

Ownership structure and performance: An empirical application with panel data in the context of Portuguese SMEs

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Abstract

This paper analyzes the causal relationship between the ownership concentration, insider ownership and profitability using a sample of 4163 Portuguese SMEs and panel data methodology. The results show an endogenous and dynamic relationship between the variables. The quadratic specification established between ownership concentration and profitability suggests that for low levels of control rights the expropriation hypothesis prevails and for high levels the supervision hypothesis prevails. It was also possible to validate the effect of entrenchment and convergence of interests in the relationship established between the insider ownership and profitability. The relationships established suggest a reciprocal causality between the variables, as well as an interdependence expressed by the relevance of the estimators obtained in the simultaneous equations model. Thus, each of the attributes – ownership concentration, insider ownership and profitability – is a function of the others.

JEL Classification: G32.

Keywords: Corporate governance, insider ownership, ownership concentration, profitability

1. Introduction

Agency theory has contributed to the understanding of the problems underlying the conflict within organizations. From the conflicts of interest that can be generated between the various *stakeholders*, the literature has given greater attention to: *i*) conflicts between owners and managers/directors, *ii*) conflicts of interest between owners and the company's creditors; (Jensen et al., 1976), and *iii*) conflict between majority and minority owners, leading to problems of expropriation (Shleifer et al., 1986).

As it is difficult to reach a consensus on the best way to assess ownership structure and the literature suggests different ways to quantify it, we propose ownership concentration and insider ownership as characteristics that identify it best, since these are simple and intuitive variables, less prone to measurement error and not subject to the problems of weighting.

Ownership concentration affects the relationship of the company with other *stakeholders*, investment opportunities, company growth and consequently performance. Dispersed ownership can lead to communication and coordination problems as a result of the diversity of owners and the separation of ownership and control. Meanwhile, supervision of the managers/directors by the owners intends to prevent unsuitable management practices or behaviours which are inconsistent with what must be the main objective of the principal (maximizing value for the owner), limiting management's immunity, known as "entrenchment" in the literature. Supervision, however, has costs and provides benefits to all of the owners in proportion to their holdings, so that few are interested in doing it. This phenomenon leads to "*free-riding*" problems and reduced performance. With a small number of owners the communication and coordination problems decrease as interests are more aligned,

which can lead to greater oversight (Shleifer and Vishny, 1986) or to less expropriation of minority shareholders (Shleifer and Vishny, 1997).

In the scenario of apparent conflict, our main aim is to analyze the relationship between ownership structure (concentration and insider ownership) and operating profitability on assets (ROA) using panel data. In addition, we intend to study whether the ROA and the ownership concentration on the one hand, and insider ownership ROA on the other hand, establish reciprocal relationships and to assess their interdependence using a system of simultaneous equations.

Results show that the ownership concentration display a U-shaped relationship with profitability in line with what Hu et al. (2010) obtained for Japanese family businesses. When compared with those obtained in similar studies in the Spanish business environment, they suggest an inverse relationship to that obtained by Miguel et al. (2004) for listed companies and confirm the relationship formulated but not validated by Arosa et al. (2010) for unlisted companies. The effects of entrenchment and convergence of interests are also confirmed in the relationship established between the insider ownership and profitability.

This paper is organized as follows. In addition to this introduction, it is comprised of four sections. The second section is devoted to a survey of the relevant literature on this topic. The third focuses on the hypotheses, the sample, data, variables and methodology. The results are presented and discussed in the fourth section. Finally, the fifth section presents the key findings and limitations of this study and to suggest avenues for future work.

2. Survey of the Literature

The relationship between the ownership concentration, insider ownership and performance in companies has been an important and controversial issue in corporate governance. Agency theory states that the ownership structure is an important determinant of performance – causality of property for performance. However, studies such as those by Pedersen and Thomsen (2001) and Holderness (2003) argue that causality may be in the opposite direction under some circumstances – causality of performance for ownership structure. Although the impact of ownership structure on performance has been explored in the literature (e.g., Anderson and Reeb, 2003; Miguel, et al., 2004), studies on the effect of performance feedback on ownership structure, are scarce and have been limited to the North American reality (e.g., Demsetz, 1983; Demsetz and Lehn, 1985).

Research conducted on U.S. firms is based on a highly dispersed ownership, whereby it may have limited applicability (Cho, 1998 and Demsetz and Villalonga, 2001). In fact, continental countries are characterized by a concentrated ownership and strategically oriented towards stable relationships. These ensure sustainable development rather than favouring performance or control rights over the company. The question is then raised: *i*) if the ownership held by the main owners and by managers/directors plays an important role in determining corporate profitability, and *ii*) do the owners and the managers/directors change their level of ownership according to the company's profitability.

Ownership concentration is one of the main mechanisms of corporate governance which influences agency costs (Jensene Meckling, 1976). Based on this premise, the effect of ownership concentration on performance has been widely documented in the literature with particular attention to companies in the United States and the United Kingdom.

Since dispersion creates *free riding* problems and makes it difficult to supervise, a positive relationship is expected between ownership concentration and corporate performance. Consistent with this hypothesis supervision, Shleifer and Vishny (1986) refer to the important role played by large owners, and how the stock price rises as the percentage of shares held by them increases. Grossman and Hart (1986) argue that owners with a high stake in the company show greater willingness to play an active role in decisions as they can internalize the benefits of their monitoring effort. The method used by large owners to oversee the management/administration is a result of informal agreements drawn up amongst themselves (Sheifer and Vishny, 1997). Nevertheless, ownership concentration can lead to conflicts between controlling and minority owners leading to worse performance, as advocated by expropriation hypothesis. The divergences induce a perverse widespread problem in that the controllers expropriate wealth from minority owners. Small investors fear being expropriated through inefficient investments yielding higher costs for the company (La Porta, et al., 1999). Sheifer and Vishny (1997) argue that in some countries, the agency costs resulting from the conflict of interest between controlling and minority owners are much more significant than those resulting from the separation of ownership and management (administration). Thus, high levels of ownership can generate costs, particularly when the majority owners do not redistribute wealth equitably with minority owners, because their interests do not always coincide.

Several authors analyze the relationship between ownership concentration and performance to determine the existence of an optimal structure. For example, in a study conducted on 470 companies listed in the UK, Leech and Leahy (1991) document an inverse linear relationship between ownership concentration and performance. The same relationship was observed by Mudambi and Nicosia (1998) and Lehmann and Weigand (2000) for a sample of British and German companies, respectively.

Meanwhile, a linear and positive relationship between ownership concentration and performance is validated for a group of U.S. (e.g., Hill and Snell, 1988 and Agrawal and Mandelker, 1990), Japanese (e.g., Kaplan and Minton, 1994 and Gedajilovic and Shapiro, 2002) and German (e.g., Schmidt and Gorton, 2000) companies. Gedajilovic and Shapiro (2002) reported that investors in the Japanese institutional context, are rather unprotected by the legal system and ownership is highly concentrated. Thus, minority owners, unlike what happens in other countries, are not expropriated since banks play an important role in corporate control. This leads to a convergence of interests between different owners and managers/directors.

