

The degree and seniority of control, and CEO compensation monitoring.  
Control thresholds estimates with a PTR model.

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*Abstract:*

Based on CEO compensation monitoring, this study first defines shareholders who exert an effective control as the largest shareholder, on his own or in concert, who is directly or indirectly represented on the board. Other blockholders, either on board or not, or excess in voting rights do not capture any enhanced-control. Second, a panel threshold regression (PTR) model is used to identify the existence and the number of regimes in the degree of control. Three threshold points and four regimes are identified. A first regime of non-controlled firms gathers firms where no controlling shareholder owns more than about 10% of interest. Three regimes of control are defined: “influential” shareholders owning between about 10% and one third of the common stock, “dominant” shareholders own up to about one half of equity, and “majority” shareholders above. Influential shareholders exert a downward pressure on CEO compensation as compared to non-controlled firms. Dominant shareholders pay higher cash compensation to their CEOs which is interpreted as evidence of “entrenchment”. Majority shareholders exert the most intensive degree of control and pay the lowest levels of cash and equity-based compensation to their CEOs. Third, this study introduces the seniority of control as a second criteria to measure the effectiveness of control. This criteria is used for the first time in the ownership literature to the best of my knowledge. It measures the number of years the controlling shareholder has been in a position to monitor the firm and aims to measure the time needed to acquire enough experience and firm-specific knowledge before the controlling shareholder is able to effectively monitor the management. Based on a panel threshold approach, this study finds that a monitor, pertaining to one of the three regimes of control earlier identified, needs about eight years, six at the minimum, to control effectively the management. Above this seniority threshold, it also defines incentive schemes that are consistent with a “long-term” horizon. Lastly, the alternative between a continuous or a discontinuous threshold measure of the degree of control is discussed and concludes to the relevance of a threshold measure.

Key words: Ownership structure, degree of control, seniority of control, CEO compensation, panel thresholds

JEL classification: G32; G34; J33; L22

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# 1 INTRODUCTION

Large shareholders have enough voting power to influence the governance of a firm and enough monetary incentives to engage in the monitoring of management (Shleifer & Vishny, 1986). Hence they may influence the major corporate decisions and significantly impact the firm strategy and performance. Nevertheless, very little is known about the conditions to be met to designate a large shareholder as an effective monitor. In the first instance, as already pointed out by Bhagat et al. (2004) or Holderness (2003; 2009), there is no guidance in the literature so as to the portion of shares or votes required to exert a significant influence on a firm governance, and no consideration for the effects of time and experience of large shareholders on the control of a firm. There is also no consensus on the relevant measure and identification of who are the controlling shareholders among the major shareholders in a given firm. Because concentrated ownership and large shareholdings are mainly the rule all over the world (La Porta, et al., 1999; Faccio & Lang, 2002), and because financial markets developed tremendously in many countries in the last decades inducing major and fast changes in the ownership structures of listed companies, the questions about how and to which degree a firm is controlled need further investigations.

Table 1 reports a survey of the literature that aims to provide a perspective on the measures of large shareholdings found in some seminal and reference studies on this subject (Survey A). At first glance, there is a wide and heterogeneous set of alternative measures intended to capture the effects of large shareholdings. A first main alternative is either a study focuses on ownership concentration and the existence of blockholders, or on the interests held by the largest shareholder. However, none of these studies try to define the most relevant measure with a perspective of control. Dyl (1988) and McConnell and Servaes (1990) do test alternatively the impact of all blockholders and of the largest shareholder; and Cyert et al. (2002) test the effect of the equity shares held by the largest shareholder, while using at the same time indicators for the existence of internal and external blockholders. But none of these studies try to disentangle the relative influence of each measure in terms of control. A second alternative lies on the choice of a continuous or a discontinuous measure of large shareholdings. Apart from two early studies which rely on the weight and concentration of the top five shareholders (Demsetz & Lehn, 1985; Dyl, 1988), most studies interested in measuring ownership concentration first identify the firms where a blockholder exists, then, some authors choose a discontinuous measure (an indicator variable takes value one when at least one blockholder exists, zero otherwise) and others a continuous measure (the portion of equity shares held by all blockholders). Other studies poses a discontinuous and dichotomous perspective between firms with at least one blockholder (“owner-controlled”), and firms with no blockholders where managers supposedly control the firm (“management-controlled”). Among all of these studies, only Dyl (1988) and Hambrick and Finkelstein (1995) discusses the alternative between continuous or discontinuous measures. Dyl contend that a continuous measure is more appropriate in an agency context but do not provide a rationale or an empirical test for the validity of this assertion. Conversely, Hambrick and Finkelstein state that a discontinuous measure is more appropriate to measure the vigilance of a major shareholder, arguing that as long as it holds a significant position, another 5% in equity should not substantially increase vigilance. The authors run a test for the respective impacts on CEO pay and conclude to the existence of a threshold effect rather than a continuous relationship with ownership.

