$

In short, expression (5) represents a dynamic panel data model. When we introduce the lagged dependent variable into this expression as an explanatory variable, we get a problem of endogeneity of correlation that exists between the variable y_{it-1} and the error term. As was explained above, it is important to bear in mind the presence of non-observable factors in the model, that could be correlated with the other explanatory variables. This problem is eliminated by taking first differences in the model (2); however, even though taking differences eliminates the problem of non-observable factors, it implies that the predetermined explanatory variables become endogenous variables (for a more detailed explanation, see Bond (2002)). The estimation of the model (equation (5)) is done using the generalized method of moments (GMM) that was proposed by Arellano and Bond (1991), and that allows the use of lagged values of the dependent variable as well as the other explanatory variables as instruments. In this way, we avoid the potential problems of endogeneity of the variables that measure competition and financial pressure, that are introduced in the model via equation (5). We also introduce dummy sectorial and temporal variables.

Arellano and Bond (1991) show that endogenous variables that are lagged by two or more periods are valid instruments, so long as there does not exist autocorrelation in the error term of the equation (2). We contrast this question in the current paper. In our case, we use as instruments y_{it-j}, for $j \geq 3$, l_{it-2}, k_{it-2}, D_{it-2}, TA_{it-2}, PM_{t-2}. The validity of these instruments has been checked using the Sargan test of over-identification of restrictions. On the other hand, the estimation of the model in first differences implies that the level of competition and/or financial pressure influences the growth of productivity. This formulation has the advantage that it does not compare levels of productivity between firms and industries, but rather only changes in productivity.

Finally some explanatory variables that measure shareholder control are included in the model (equation (5)) using dummy variables.

4 Results

The results of the estimations of the model using the method of generalized moments (GMM) are presented here in five tables (Tables 2 to 6), in order to properly show the different explanatory factors for the growth of a firm's productivity. All of the estimations were done using the software package STATA^{TM}.

Table 2 shows the results corresponding to the effects of sectorial concentration (Gini index, $Gini_{t-1}$), dominant position rents (the product of market share and the first difference of the profitability, CPM_{it}) and extraordinary profitability (profitability of the firm with compared to the average of the relevant sector, PM_{it}) on the growth of productivity. Additionally, the models in this table include the effects of financial pressure derived from debt on the change in productivity. Finally, we include dummy variables that measure the sectorial and temporal effects. The factors of production are significant in the three models, and although the factor labour does give the expected sign, the factor capital enters with a negative sign. The presence of this particular sign can be explained for the specific case of Spain as a consequence of the time period that is analysed, which includes the beginning of a recovery from an economic crisis whose lowest point appeared in 1993. In that year in Spain there was an excess of installed capacity, and as of that date production began to increase, and at the same time as the amortization of the excess installed capacity lead to negative rates of net investment in fixed material in Spanish firms.

In Model 1, the only effects that are taken into account are that of competition and that of debt pressure on the growth of firm productivity. In order to measure competition we have used the Gini index, $Gini_{it-1}$, lagged one period. We observe that the effect is positive and statistically different from zero. Therefore, the greater is the concentration within the sector, which implies a lower level of sectorial competition, the greater is the growth in productivity. Also, the effect of financial pressure, as measured by the ratio of financial expenses and profits before interest payments and taxes (D_t), has positive sign, from where we conclude that an increase in the financial pressure faced by a firm has beneficial effects on the growth of productivity. We should add that this variable is statistically significant, but with a significance level that is above 5%. This significance

level can be explained by the reduction in interest rates that occurred in Spain over the period under analysis, which implies declining importance of the effect of financial pressure derived from debt on the behaviour of a firm's directors.

In Model 2 we introduce a new explanatory variable, CPM_{it}, which measures the interaction between a firm's individual market share, $CDMDO_{it}$, and the differential of the firm's profitability over the average profitability of the sector (extraordinary profitability), PM_{it}. This variable appears with positive sign, which indicates that the greater is the margin of profitability that firms can appropriate, and thus the less intense is market competition, the greater is the growth of productivity. Finally, in this model an increase in the financial pressure turns out to be explanatory for the growth in a firm's productivity.

Model 3 measures the effect of competition at the sectorial level using a lagged Gini index, $Gini_{t-1}$. The sign is positive, which indicates that less competition, as measured by a higher concentration in the sector in a given year t, has a positive effect on the growth of productivity of the firms in that sector in year $t+1$. This result is contrary to the theoretical foundations upon which this paper is based, which would argue that a greater level of competition increases the rate of growth of a firm's productivity. However, the result is in line with the theoretical studies of Scharfstein (1988) who showed that increased competition in the product markets leads to greater managerial slack. Finally, the effect of monopoly power, measured by the extraordinary profitability of the firms, PM_{it}, does not turn out to be significant in this model as an effect that explains a firm's productivity.