Yet, when the dominant owners have enough power to control, they can maximize personal wealth at the expense of the company's value, leading to a conflict of interests between the majority and minority owner. In this sense, while analyzing listed Spanish Miguel et al. (2004) companies realize there is a nonlinear relationship. They conclude that the market value of companies increases until ownership concentration reaches 87 percent as a result of the effect of supervision, but beyond this point minority owners may be expropriated. This leads to a decrease in the value of the company. Thus, an inverted U-shaped relationship is found. In order to explain the results obtained, the work refers to a set of institutional features of the Spanish corporate governance system which differentiates it from previous studies, including: the level of ownership concentration, the effectiveness of boards of directors, the development of the capital market, the monitoring activity of the market over business activity and the legal protection of investors. Other authors (e.g., Gedajilovic and Shapiro, 2002 and Anderson and Reb, 2003) also provide support for a nonlinear relationship between ownership concentration and

performance, diverging, however, as to the value from which the effect of supervision replaces that of expropriation. This difference stems from different corporate governance systems, the legal protection of investors, the development of capital markets, the role of the market in corporate control, the industrial sector, among others (Shleifer and Vishny, 1997, La Porta et al. , 1998.)

In a more recent study of unlisted Spanish SMEs, Arosa et al. (2010) report that no relationship was identified between ownership concentration and performance. No evidence was found to corroborate the expropriation and supervision hypothesis for the companies analyzed. That is, the results obtained by Miguel et al. (2004), is based listed Spanish companies is uncorroborated for unlisted companies. In this case, the level of ownership concentration has no direct influence on the behaviour of the owners. This may be related to the status of unlisted companies their ownership concentration. Nevertheless, when dividing the sample depending on the nature of the ownership, the results suggest that the relationship between ownership concentration and performance differs depending on the generation which generates/manages the enterprise. In first-generation family businesses, a positive relationship between ownership concentration and performance is found for low levels of control rights, so that the supervision hypothesis prevails; a negative relationship is found for high levels of control rights, as expected by the expropriation hypothesis.

In the context of Japanese manufacturing enterprises, Hu and Izumida (2008) conducted a study where they analyze the causal relationship between ownership concentration and performance. The results suggest a U-shaped relationship between ownership concentration and performance, in line with the expropriation effect predominant in low levels of ownership and the supervision effect for intermediate levels of ownership, indicating that both dispersed ownership and high ownership concentration are associated with improved performance. On the other hand, they showed an insignificant effect of performance on ownership concentration, supported by the fact that capital markets have low liquidity, which prevents larger owners from changing their portfolios depending on performance. Considering the results, they conclude that ownership concentration is not determined by performance in illiquid markets, where it is difficult to transact and change ownership in response to changes in circumstances.

In addition to ownership concentration, the company's performance can be influenced the decisions of the managers/directors and the way they use company resources to maximize personal wealth at the expense of business results (Oswald and Jahera, 1991; Pegels et al., 2000). According to Jensen and Meckling (1976), the natural tendency of managers/directors is to affect the company's resources for their own interests, which may lead to conflicts with other stakeholders. As insider ownership increases, interests converge and thus conflicts between managers/directors and owners tend to be resolved (Miguel, et al., 2004). This convergence of interests hypothesis suggests that the company increases its value when the level of insider ownership rises. Nevertheless, high levels of insider ownership can generate costs as Fama and Jensen (1983) point out. When the manager/director owns a substantial fraction of the company's capital, this gives him voting power and/or significant influence. This, in turn, may not comply with the objectives of maximizing value, without jeopardizing their employment and therefore their salary (Miguel et al., 2004).

Since one of the objectives pursued by governance mechanisms is to prevent managers/directors from taking inadequate measures or from performing in a manner that is inconsistent with maximizing value to the owner, a phenomenon of management immunity can sometimes develop. This is known in the literature as

“entrenchment” (Costa, 1998). According to Berger et al. (1997), entrenchment reflects the situation in which managers/directors are immune to the discipline imposed by a wide range of control mechanisms. The level of the managers/directors’ “entrenchment” may be enhanced by several factors, particularly the weight of ownership held and voting power in decision-making (Demsetz, 1983; Fama and Jensen, 1983; Bebchuk et al. 2009).

Opposing effects of insider ownership on firm value, alignment of interests and entrenchment, suggest a nonlinear relationship between insider ownership and company performance. For low levels of insider ownership, there is a convergence of interests, agency costs decline and performance improves. In intermediate levels of insider ownership convergence costs (coincidence of ideas about how to run the business) outweigh gains and interest between managers and other owners may differ. In order to maximize their own interest managers/directors can divert results and other company assets under their control, enjoy higher remuneration, place unqualified relatives in management positions, or become irreplaceable (La Porta, et al. 2000; Gomez-Mejia, et al. 2001). Managers/directors can also choose to invest in projects that would be rejected when the rate of return required by the owners is considered, but which would meet their own expectations (Lisboa, 2007). For higher levels of insider ownership performance increases again, as the owner/manager/director of the company has additional incentives in valuing share price (Loderer and Martin, 1997). A review of relevant literature (Mudambi and Nicosia, 1998; Gedajlovic and Shapiro, 2002; Kumar, 2004; Miguel, et al., 2004) suggests that the relationship between insider ownership and performance has two inflection points; however, studies are not unanimous as to the percentage at which the inflection occurs and diverge in the models and variables used. Some studies use accounting data (e.g., Kumar, 2004) or market data (e.g., Michael, et al. 2004), others use a small number (e.g., Gedajlovic and Shapiro, 2002) or a significant number (e.g., Demsetz and Villalonga, 2001) of control variables.

Most studies indicate that ownership concentration and insider ownership have a positive impact on performance. Nevertheless, Demsetz (1983) and Demsetz and Lehn (1985) question this causal relationship, indicating that ownership concentration should be thought of as endogenous, a consequence of the decisions of maximizing results for owners. Cho (1998), Himmelberg et al. (1999) and Demsetz and Villalonga (2001) suggest that the variables of ownership are determined in equilibrium, endogenously. The positive or negative causal effect of performance on ownership is also reported by Pedersen and Thomsen (2001) and Holdeerness, (2003). Expecting better performance, the owners who are controllers increase their holdings in order to have greater control and obtain a higher income, assuming good performance persists, thereby constituting an indicator of the positive effect of performance on ownership concentration (Hu and Izumida, 2008). Conversely, if the value of the company is too high in relation to expectations generated and participation is subject to high risks, the owners are driven to sell part of their holdings. In this situation there is a negative effect of performance on concentration (Hu and Izumida, 2008). However, Zhou (2001) finds that ownership concentration has remained stable over the years, leading him to conclude that significant costs of adaptation and coordination make adjustments of ownership concentration more difficult.