Table 1: Survey of the ownership influence measures

References	Measure of the degree of control	Thresholds	Subject of study
<b>Survey A: Large shareholders</b>			
<b>Ownership concentration / Blockholders</b>			
Demsetz and Lehn, 1985	Concentration measures: Log(Top5 equity shares / (100 - Top5 eq.sh.)); Herfindahl index (HHI)	0%	Determinants of ownership
Dyl, 1988	Concentration measure: Log(Top5 equity shares)	0%	CEO pay
Beatty 1994	Indicator for the presence of an outside blokcholder	5%	CEO pay
Mehran 1995	Equity shares of outside blokcholders	5%	CEO pay and perf.
Holderness, 2007	Equity shares of blockholders (voting rights $\geq$ 5%); Indicator for the presence of a blockholder	5%	Ownership patterns
Konijn et al., 2011	Equity shares of blockholders; Dispersion measure: HHI (scaled) for 5 largest blockholders	5%	Firm value (Q)
Tosi and Gomez-Mejia, 1989	Dichotomous (indicator): □ Owner-controlled □ Management-controlled	□ $\geq$ 5% □ $<$ 5%	CEO pay
Hambrick and Finkelstein, 1995	Dichotomous (indicator vs. equity shares): □ Owner-controlled □ Management-controlled	□ $\geq$ 5% □ $<$ 5%	CEO pay
Shleifer and Vishny (1997)	Definition of: □ Large minority shareholders □ Large shareholders	□ 10%/20%-50% □ $\geq$ 51%	Survey of corporate governance
<b>Largest shareholder</b>			
Shleifer and Vishny 1986	Equity shares of one non-manager large shareholder (+ a fringe of risk-neutral atomistic shareholders)	5%	Large shareholders
Cyert et al., 2002	Equity shares of largest sh., non-CEO/CEO; Indicator for internal/external blockholder	5%	CEO pay and market for corporate control
Holderness and Sheehan, 1988	Dichotomous (paired categories): □ Diffusely held equity □ Majority shareholders	□ $<$ 20% □ $\geq$ 50%	Inv. policy, Corp. control, Firm perf.(Q and ROE), CEO pay
Margaritis and Psillaki, 2010	Equity shares, in piecewise linear form: Low / Intermediate / High concentration	25% and 50% (3 regimes)	Firm performance (technical efficiency)
<b>Largest ultimate shareholder</b>			
La Porta et al., 1999	Sub-samples by category: □ Widely held □ Voting shares by type of ultimate control	□ $<$ 10%/20% □ $\geq$ 10%/20%	International comparison; Law and finance
Claessens et al., 2002	Equity shares of ultimate owner; Voting minus equity shares; Indicator for "Control exceeds ownership"	10%	Firm value (Q)
<b>Survey B: Insider or managerial ownership</b>			
Morck et al., 1988	Equity shares, piecewise linear regression	5% and 25% (3 regimes)	Firm value (Q)
Cho, 1998	Equity shares, piecewise linear regression	7%/10% and 34%/38% (3 regimes)	Firm value (Q) and Investment (CapEx and R&D exp.)
McConnel and Servaes, 1990	Equity shares, quadratic/curvilinear relationship	5% and 40%/50% (2 regimes)	Firm value (Q)
Short and Keasey, 1999	Equity shares, cubic relation	13% and 42% (3 regimes)	Firm performance (RSE and VAL)
Davies et al., 2005	Equity shares, quintic relation	7%, 26%, 51% and 76% (5 regimes)	Firm value (Q)

Large shareholders are in almost all instances designated as blockholders which are defined as owners of 5% or more of the common stock. The studies interested more specifically on the effects of the largest shareholder also take into account the first blockholder. However, this threshold of 5% used in almost all of the cited studies has no theoretical or empirical rationale. The 5% cut-off is widely found in the literature because it triggers a mandatory public reporting of ownership positions under the SEC regulation. This minimum threshold is also found under other stock-exchange authorities' regulations around the world, although in some other countries this level is 10% and it justifies the minimum level of ownership found in the international survey of La Porta et al. (1999). Some other studies use a threshold of 20%, starting with Holderness and Sheehan (1988). These authors need to define diffusely-held firm in their study so as to pair them with majority-controlled firms. In this context, they posit arbitrarily a maximum threshold of 20% and mention that under this threshold, shareholders would not have enough voting power to affect firm policies, but they do not provide any theoretical or empirical support for this mention. La Porta et al. (1999) also use a 20% cut-off to define the chain of control of the ultimate largest shareholder based on a similar unsupported rationale that "this is usually enough to have an effective control of a firm". Hence the thresholds used in the literature about large shareholders only relies on mandatory disclosures or on anecdotal evidence. To the best of my knowledge, no study aimed to define the proper level of ownership required to have an effective control over a firm.