The three models presented in Table 2 also introduce a control variable on firm size, TA_{it}, as well as dummy sectorial and temporal variables. The second order serial correlation tests of the residuals do not reject the null hypothesis of no autocorrelation. Also, the Sargan tests do not reject the hypothesis of the validity of the instruments.

[TABLE 2 OVER HERE]

The GMM estimations which are set out in Table 3 incorporate the possible effects that different types of control shareholders may have on the growth of productivity. This effect is incorporated

via the introduction of seven dummy variables each one of which reflects the fact that the control shareholder of the firm is an industrial company ($INDUS_{it}$), a self-owner (AUT_{it}), mutual & pension fund/trust/nominee (PF_{it}), individual(s) or family(ies) (IND_{it}), financial company (FI_{it}), foundation ($FUND_{it}$) and employees/managers (EMP_{it}). The dummy variable that corresponds to a control shareholder that is a bank ($BANK_{it}$) is excluded from the model to avoid problems of multicollinearity. In the three models that are included in this table, the only ownership structure variable that is significant is that which reflects that fact that the control shareholder is a pension fund, and since it has negative sign, the implication is that the presence of pension funds as majority shareholders has a negative effect on the growth of productivity. This effect can be explained by the conservative management that pension funds impose upon the firms in which they participate.

In Model 4, we measure competition using the individual market share of the firm lagged one period, $CDMDO_{it-1}$, and we observe the fact that it is statistically different from zero and negative, and so over the period of analysis of our sample, a greater level of competition as measured by a lower market share results in a positive effect on the growth of the firm's productivity. We also incorporate the dummy variables that represent the presence of different types of majority shareholders. In this model we also see that an increase in financial pressure has a positive effect on the growth of productivity.

In Model 5 we introduce competition using the Gini index lagged one period, and again we see that the sign is positive, although in this case it is not statistically significant, while changes in financial pressure are significant and have positive sign. On the other hand, while greater competition at the individual level has a positive effect on the firm's productivity growth, sectorial competition has no effect on it, according to Model 5.

Finally, Model 6 is the result of incorporating into Model 2 the dummy variables of ownership structure that we have mentioned above, and it shows that the interaction between market share and extraordinary profitability, CPM_{it}, results in a positive effect on productivity growth, although the variable is not significant.

[TABLE 3 OVER HERE]

Finally, Table 4 presents the results of the estimations of the model after incorporating variable that measure the combined effect of competition and financial pressure on the growth of productivity. To do this, we introduce, alternatively, the explanatory variables that measure the interaction between competition in the markets and the financial pressure of debt, using the product $D_{it} \cdot CDMDO_{it}$ (measures competition at the individual level) or the product $D_{it} \cdot HI_t$ (measures sectorial competition via the Herfindahl index). Also in an alternative manner, the model incorporates the variables $CDMDO_{it-1}$, to measure the effect of competition on the productivity of firms. The financial pressure of debt, D_{it}, and the variable TA_{it} which controls for the size of the firm are also used. As can be observed in Model 7, the sign of the product $D_{it} \cdot CDMDO_{it}$ is positive, which reflects a substitutive effect between market competition at the individual level and financial pressure, on the growth of productivity. We can find a similar result in Nickell (1997), thus, the positive effect of a higher financial pressure on productivity growth is attenuated by a higher level of competition at the individual level. Also, as can be seen by the results of Model 8, the interaction between market competition at the sectorial level as measured by the Herfindahl index and financial pressure of debt, turn out to be substitutive mechanisms as far as generating increases in productivity is concerned. In both models, we do not incorporate D_{it} nor $CDMDO_{it-1}$, as these are included in Model 9. In this final model, the interaction between $CDMDO_{it}$ and D_{it} is no longer significant.

[TABLE 4 OVER HERE]

5 Conclusions

This paper reports empirical evidence to support the hypothesis that real market competition, together with financial pressure, can complement the pitfalls of the usual mechanisms of corporate governance in Spanish industrial firms. In particular, this occurs through the stimulus provided for productivity and for the growth of sales of these firms.

The empirical analysis is based on the construction of a dynamic panel data set with 4,947

Spanish manufacturing firms, that belong to 19 industrial sectors, during the period 1994-2003. Using this data, we have estimated different models using the generalized moments model, based on the Cobb-Douglas production function to measure the growth in productivity.