The relationship between performance and insider ownership can be seen, within the context of agency theory, as one of the most relevant contributions to reduce agency problems between different *stakeholders* (Fama and Jensen, 1983; Demsetz and Lehn, 1985; Jensen and Meckling, 1976). Indeed, when the manager/director has no

holding, he may not have sufficient incentives to develop creative activities (often required to maximize the company's value) such as, seeking innovative investment projects or incorporating new production technologies, leading to myopic policies (Jensen and Meckling, 1976). The manager/director's stake in the capital can be a tool which will make him be more efficient or lead others to be so. Short-term incentives (salary) can be linked to long-term incentives (depending on results) translated by shares in the company, which serve as incentives or complementary compensatory systems to enhance the manager/director's preference for long-term results (Gaver and Gaver, 1993). Jensen (1993) proposes a combination of incentives to increase shareholder value. Thus, the manager/director is rewarded by increasing their wealth and differences between managers/directors and owners are reduced (Mehran, 1995). Thus, managers/directors may receive stock or stock options. Both have similar effects and, therefore, perform a substitute effect. Nevertheless, stock options reward manager/director but do not penalize them the same way as diminishing shareholder wealth. This leads them to assume greater risk when they hold options.

Within the context of family firms, ownership concentration often leads to the controlling shareholder/partner to perform activities designed to extract private benefits (Shleifer and Vishny, 1997, La Porta et al., 2000) by which profitability as a mechanism to induce greater participation by managers/directors in the company's capital and convergence of interests becomes less relevance. In this sense, some studies (Shleifer and Vishny, 1997; Demsetz, 1983) suggest that controlling family shareholders/partners tend to defend their own interests, treating the company as a tool to provide employment to the family or as a way to obtain financing thereby limiting the top positions to family members.

3. Hypotheses, sample, data and variables, methodology

3.1. Hypotheses

The object of study in the literature has been large firms with dispersed capital. The question, however, of assessing whether the results remain valid for small and family-oriented businesses has come up. To begin with, family owners, unlike the others, are more interested in the long term survival of the company. Agency problems seem less important in the context of these companies because the controlling owners already have enough incentives that give them power and information to control top managers/directors (Jensen and Meckling, 1976). Nevertheless, high levels of ownership concentration can trigger other problems and other costs in the context of corporate governance. The free-rider and entrenchment problems of the family members can override or even exceed the benefits of the agency agreement between owners and managers/directors (Dinoe Buchholtz, 2001; Chua, et al., 2003). Conversely, the long term presence of family members in the company can increase the quality of results (Wang, 2006) and facilitate the company's technological knowledge, thus improving performance (Martikainen, et al., 2009).

On the other hand, concern for reputation and the intention of preserving the family name are likely to involve a greater commitment on the part of owners, producing positive economic impacts. Family ties and reputation may limit the manager/director's acting for his own benefit when their family members manage the company (Denis,

1994). The family reputation may also foster long-term relationships, leading, for example, to a reduction of conflict of interests between owners and creditors and a lower cost of financing (Anderson and Reeb, 2003).

Problems arising from the separation of ownership and control are reduced in first generation family businesses because the same person is responsible for the management/administration, for investment decisions and supervision (Schulze et al., 2001). Agency costs can be reduced by completely eliminating separation of ownership and control. In these cases, the interests of the principal and the agent are aligned, so that the management/administration will not expropriate the wealth of the owners (Miller and Le Breton-Miller, 2006). When the company incorporates later generations, priorities are altered; ownership is shared by a growing number of members and conflicts can arise if interests are not aligned, and the relationships between the various participants are influenced by economic and personal preferences (Chrisman, et al. 2005; Sharmaa, et al. 2007). Over time the economic incentive to maximize personal utility can induce the controlling owner to confuse family objectives (interests) with the business objectives (Schulze et al., 2002). According to Anderson and Reeb (2003), the founding owner grants the company valuable capabilities, unlike his successors who intervene less towards productivity and efficiency. This argument is consistent with empirical evidence (Villalonga and Amit, 2006; Baraontini and Caprio, 2006; Pindado, et al., 2008) which testifies that firms managed by their founder perform better than others.

Based on the theoretical references developed in the previous section we have formulated the following hypotheses:

Hypothesis 1: There is a nonlinear relationship between ownership concentration and the company's operating profitability, which first increases and then decreases.

$$ROA_{it} = \beta_{10} + \beta_{11}ROA_{i(t-1)} + \beta_{12}C_{it} + \beta_{14}C_{it}^2 + \varepsilon_{it} \quad \text{Model 1}$$

where ROA and C represent operational profitability and ownership concentration, respectively. The dependent variable in Model 1 is profitability. The persistence of results – the company that operates well can continue to do so (Goddard and Wilson, 1999) – leads the profitability of the previous year to be positively associated with that of the current year. The literature review states that the effect of supervision and expropriation may occur simultaneously, suggesting a non-linear effect. The main advantage of the linear quadratic regression model is the presence of an inflection point, which takes in a change in the slope, the earliest symptom of the prevalence of the supervision and expropriation hypotheses.

The aim is also to investigate empirically if age is a potentiating factor of the effect of ownership concentration on profitability, reflected in the fact that it reduces or increases the magnitude and direction of this effect. The importance of considering this effect has already been suggested by Morck et al. (2000). The classification of companies based on age is associated with two recent problems in research: *i*) the decision of succession within the family business and *ii*) the generation of the family that exercises domination. Bennedsen et al. (2006) report a decline in corporate performance with the succession of family managers/directors. They also reveal that companies where the founder is in charge of management/administration show better performance in relation to others (Villalongaa and Amit, 2006).

Therefore, we formulate the second hypothesis.

Hypothesis 2: The relationship between ownership concentration and operating profitability is stronger in young companies than in 'mature' ones.

To test this hypothesis in Model 1 a dummy variable JM is introduced. It takes the value "one" if the company is young and zero in all other cases and a model is formulated in which the existence iterative effects between ownership concentration and this dummy is admitted. For purposes of classification as "young" and "mature," we felt that a company is "young" when its age is below the sample mean in line with (Pindado, et. Al, 2008).

$$ROA_{it} = \beta_{20} + \beta_{21}ROA_{i(t-1)} + (\beta_{22} + \beta_{23}JM_{it})C_{it} + (\beta_{24} + \beta_{25}JM_{it})C_{it}^2 + \varepsilon_{it} \quad \text{Model 2}$$

Regarding insider ownership the following hypothesis is formulated:

Hypothesis 3: A company's profitability increases with insider ownership for low and high levels (as a result of the effect of convergence of interest) and decreases for intermediate levels (as a result of the effect the managers/directors' entrenchment).

In order to test this hypothesis, a model that postulates a cubic relationship between ownership and internal operational profitability was formulated.

$$ROA_{it} = \beta_{30} + \beta_{31}ROA_{i(t-1)} + \beta_{32}PI_{it} + \beta_{33}PI_{it}^2 + \beta_{34}PI_{it}^3 + \varepsilon_{it} \quad \text{Model 3}$$

where PI , PI^2 , PI^3 is the percentage of equity held by managers/directors, its square and its cube, respectively.

A fourth hypothesis addresses the effect of profitability on ownership concentration

Hypothesis 4: The company's profitability has a positive impact on ownership concentration which is an incentive for the owner to exert greater control.

To test this hypothesis, the model is as follows:

$$C_{it} = \beta_{40} + \beta_{41}C_{i(t-1)} + \beta_{42}ROA_{it} + \beta_{43}ROA_{i(t-1)} + \varepsilon_{it} \quad \text{Model 4}$$

In opposition to the causality advocated in Hypothesis 1, performance has been recognized to have an inverted relationship on ownership concentration in the literature (e.g., Pedersen and Thomsen, 2001 and Holderness, 2003). Companies with good profitability are a strong incentive for concentrating ownership, resulting in greater control and/or a higher volume of rights on the assumption that it will persist, indicating a positive effect.

Regarding what conditions insider ownership, corporate performance is a strong incentive for greater involvement of the manager/director in the company's equity.

Hypothesis 5: The company's profitability has a positive impact on insider ownership constituting an incentive to practice efficient management/administration and to reduce conflicts between owners and managers/directors.

To test this hypothesis, the following model was estimated:

$$PI_{it} = \beta_{50} + \beta_{51}PI_{i(t-1)} + \beta_{52}ROA_{it} + \beta_{53}ROA_{i(t-1)} + \varepsilon_{it} \quad \text{Model 5}$$

As the literature review points out, there are a growing number of authors who formulate interdependent relationships between profitability, concentration of ownership and internal property whereby from an econometric point of view it is necessary to formulate a system of simultaneous equations.

Hypothesis 6: The company's profitability, the ownership concentration and insider ownership establish an interdependent relationship amongst themselves.

To test this interdependent relationship between performance, ownership concentration and insider ownership the following model of simultaneous equations is also estimated:

$$\begin{cases} ROA_{it} = \beta_{610} + \beta_{611}C_{it} + \beta_{612}PI_{it} + \varepsilon_{it} \\ C_{it} = \beta_{620} + \beta_{621}ROA_{it} + \beta_{622}PI_{it} + \varepsilon_{it} \\ PI_{it} = \beta_{630} + \beta_{631}ROA_{it} + \beta_{632}C_{it} + \varepsilon_{it} \end{cases} \quad \text{Model 6}$$

3.2. Sample, data and variables

The main source of information was SABI (Iberian Balance Sheet Analysis System, version 123 – November 2009) and the sample was selected as follows: *i*) companies that did not have accounting information for the period under review were eliminated from the database; *ii*) only those which satisfied the conditions set by the Bank of Portugal in their analyses (Total Assets, Equity, Positive Turnover and Gross Value Added (GVA)) were included; *iii*) only companies that presented economic viability shown by a positive operating profitability were retained *iv*) companies that met the conditions of SMEs under Decree-Law no. 372/2007¹; *v*) neither the

¹ This Decree-Law defines micro, small and medium enterprises. The category of micro, small and medium enterprises (SMEs) is made up of enterprises which employ fewer than 250 people and whose annual turnover does not exceed €50 million or whose annual balance sheet total does not exceed € 43 million. A small business is defined as an enterprise which employs fewer than 50 people and whose annual turnover or annual balance sheet total does not exceed €10 million. A micro enterprise is defined as employing fewer than 10 people and whose annual turnover does not exceed €2 million.

“Public Administration, Defense and Social Security” nor the “Financial and Insurance Activity” sectors were considered for lack of data; and finally *vi*) only those companies for which information regarding equity distribution was available were retained. Note that the need to classify companies according to their size, given the limited number of which had a record of their number of employees for the period 2003 to 2005, has led us to adopt their number of employees in 2006 for this period. Given these constraints, the sample consists of 4163 companies.

The period time considered, 2003/08, allows two of the methodology’s limitations to be controlled for: unobserved heterogeneity and endogeneity. Thus, information for a period of at least four consecutive years by the company becomes necessary to be able to test the absence of second order serial correlation as mentioned by Arellano and Bond (1991), one of the assumptions of the estimation method adopted (GMM).

To measure each attribute, we take into account the indicators used by other authors from the accounting information given the absence of market values for the population under study (SMEs). The use of profitability indicators as an expression of corporate performance is supported in many empirical studies, highlighting economic profitability (*ROA*), expressed in the asset’s capacity to generate results (e.g., Pedersen and Thomsen, 2001 and Wiwattanakantang, 2001).

Ownership structure as a mechanism of internal control is measured by ownership concentration and insider ownership. Ownership concentration (*C*) indicates the percentage of equity held by the two largest owners (Kuznetsov Muravyev, 2001) and insider ownership (*IP*) the part of the equity held by the managing bodies/directors (Anderson and Reeb, 2003; Villalonga and Admit, 2006). The variables used in the models are defined in Table 1 and the descriptive statistics in Table 2.

(Insert Tables 1 and 2)

We also consider a company young when its age is below the mean of the companies in the sample, yielding a dummy variable (*JM*) which is equal to one if the company is young, and zero otherwise (Pindado et. al, 2008). As for the nature of the ownership, it is a family company if the main partner/shareholder is an individual or family with at least 50% of the equity (Anderson and Reeb, 2003, Wang, 2006). The business dimension is evaluated by a set of variables to classify firms according to a multicriteria vector that combines the number of employees, turnover and total assets. Decree-Law No. 372/2007 is adopted as a basis, gathering together micro, small and average enterprises. Table 3 presents the segmentation criteria of the sample.

(Insert Table 3)

3.1. Methodology

The methodology uses panel data to estimate the models formulated. This choice is motivated by the relevance of two important issues in the study of the impact of ownership concentration and insider ownership on operational profitability: i) unobserved heterogeneity (corporate characteristics that influence profitability are difficult to measure or obtain) and ii) problems of individual endogeneity. Unobserved heterogeneity was controlled through the individual effect η_i - corporate specificities giving rise to specific behaviour, and the

effect of time, d_t . What is considered the error term in the model, v_{it} is divided into three distinct components: the first is the individual effect η_i , the second d_t , the time effect and the third $\mu_{i,t}$ random disturbance. Moreover, the potential endogeneity of ownership concentration and insider ownership may condition the relationship with profitability, so that instrumental variables are used and the Generalized Method of Moments (GMM).

Consider the following generic specification for a data panel model referring to the sectional unit i at moment t

$$Y_{it} = \beta_{0it} + \sum_{k=1}^K \beta_{kit} X_{kit} + v_{it} \quad i = 1, \dots, N \quad t = 1, \dots, T$$

where:

- Y_{it} - observed value of the dependent variable for individual i at moment t
- β_{0it} - independent regression term for individual i at moment t
- β_{kit} - regression coefficient of the K variable for individual i at moment t
- X_{kit} - observed value of explanatory variable K for individual i at moment t
- v_{it} - residual term (the regression error) for individual i at moment t , equal to $\eta_i + d_t + \mu_{i,t}$
- N - number of sectional units (individuals)
- T - number of time periods
- $N \times T$ - number of observations

Decomposition of the error term allows the panel data methodology to consider that the effect is not observed, η_i is correlated with the explanatory variables. Since η_i is constant over time, data over two consecutive periods can be distinguished, giving rise to a new equation, known as the first-difference equation, where η_i is not found (it was removed by differentiation). The inclusion of lagged values for the explanatory variables gives rise to endogeneity, reflected in the fact that it is correlated with the error term, so that the estimators obtained by the Ordinary Least Squares (OLS) method of are biased and inconsistent. Thus, the Generalized Method of Moments (GMM) is used in estimating our models, which allows us to control endogeneity using instruments (variables that satisfy two conditions: i) not being correlated with v_{it} , i.e. $\text{Cov}(Z_{it}, v_{it}) = 0$ and ii) they are correlated with X_{it} , i.e. $\text{Cov}(Z_{it}, X_{it}) \neq 0$.