The results of these estimations show that, firstly the factors of production are significant in the models that we have considered. But there are ambiguous results, since the factor labour has a positive sign, while the sign of the factor capital is negative.

For the Spanish case that we have considered, we interpret our results in the light of the influence of the economic cycle, which lead to a certain degree of unused capacity in 1994, after a recession that reached its lowest point in 1993. This idle productive capacity can provide a possible justification for the presence of negative net investment in fixed material, even though there is an increase in sales.

The estimation of the models also turns up ambiguous results on the effects of competition and debt pressure on the growth of a firm's productivity. In spite of the downward tendency of financial expenses of firms, although debt pressure is, in all cases, a positive and significant effect on the growth of productivity, the degree of sectorial competition has an effect that is the opposite from what one would expect. The way in which the possible reduction in competition that is derived from a greater concentration has resulted in greater growth of sales. In our analysis of the combined incidence of market shares and the profit margin of the firms over the average margin of each sector, we have found that these variables have positive and significant effects on the growth of productivity. These results, however, are in the same line as those of the literature that attempts to relate increases in competition with lower productivity for the cases of non-correlated costs between the firms of each sector, of the existence of different utility functions for the firm's directors, or of the possible emergence of diseconomies of scale. These factors, however, were not considered in this paper, and they are left to further research.

Finally, the estimation of the models has considered the existence of control shareholders on the growth of productivity. The results point to the only significant variable of ownership structure being when the control shareholder is a pension fund, in which case there is a negative effect on the growth of productivity. This suggests that the effects of a certain type of management can

be favourable for the objective of profitability more than for the growth of sales. In all cases, however, the effect of financial pressure on the change in productivity continues to be significant and positive. What is more, financial pressure also turns out to be positive and significant when it is combined with firm competition at an individual level, as well as when it is combined with sectorial competition and with the presence of a control shareholder. What all of this underlines is the importance of the control of management that is provided by debt pressure, as well as the interaction of the alternative mechanisms that have been considered for the governance of firms to increase their productivity.

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Appendix 1: Definition of variables

The variables that we include in the model are not so different from those that are habitual in the literature (see Nickell *et al.* (1997) and Januszewski *et al.* (2001)). In what follows, we give a detailed description of these variables.

1. **Level of production of the firms:** to define this variable, denoted in the model by Y_{it} , we have used the net level of sales. This variable is deflated by the Industrial Price Index by industrial sectors, to two digits.

2. **Capital:** This variable, denoted by K_{it}, represents the level of capital accumulated by firm i up to a particular time t, and we thought that a good indicator of this would be the level of net fixed material. This variable is deflated by the Industrial Price Index by industrial sectors, to two digits.

3. **Number of employees (L_{it}):** this variable represents the factor of production labour within the production function.

4. **Competition at the firm level ($CDMDO_{it}$):** This variable is defined using the market share of the firm within the sector in which it operates. In order to create the variable, given the limitations of our sample, for each period t we calculated the average net sales revenue of each sector j, denoted by the variable $PINCV_{jt}$, and, taking the number of firms that exist in the sector in each year from the Survey of Industrial Firms elaborated by the National Statistics Institute, N_j, we have calculated the total sales of the sector in question, $TINCV_{jt}$, as the product of the number of firms and the average level of sales revenue in the same year: $TINCV_{jt} = N_{jt} \cdot PINCV_{jt}$. In this way, the market share of each firm i in each period t is then obtained by dividing the net sales revenue of the firm in the period in question by the total net sales revenue of the same sector in the same year: $CDMDO_{it} = INCV_{it}/TINCV_{jt}$.

5. **Competition at the sectorial level:** we use the following two alternative indicators for concentration:,

i. Herfindahl concentration index (HI_t).

ii. Gini concentration index ($Gini_t$).

6. **Extraordinary profitability** (PM_{it}): the difference between the profitability of firm i measured by gross profit ($EBIT_i/Sales_i$) and the average profitability of the firms in the same sector defined by the same ratio at the sectorial level.

7. **Dominant position income:** $CPM_{it} = PM_{it} \cdot CDMDO_{it}$: measures the interaction between the market power of the firm as defined above (PM_{it}) and the market share of the firm represented by the variable $CDMDO_{it}$.