Under the GMM, the best known test is the over-identification test, or J test proposed by Hansen, which allows the quality of the instruments to be measured. The clearest way to test the specification of a model is to check if the values of all the conditions of the sample moments are close to zero or not, since the GMM only requires their k linear combinations to be. The J statistic has an asymptotic distribution of chi-square with $s-k$ degrees of freedom.

In models with time series the presence of a positive correlation between adjacent errors is often found, symbolically expressed by $E(\varepsilon_i, \varepsilon_j) \neq 0; \forall i \neq j$. One of the situations in which the regressors are not strictly exogenous occurs when the model contains a lagging dependent variable: Y_{it} and $\mu_{i,t}$ are correlated. To test the autocorrelation of the error term we use the Arellano and Bond statistic for autocorrelation under the null hypothesis of zero serial correlation. Negative serial correlation in the first order differences is expected, resulting from the relationship between $\Delta \varepsilon_{i,t}$ and $\Delta \varepsilon_{i,t-1}$ through the $\varepsilon_{i,t-1}$ term, so that a serial correlation of order r with $r = 2, \dots, T$ should be sought.

The need to estimate the mutual relations between profitability, ownership concentration and insider ownership requires a simultaneous equations model to be adopted, with a number of equations equal to the endogenous variables. The existing statistical programs (e.g., STATA) do not include routines for estimating systems of simultaneous equations with panel data, considering them cross-section data, leading to inefficient estimates.

4. Results

In this section we present the results of the proposed models in order to test the hypotheses. The estimates for the parameters in each model were obtained through the Generalized Method of Moments (GMM). This was followed up with tests to assess their quality. In all of the models, the Arellano and Bond test reveals no correlation between the errors, with Hansen's test validating the instruments used, so that the methodology used is found to be suitable.

4.1. Ownership Concentration and Corporate Profitability

Estimation results of the model first formulated using the Generalized Method of Moments (GMM), are found in Table 4 column I, when considering the totality of the sample companies. The values obtained suggest that ownership concentration has a nonlinear impact on corporate profitability, expressed in the significance of regression coefficients. In particular, the coefficient of the ownership concentration variable is negative ($B_1 < 0$) and its square is positive ($B_2 > 0$), which represents a quadratic U-shaped relationship. This means that the expropriation hypothesis prevails for low levels of control rights and the supervision hypothesis for high levels. The results have revealed themselves significant, unlike what happened in Arosa et al. (2010) and Westhead and Howorth (2006), and establish a contrary relationship to that obtained by Miguel et al. (2004) for Spanish listed companies. Nevertheless, they are in consonance with the findings of Hu and Izumida (2008) for small family businesses in Japan. The negative effect of ownership concentration on profitability for low levels of concentration suggests that two potential costs prevail. On the one hand, there is an incentive for the owner to take actions that increase their personal utility, reducing corporate performance (Anderson and Reeb, 2003), which may be associated with less efficient investment decisions (Cronqvist and Nilsson, 2003). On the other hand, Gomez-Mejia et al. (2001) suggest that as the concentration of family ownership increases there is an influence of family control over managers/directors, which can lead to greater entrenchment. The inversion of the concavity of the quadratic relationship, over that obtained in other studies focusing on large enterprises, may be related to the fact that the latter possess external control systems, professional management and more dispersed ownership where the holders of the equity purchase and sell shares in high liquidity securities markets. In listed companies, ownership loses its relevance as a mechanism of supervision, as this is ensured by external (market) forces. Conversely, in small businesses internal control systems and more concentrated ownership prevail and less efficiency of securities markets is felt. The ownership structure thus plays an important role in disciplining managers/directors and significantly determines performance for lack of effective external control.

A quadratic relationship proposed in model 1 shows only one inflection point that can be determined by deriving the function in relation to ownership concentration. Calculating the first derivative and making it equal to zero, we obtain the variable value where the function reaches an extreme. Since the coefficient of the term of higher degree is positive, we can say that the function has a minimum at $C_1 = - (B_1/2B_2)$, which for this sample is

68.69%. The fact that the coefficient B_2 presents a very low value indicates that the parabola has a “very open” U-shape. These values allow us to conclude that there is a quadratic relationship between ownership concentration and profitability as advocated by Hypothesis 1. Nevertheless, concavity is inverted.

Columns II, III and IV of Table 4 show the results of the estimation of model 1, for the sample segmented by size according to the criteria defined in Table 3. The results obtained when considering all firms in the sample remain valid for the subsamples consisting of micro, small and medium enterprises. Nevertheless, the *break point*, where the expropriation effect gives rise to the supervision effect, changes. It appears that micro and small enterprises have a value of 80.47% and 71.51%, respectively, placing them above the value obtained for the total sample firms. For medium-sized companies the inflection point is found at lower levels, 57.04%. The results indicate that as the company increases in size, the supervision effect prevails from lower levels of ownership concentration. Thus, the estimates suggest that larger firms are subject to mechanisms of higher scrutiny.

In columns V and VI of Table 4, we consider the segmenting criterion firm age, according to the criterion found in Table 3. The model parameters remain significant as the conclusions remain valid for all firms in the sample. Nevertheless, the supervision effect of the “mature” companies replaces the expropriation effect at lower levels of ownership concentration than obtained for the total sample, with the value of 67.18%. “Young” firms need to achieve a concentration of 74.19% for the supervision effect to prevail. Adopting the nature of ownership (family/non-family) as a segmenting criterion, as recommended in Table 3, the significance of ownership concentration on profitability is only validated for family businesses. The sign of its coefficients remain in accordance with the values expressed in columns VII and VIII of Table 4.

Finally, columns IX, X, XI and XII of Table 4 show the estimation of model 1 intersecting the first two segmenting criteria above. The level of significance for the coefficients obtained leads us to assert that the relationship between ownership concentration and profitability is relevant in young family firms. These results suggest that their owners are more motivated to expropriate businesses. It is important to highlight the fact that the *break point* presents the highest value within the estimations made, reaching 80.55%.

We can say that in family businesses ownership concentration becomes significant with regards to profitability, largely attributable young family firms.

(Insert Table 4)

4.2. The moderating effect of age

The results of the second model formulated are presented in Table 5, showing the moderating effect of age on the relationship established in the previous model. Analysis of the regression coefficients associated with C_{it} , JM_t and $C_{it}^2 JM_t$ allows us to conclude that there is a significant interaction between ownership concentration and age (i.e., the relationship between ownership concentration and profitability is moderated by age). The values suggest that age influences and enhances the relationship established in the previous model, in line with previous empirical results (e.g., Anderson and Reeb, 2003 and Baronitini and Caprio, 2006). All of the model’s estimated coefficients are significant, with the previous references remaining valid, allowing Hypothesis 2 to be validated.