8. **Control shareholder dummies:** we distinguish eight different shareholders types using dummy variables that take the value one if the largest shareholder owns more than 24.9% in the company and cero otherwise. The shareholders types are: industrial company ($INDUS_{it}$), self-owner (AUT_{it}), mutual & pension fund/trust/nominee (PF_{it}), individual(s) or family(ies) (IND_{it}), financial company (FI_{it}), foundation ($FUND_{it}$) y employees/managers (EMP_{it}) and a bank ($BANK_{it}$).

9. **Size of the firm (TA_{it}):** measured by the logarithm of the total assets of the firm. The total assets are deflated using the Industrial Price Index by industrial sectors, to two digits.

10. **Debt control** (D_{it}): The ratio of accepted financial expenses and the firm's profit before interest payments and taxes.

Appendix 2: Tables

TABLE 1. Sample used by industrial sector

Sector (NACE)	N^o. of firms	% of all firms
Foodstuffs (15)	709	14.33
Textile (17)	299	6.0
Confection (18)	160	3.0
Cutting and leather (19)	205	4.14
Wood (20)	177	3.58
Paper (21)	103	2.08
Edition (22)	584	11.81
Chemicals (24)	260	5.26
Plastics (25)	293	5.92
Non-metal minerals (26)	352	7.12
Metals (27)	107	2.16
Metallic products (28)	739	14.94
Machinery (29)	364	7.36
Electric material (31)	150	3.03
Electronic material (32)	37	0.75
Medical equipment (33)	42	0.85
Motor vehicles (34)	109	2.20
Other transport (35)	41	0.83
Furniture (36)	216	4.37
TOTAL	4947	100.00

TABLE 2. Effects of competition and financial pressure on the growth of productivity

Dependent variable: change in net sales (Δy_{it})

	Model (1)	Model (2)	Model (3)
Δy_{it-1}	0.29^{*}	0.30^{*}	0.29^{*}
	(0.030)	(0.030)	(0.031)
Δl_{it}	0.54^{*}	0.53^{*}	0.58^{*}
	(0.14)	(0.13)	(0.14)
Δk_{it}	-0.19^{*}	-0.18^{**}	-0.16^{**}
	(0.089)	(0.088)	(0.092)
$Gini_{t-1}$	0.21^{*}	0.21^{*}	0.21^{*}
	(0.075)	(0.075)	(0.077)
CPM_{it}		31.25^{*}	
		(16.40)	
PM_{it}			-0.085
			(0.052)
ΔD_{it}	0.000075^{*}	0.000076^{**}	0.000074^{*}
	(0.000040)	(0.000040)	(0.000040)
ΔTA_{it}	0.31^{**}	0.32^{**}	0.26^{**}
	(0.13)	(0.12)	(0.13)

Continue overleaf

TABLE 2 *Continued*

Industry dummies	Included	Included	Included
Time dummies	Included	Included	Included
Second order correlation residuals	$p = 0.7918$	$p = 0.7231$	$p = 0.5396$
Instrument validity	$\chi^2(31) = 40.74$	$\chi^2(31) = 41.01$	$\chi^2(29) = 36.35$
Sargan Test	$p = 0.1133$	$p = 0.1077$	$p = 0.1969$
N. of firms	4452	4452	4452
N. of observations	28687	28687	28687

i. *, **, *, indicate significance at the 0.01, 0.05 and 0.10 levels, respectively

ii. Standard errors in brackets.

iii. GMM regression results using Arellano and Bond's (1991) method. All regressions include time and two digit industry dummies. All results are based on a one-step estimator except the Sargan test which is based on a two-step estimator.

iv. Instruments are y_{it-j}, for $j \geq 3$, l_{it-2}, k_{it-2}, D_{it-2}, TA_{it-2}, PM_{t-2}

TABLE 3. Competition, financial pressure and corporate control

Dependent variable: change in net sales (Δy_{it})

	Model (4)	Model (5)	Model (6)
Δy_{it-1}	0.19^{***}	0.32^{***}	0.32^{***}
	(0.033)	(0.036)	(0.036)
Δl_{it}	0.54^{***}	0.53^{***}	0.53^{***}
	(0.14)	(0.16)	(0.16)
Δk_{it}	-0.15^{*}	-0.28^{***}	-0.27^{***}
	(0.080)	(0.090)	(0.090)
$CDMDO_{it-1}$	-16.30^{***}		
	(1.82)		
CPM_t			28.94
			(18.18)
$Gini_{t-1}$		0.14	0.14
		(0.097)	(0.097)
ΔD_{it}	0.000063^{*}	0.000094^{**}	0.000094^{**}
	(0.000034)	(0.000039)	(.000039)
ΔTA_{it}	0.22	0.36^{**}	0.36^{**}
	(0.14)	(0.14)	(0.14)
EMP_{it}	0.00057	-0.02694	$-.030$
	(0.048)	(0.053)	(.053)
FI_{it}	-0.0066	-0.016	-0.016
	(0.031)	(0.035)	(0.035)
$FUND_{it}$	-0.11^{*}	-0.14^{*}	-0.14^{*}
	(0.065)	(0.073)	(0.073)