(Insert Table 5)

4.3 Insider ownership and corporate profitability

Estimation results of the model that establishes a link between profitability and insider ownership (model 3) are summarized in Table 6. The coefficients of the columns I and II are all shown to be meaningful, validating a quadratic relationship between insider ownership and profitability. It is not possible, however, to support the cubic specification of the model with the values obtained when this specification is considered (see column III). The coefficients for PI and PI^2 , respectively negative and positive, constitute an entrenchment effect and convergence of interests. For insider ownership values up to 79.10%, profitability decreases, suggesting that *insiders* are less interested in the welfare of the other owners and that their greater security is more likely to entrench them. For higher values, the increases in insider ownership are translated into increased profitability, where the added incentives that managers/directors have to maximize the value can contribute to their increased participation. In a study conducted on listed Spanish firms subject to the scrutiny of the market, Miguel et al. (2004) validate a cubic relationship between these variables. The results do not allow the cubic specification formulated in Hypothesis 3 to be validated; however, the coefficients of the variables PI and PI^2 support a quadratic relationship between insider ownership and profitability.

(Insert Table 6)

4.4 Profitability and ownership concentration

Table 7 presents the estimation results of model 4. Analysis of these results shows a causal relationship between the values of profitability with one period lag and ownership concentration. The values of the previous period, however, are not statistically significant on concentration. The value of the profitability coefficient is positive and significant validating not only the relationship of reciprocity, but also the determinant role it has on ownership concentration. The results reveal the importance of profitability, namely in the previous period, on ownership concentration, as suggested by Hypothesis 4, which is consistent with previous empirical evidence (Thomsen et al., 2006).

(Insert Table 7)

4.5 Profitability and insider ownership

The estimation results of model 5, which establishes a relationship between profitability and insider ownership, are found in Table 8. The coefficients of profitability (current and lagging by one period) are statistically significant, with a negative relationship with the insider ownership. The insider ownership held in the previous period is also a determinant of insider ownership at the current time. The inverse relationship between profitability and insider ownership suggests that, as a result of expropriation practices performed by the controlling owner and by allocating managerial/directorial positions to people appointed by him, profitability is not a sufficient “incentive” to induce greater participation by managers/directors in corporate ownership. The absence of a clear distinction between individual and corporate property, the propensity to give up, in the short run, income (safeguarding the business for future generations) and reduced professionalism of the management/administration can contribute to profitability not being considered an sufficiently relevant incentive for the participation of managers/directors in the ownership (Anderson and Reeb, 2003, Wang, 2006; Arosa, et

al., 2010). The estimation results of the model and the negative coefficients of the ROA_{it} and $ROA_{i(t-1)}$ support Hypothesis 5, but with an opposite impact (negative) to what was formulated.

(Insert Table 8)

4.6. Simultaneous effects: operational profitability, ownership concentration and insider ownership.

As a prior study to the analysis of the simultaneity between profitability, ownership concentration and insider ownership, an endogeneity diagnostic is carried out by the ordinary least squares method. Table 9 provides the results obtained in the estimation of each equation, allowing endogeneity between the variables to be assured since all the coefficients are statistically significant.

(Insert Table 9)

The estimation results of model 6 estimation, obtained by the three-step least squares (3SLS) method are shown in Table 10. Firstly, I shall point out two aspects: i) the statistical relevance of all the coefficients and, ii) the stability of the relationship among variables expressed in maintaining the sign of the coefficients. Ownership concentration and profitability establish a direct relationship between themselves (equation I) that remains between profitability and ownership concentration (equation II). Insider ownership conditions profitability negatively (equation I) and this, in turn, conditions insider ownership (equation III), without changing the direction of the relationship. Regarding insider ownership and ownership concentration, they maintain a direct relationship between themselves as shown by equations II and III.

(Insert Table 10)

4.7. Robustness analysis

The models proposed require a methodology that makes use of the instrumental variables as a mechanism to control the possible endogeneity of the explanatory variables. The best choice is a GMM estimator because it incorporates all of the others (Ogaki, 1993). Furthermore, GMM is particularly suitable for this study given the dynamic nature of the variables. Previous studies show that in the context of dynamic models, various estimation techniques generate biased estimators. Specifically, the ordinary least squares method (OLS) yields an overestimation of the parameters by virtue of the presence of individual endogeneity (Hsaio, 1986). Moreover, the estimators with centred variables (Within-groups) give rise to default values (Nickell, 1981). More recently, Alonso-Borrego and Arellano (1999) show that the first difference GMM estimators (First difference GMM) are subject to a problem of weak instruments. As a result Blundell and Bond (1998) propose the system GMM (System GMM) in the context of dynamic models.

To validate that the System GMM is the best suited to our study, we compared the results obtained (Equation 1) with this methodology with other estimation techniques.

The results obtained are shown in Table 11. The lag ROA coefficient, using the reference estimation method (System GMM), is 0.36560 (column IV). As Hsaio (1986) suggests, the coefficient obtained by the OLS

estimator, 0.64435 (column I) has a higher value. The value of the coefficient, estimated by Within-Groups, 0.13015, is clearly inferior. Contrary to the OLS and the Within-groups, it is not possible to establish any specific relationship between the first difference GMM and the System GMM. As shown in Table 11 (Column III), the yield coefficient of the offset is 0.15562, smaller than the coefficient obtained by the System GMM (0.36560).

Given the values obtained and according to the authors indicated, we can conclude that System GMM is the method which best serves the purposes of our work. Thus, all of the models were estimated using the System GMM.

The methodology allows the endogeneity of the variables in the model to be controlled, with the inclusion of lags of the second and third period, *lags* (2 3), as instruments in the equations in differences and with only one lag in the equations for levels, as suggested by Blundell and Bond (1998).

Tests were carried out to assess the quality of the specification models. Through Hansen's *J* overidentification statistic, the selected instruments were validated, and the *AR* (2) and *AR* (3) statistics developed by Arellano and Bound (1991) revealed the absence of second-order correlation in the first residual differences; no problems were identified in the models.

(Insert Table 11)

5. Conclusion

In this study we analyzed the relationship between profitability, ownership concentration and insider ownership, extending the previous literature in this area, highlighting their endogenous nature and dynamics. The control of unobserved heterogeneity and individual endogeneity, provided by panel data the methodology and analysis of the interrelationships performed through the use of a system of simultaneous equations, allows role of ownership concentration and insider ownership to be evaluated as control mechanisms within the governance of small firms.

To achieve this goal, several steps were taken. First, we analyzed the relationship between ownership concentration and corporate profitability through a quadratic specification, which is validated for the companies under study and for the subsamples generated from the criteria of size and age. When we segment the sample by the nature of ownership, the empirical evidence shows that the relationship is valid only for family businesses, in line with the potential benefits associated with these companies. The results are in line with those obtained by Hu et al. (2008) for Japanese family businesses. They confirm the relationship Arosa et al. (2010) formulated and which we were unable to validate in the context of unlisted Spanish companies and suggest a U-shaped relationship between ownership concentration and performance – the inverse of that obtained by Miguel et al. (2004) in a paper on listed companies. Nevertheless, for family businesses, the relationship differs depending on age – young companies show a negative relationship between ownership concentration and profitability for low levels of control rights, so that the expropriation hypothesis prevails; and they show a positive relationship for high levels of ownership concentration, as a consequence of the supervision hypothesis.

The next step reinforces the role of ownership concentration on profitability, when this is moderated by firm age.