Continued overleaf

TABLE 3 *Continued*

IND_{it}	-0.013	-0.011	-0.011
	(0.028)	(0.032)	(0.032)
$INDUS_{it}$	-0.00077	-0.0089	-0.0094
	(0.028)	(0.032)	(0.032)
PF_{it}	-0.022	-0.019	-0.019
	(0.033)	(0.037)	(0.037)
AUT_{it}	-0.039	-0.019	-0.019
	(0.040)	(0.041)	(0.041)
Industry dummies	Included	Included	Included
Time dummies	Included	Included	Included
Second order correlation residuals	$p = 0.3926$	$p = 0.6899$	$p = 0.6660$
Instrument validity	$\chi^2(31) = 25.81$	$\chi^2(31) = 29.82$	$\chi^2(31) = 29.72$
	$p = 0.7306$	$p = 0.5265$	$p = 0.5320$
N. of firms	3289	3289	3289
N. of observations	21541	21541	21541

i. ***, **, *, statistically significant at 0.01, 0.05 and 0.1 respectively

ii. GMM regression results using Arellano and Bond's (1991) method. All regressions include time and two digit industry dummies. All results are based on a one-step estimator, except the Sargan test, which is based on a two-step estimator.

iii. Instruments are y_{it-j}, for $j \geq 3$, l_{it-2}, k_{it-2}, D_{it-2}, TA_{it-2}, PM_{t-2}

TABLE 4. Joint effect between competition and financial pressure

Dependent variable: change in net sales (Δy_{it})

	Model (7)	Model (8)	Model (9)
Δy_{it-1}	0.34^{***}	0.31^{***}	0.21^{***}
	(0.032)	(0.034)	(0.034)
Δl_{it}	0.49^{***}	0.55^{***}	0.51^{***}
	(0.14)	(0.15)	(0.13)
Δk_{it}	-0.25^{***}	-0.27^{***}	-0.098
	(.079)	(0.083)	(0.074)
$CDMDO_{it-1}$			-17.59^{***}
			(2.10)
$D_{it}{\cdot}CDMDO_t$	0.37^{***}		0.12
	(0.14)		(0.11)
$D_{it}{\cdot}HI_t$		0.0035^{**}	
		(0.0014)	
ΔD_{it}			-0.000025
			(0.000026)
ΔTA_{it}	0.37^{***}	0.35^{***}	0.18
	(0.13)	(0.13)	(0.13)
EMP_{it}	-0.028	-0.028	0.0071
	(0.048)	(0.049)	(0.045)
FI_{it}	-0.019	-0.015	-0.0076
	(0.032)	(0.032)	(0.029)
$FUND_{it}$	-0.13^{*}	-0.14^{**}	-0.095
	(0.066)	(0.067)	(0.060)

Continued overleaf

TABLE 4 *Continued*

IND_{it}	−0.014	−0.011	−0.015
	(0.029)	(0.029)	(0.026)
$INDUS_{it}$	−0.011	−0.0084	−0.0028
	(0.028)	(0.029)	(0.026)
PF_{it}	−0.023	−0.019	−0.025
	(0.033)	(0.034)	(0.030)
AUT_{it}	−0.022	−0.019	−0.040
	(0.040)	(0.041)	(0.037)
Industry dummies	Included	Included	Included
Time dummies	Included	Included	Included
Second order correlation residuals	$p = 0.5462$	$p = 0.8058$	$p = 0.4352$
Instrument validity	$\chi^2(31) = 30.52$	$\chi^2(31) = 30.06$	$\chi^2(31) = 29.27$
	$p = 0.4904$	$p = 0.5141$	$p = 0.5552$
N. of firms	3289	3289	3289
N. of observations	21541	21541	21541

***, **, *, statistically significant at 0.01, 0.05 and 0.1 respectively

ii. GMM regression results using Arellano and Bond's (1991) method. All regressions include time and two digit industry dummies. All results are based on a one-step estimator, except the Sargan test, that is based on a two-step estimator

iii. Instruments are y_{it-j}, for $j \geq 3$, l_{it-2}, k_{it-2}, D_{it-2}, TA_{it-2}, PM_{t-2}