During the third step, the results confirm the entrenchment effect and the convergence of interests in the relationship established between the insider ownership and profitability. They do not validate, however, the cubic relationship established by Miguel et al. (2004).

The inverse causality relationship tested in the fourth and fifth steps brings new evidence to the existing literature. The results are in line with the findings of studies conducted in the United States (e.g., Cho, 1998 and Demsetz and Villalonga, 2001) and validate the relationship not identified in Hu and Izumida (2008) and Arosa et al., (2010) on samples of similar companies to those used in our study.

Results obtained in the estimation of the system of simultaneous equations suggest that the decisions of ownership concentration, insider ownership and profitability are not taken in isolation; rather, they are considered jointly. In the case of Portuguese SMEs, the institutional context in which they develop their activity, determines the existence of interdependence between these variables, leading to the need for an integrated and simultaneous analysis.

Additional research is needed, in our view, to overcome some constraints found in this work. Firstly it is very difficult to carry out a comparative study between different institutional contexts due to the absence/scarcity of databases with unlisted companies, which allow the role of ownership concentration in disciplining managers/directors and business performance to be assessed in the absence of effective external control mechanisms. The lack of data also prevented us to make a clear distinction between the company's founder and other members, to assess the relevance of the “generation effect”.

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Table 1. Variables used in the model.

Variable	Definition
Economic Return on Assets	$ROA_{it} = RO_{it}/A_{it}$, where RO_{it} is the Operating Profitability and A_{it} is the Total Assets. It measures the capacity of the company's assets to generate results.
Ownership Concentration	C_{it} expresses the holdings of the two largest partners/shareholders of the company's equity.
Insider Ownership	PI_{it} is the equity held by whoever performs management duties. It gives the percentage of the ownership held by the managers/directors.
Dummy Young/Mature	JM_{it} is a <i>dummy</i> which is equal to 1 if the age of the company is lower than the mean and zero otherwise.
Lagged Variable	$X_{(t-1)}$ denotes that the variable X is lagging by one period.
Time Dummy	$D_{(t)}$ is the dummy of period t

Table 2. Descriptive statistics.

Variable	Mean	Standard Deviation
ROA	0,07233	0,072945
C	90,48618	18,22097
C^2	8.520,144	2582,261
PI	73,56178	34,326
PI^2	6.589,562	3908,473
PI^3	61.4863,3	420040,6
Idade	17,65765	11,49313

Table 3. Sample segmenting criteria.

Criterion	Definition
Age	
Young	Age of the company is lower than the sample mean
Mature	Age of the company is higher than the sample mean
Nature of Ownership	
Family	Percentage of family in equity greater than 50%
Non-Family	Percentage of family in equity less than 50%
Size	
Micro	Classification as a micro enterprise as defined by Decree-Law No. 372/2007
Small	Classification as a small enterprise as defined by Decree-Law No. 372/2007
Average	Classification as an average enterprise as defined by Decree-Law No. 372/2007

Table 4. Results of estimation of impact of ownership concentration on profitability.

	Sample			Size								
				Micro			Small			Average		
	I			II			III			IV		
Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	
ROA _{it}												
ROA _{it(t-1)}	0,36560	0,032750	***	0,34761	0,040515	***	0,29735	0,104723	***	0,28182	0,14601	*
C _{it}	-0,00043	0,000148	***	-0,00075	0,000407	*	-0,00068	0,000342	**	-0,00089	0,000402	**
C ² _{it}	3,16E-06	0,000001	***	4,64E-06	0,000003	*	4,77E-06	0,000002	**	7,76E-06	0,000003	**
D _(t-4)	0,06120	0,005928	***	0,07967	0,015513	***	0,07301	0,014280	***	0,07669	0,017419	***
D _(t-3)	0,05856	0,005950	***	0,07617	0,015652	***	0,07375	0,014602	***	0,07107	0,016097	***
D _(t-2)	0,05783	0,005972	***	0,07624	0,015553	***	0,07076	0,014741	***	0,06774	0,015419	***
D _(t-1)	0,06127	0,006014	***	0,07814	0,015589	***	0,07512	0,014721	***	0,06884	0,015044	***
D _(t)	0,04235	0,006144	***	0,05178	0,015622	***	0,06385	0,015066	***	0,06117	0,015197	***
AR(2)	2,540		0,011	1,440		0,149	1,020		0,309	-0,640		0,521
AR(3)	1,040		0,297	1,130		0,258	0,260		0,797	-0,250		0,800
Hansen	17,850		0,022	15,050		0,239	18,140		0,020	6,210		0,624

Table 4. Results of estimation of impact of ownership concentration on profitability (continued).

	Age						Nature of Ownership					
	Young			Mature			Family			Non-Family		
	V			VI			VII			VIII		
Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	
ROA _{it}												
ROA _{it(t-1)}	0,33770	0,040234	***	0,44287	0,052614	***	0,37433	0,032751	***	0,39225	0,091375	***
C _{it}	-0,00048	0,000275	*	-0,00039	0,00015	**	-0,00029	0,000175	*	-0,00014	0,000316	
C ² _{it}	3,21E-06	0,000002	*	2,87E-06	0,000001	***	2,04E-06	0,000001	*	1,34E-06	0,000003	
D _(t-4)	0,06727	0,010556	***	0,05288	0,006445	***	0,05556	0,006775	***	0,06095	0,010897	***
D _(t-3)	0,06513	0,010564	***	0,04958	0,006625	***	0,05338	0,006831	***	0,05395	0,010955	***
D _(t-2)	0,06580	0,01063	***	0,04716	0,006618	***	0,05249	0,006811	***	0,05477	0,011329	***
D _(t-1)	0,06989	0,010672	***	0,05059	0,006649	***	0,05563	0,006815	***	0,06135	0,011823	***
D _(t)	0,05188	0,01089	***	0,03186	0,006782	***	0,03695	0,006917	***	0,03996	0,012432	***
AR(2)	1,960		0,050	0,990		0,321	2,500		0,013	0,950		0,344
AR(3)	0,950		0,344	0,550		0,579	1,320		0,186	-0,100		0,917
Hansen	11,540		0,173	12,880		0,116	14,840		0,062	19,240		0,014

Table 4. Results of estimation of impact of ownership concentration on profitability (continued).

	Family						Non-Family					
	Young			Mature			Young			Mature		
	IX			X			XI			XII		
	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t
ROA _{it}												
ROA _{i(t-1)}	0,35584	0,0405592	***	0,43872	0,053639	***	0,21690	0,128569	*	0,55097	0,107733	***
C _{it}	-0,00058	0,0003073	*	-0,00018	0,000218		-0,00046	0,000534		-0,00009	0,000352	
C ² _{it}	3,62E-06	2,03E-06	*	1,27E-06	1,47E-06		4,12E-06	4,54E-06		8,25E-07	3,26E-06	
D _(t-4)	0,07053	0,0117246	***	0,04577	0,008412	***	0,08390	0,016454	***	0,04495	0,012507	***
D _(t-3)	0,06887	0,0117487	***	0,04279	0,008585	***	0,07523	0,017462	***	0,03728	0,013616	***
D _(t-2)	0,06919	0,0117327	***	0,04073	0,00856	***	0,07944	0,017458	***	0,03574	0,013299	***
D _(t-1)	0,07309	0,0117569	***	0,04330	0,008499	***	0,08579	0,018076	***	0,04292	0,014005	***
D _(t)	0,05499	0,0119711	***	0,02539	0,008645	***	0,06912	0,020407	***	0,02131	0,014678	
AR(2)	1,840		0,065	0,990		0,321	0,840		0,400	0,760		0,448
AR(3)	0,720		0,472	1,010		0,314	0,920		0,356	-0,680		0,498
Hansen	9,410		0,309	11,940		0,154	8,580		0,379	11,710		0,164

Notes:

The information required to interpret the tables is as follows: i) estimating the data was performed using GMM estimators as dynamic panel data using **xtabond2** developed by David Roodman (2006); ii) ***, ** and * indicate the significance level at 1%, 5% and 10% respectively, iii) to eliminate the individual effects, the model was estimated after considering the first differences for the variables iv) Arellano and Bond (AR) is a test of the autocorrelation of errors developed in order to verify if there are lags that are not valid instruments, v) Hansen is a test of the over-identifying restrictions, asymptotically distributed as χ^2 under the null hypothesis of no correlation between the instruments and the error term.

Table 5. Results of the estimation of the impact of ownership concentration on profitability, with the moderating effect of age.

	Sample		
	Coef.	Std. Err.	P> t
ROA _{it}			
ROA _{i(t-1)}	0,36906	0,032617	***
C _{it}	-0,00051	0,000154	***
C ² _{it}	3,73E-06	1,12E-06	***
C _{it} JM _i	2,15E-04	0,000099	**
C ² _{it} JM _i	-1,75E-06	1,02E-06	*
D _(t-4)	0,05988	0,005842	***
D _(t-3)	0,05737	0,005863	***
D _(t-2)	0,05686	0,005886	***
D _(t-1)	0,06056	0,005934	***
D _(t)	0,04184	0,006070	***
AR(2)	2,56		0,01
AR(3)	1,07		0,284
Hansen	18,08		0,054

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

Table 6. Results of the estimation of the impact insider ownership on profitability.

	Insider Ownership								
	Linear I			Squared II			Cubic III		
	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t
ROA _{it}									
ROA _{i(t-1)}	0,36615	0,032749	***	0,36706	0,032709	***	0,36719	0,03271	***
PI _{it}	-0,00011	0,000022	***	-0,00038	0,000086	***	-0,00061	0,00022	***
PI _{it} ²				2,38E-06	0,000001	***	8,56E-06	4,96E-06	*
PI _{it} ³							-3,95E-08	3,04E-08	
D _(t-4)	0,05735	0,003467	***	0,06094	0,004009	***	0,06150	0,00413	***
D _(t-3)	0,05452	0,003518	***	0,05812	0,004056	***	0,05867	0,00418	***
D _(t-2)	0,05372	0,003549	***	0,05735	0,004085	***	0,05791	0,00421	***
D _(t-1)	0,05712	0,003551	***	0,06078	0,004090	***	0,06135	0,00422	***
D _(t)	0,03791	0,003727	***	0,04161	0,004267	***	0,04217	0,00439	***
AR(2)	2,56		0,010	2,57		0,010	2,57		0,010
AR(3)	1,04		0,299	1,03		0,303	1,03		0,301
Hansen	15,27		0,018	15,4		0,017	15,43		0,017

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

Table 7. Results of the estimation of the impact of profitability on ownership concentration on yield grounds.

	Sample		
	Coef.	Std. Err.	P> t
C _{it}			
C _{i(t-1)}	0,05388	0,081832	
ROA _{it}			
ROA _{i(t-1)}	191,16210	77,098000	**
D _(t-4)	-0,64643	0,149352	***
D _(t-3)	-0,51151	0,173992	***
D _(t-2)	-0,12561	0,112239	
D _(t-1)	0,69834	0,221077	***
AR(2)	-2,500		0,012
AR(3)	-0,380		0,701
Hansen	5,980		0,112

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

Table 8. Estimation of impact of profitability on insider ownership.

	Sample		
	Coef.	Std. Err.	P> t
PI_{it}			
$PI_{i(t-1)}$	0,14744	0,081506	*
ROA_{it}	-35,02412	7,595487	***
$ROA_{i(t-1)}$	-9,40107	2,873151	***
$D_{(t-4)}$	5,98738	0,587962	***
$D_{(t-3)}$	5,35080	0,517579	***
$D_{(t-2)}$	3,78319	0,410201	***
$D_{(t-1)}$	3,20760	0,321417	***
AR(2)	0,81		0,418
AR(3)	-1,18		0,239
Hansen	24,88		0,024

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

Table 9. Study of endogeneity – result of estimation: ordinary least squares (OLE).

	ROA Equação I			C.P. Equação II			P.I. Equação III		
	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t
Constant	0,07312	0,002406	***	82,05333	0,299844	***	42,37432	1,097021	***
ROA				7,961582	1,564337	***	-36,6818	2,925719	***
C.P.	0,00013	0,000026	***				0,374723	1,097021	***
P.I.	-0,00017	0,000026	***	0,106566	0,0033274	***			

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

Table 10. Results of the estimation of the system of simultaneous equations.

	ROA Equation I			C.P. Equation II			P.I. Equation III		
	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t
Constant	0,069208	0,002405	***	73,94570	0,295676	***	13,60307	1,077252	***
ROA				19,28922	1,563354	***	-74,3318	2,961648	***
C.P.	0,000319	0,000259	***				0,722829	0,011474	***
P.I.	-0,000350	0,002405	***	0,205554	0,003262	***			

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

Table 11. Results of Model I with by use of different estimators.

	Ordinary least squares estimator I			Within-Groups estimator II			First Diference GMM III			System GMM IV		
	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t	Coef.	Std. Err.	P> t
ROA _{it}												
ROA _{i(-1)t}	0,64435	0,022879	***	0,13015	0,029984	***	0,15562	0,054694	***	0,36560	0,032750	***
C _{it}	-0,00031	0,000116	***	-0,00048	0,000241	**	-0,00030	0,000218		-0,00043	0,000149	***
C ² _{it}	2,22E-06	0,000001	***	3,37E-06	0,000002	*	1,68E-06	0,000002		3,16E-06	0,000001	***
D _(t-4)	0,01991	0,001492	***	(dropped)			0,03865	0,006906	***	0,06120	0,005929	***
D _(t-3)	0,01666	0,001463	***	-0,00227	0,000976	**	0,02721	0,003480	***	0,05856	0,005950	***
D _(t-2)	0,01574	0,001440	***	-0,00435	0,000996	***	0,02062	0,002864	***	0,05783	0,005973	***
D _(t-1)	0,02012	0,001456	***	-0,00116	0,001090		0,02203	0,002552	***	0,06127	0,006014	***
D _(t)	(dropped)			-0,01991	0,001476	***				0,04235	0,006145	***
AR(2) in first dif.: Z =							1,610	0,108		2,540	0,011	
AR(3) in first dif.: Z =							1,250	0,210		1,040	0,297	
Hansen test: Chi2 =							1,220	0,543		17,850	0,022	

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.