A potential explanation for this absence of investigation may lie on the ownership structure of large listed U.S. firms which are perceived as mostly diffusely-held. Because blockholders would be rare and would typically own small blocks of equity shares, a simple indicator for their existence (as in Beatty and Zajac (1994), Tosi and Gomez-Meija (1989), among others reported in Table 1) or a simple linear relationship (e.g., in Mehran (1995)) would be considered as sufficient. Although, Holderness (2009) demonstrates that the specific diffuse ownership pattern of U.S. companies is essentially a "myth", as Holderness and Sheehan (1988) already suggested in their earlier study of majority-controlled companies. Until the 1990s, most studies focused on the U.S. partly because of the lack of ownership data transparency in other countries. Since then, the increasing transparency in this matter has enabled the development of a growing literature on worldwide ownership patterns, starting with the seminal studies of La Porta et al. (1999) and Faccio and Lang (2002), showing that large shareholdings are a widespread ownership pattern all over the world. The survey by Shleifer and Vishny (1997) also contributed to highlight the role of large shareholders, when corporate governance studies focused quite essentially on managerial ownership. Still, to date, very little is known about the forms and the measures of their influence.

By contrast, the literature about managerial ownership investigated more insightfully the impacts of different levels of shareholdings (Survey B in Table 1) and provide relevant references for an investigation of the degrees of control by large shareholders. The issue of managerial ownership rose from Berle and Means' (1932) vision of a modern corporation in which no large controlling owners exist, leaving the effective control of the firm in the hands of the management. Consecutively, Jensen and Meckling (1976) developed a theory where managers ought to be the agents of the equity owners and where this would be achieved by providing the former with equity shares. A large literature then emerged about how much interest in the company managers should acquire to impact positively the value of the firm. Morck et al. (1988) showed that the firm value as measured by Tobin's Q had a nonmonotonic relationship with managerial or insider ownership (managers or insiders being defined as officers and directors): they specify a piecewise (or spline) regression and find a positive impact up to 5%, then negative up to 25% and slightly positive above

25%<sup>2</sup>. However, their two breakpoints are pre-determined and are not provided endogenously by their model. The 5% and 25% points are respectively motivated by the mandatory disclosure level and by the suggestion in Weston (1979) that hostile bids cannot succeed above an incumbent 20-30% shareholding. Cho (1998) uses the same piecewise linear regression with two breakpoints but defines the values of the points with an “iterated search technique”, he finds a first point ranging between 7% and 10% and a second one between 34% and 38% according to the dependent variable he uses. Some subsequent studies used polynomial specifications in order to identify the values of change points. First, McConnell and Servaes (1990) hypothesize a curvilinear relationship between managerial ownership and firm value and their specification takes the form of a quadratic function allowing for one turning point (i.e. the extreme value of the function) and two regimes. The authors conclude to an inverted U-shaped relationship with a maximum value at around 40% to 50%. Second, Short and Keasey (1999) refer to the spline regression of Morck et al. to specify a cubic function allowing for two turning points and three regimes. Finally, Davies et al. (2005) think a cubic specification is too restrictive because it would not capture the more complex evolution of managerial behavior<sup>3</sup>. They find significant coefficients for their quintic equation and define four turning points and five regimes. These various specifications provide a better estimate of the turning points as compared to Morck et al. (1988), because the point values are defined endogenously in the model. However, they still suffer some limits because the number of regimes are pre-determined by the number of degrees initially hypothesized in the polynomial function. Furthermore, these investigations do not discuss the alternative of threshold effects in managerial shareholdings instead of continuous relationships with breakpoints.

Another limit of these studies on the relationship between managerial ownership and firm value relates to an endogeneity issue in the causal relationship. Demsetz and Lehn (1985) and Himmelberg et al. (1999) show that ownership structure is endogenously determined by some firm characteristics and that there is no direct causal effect of ownership on firm value, either by large or managerial shareholders. Indeed, firm value and performance may be influenced by multiple firm and industry specific effects or by the economic and legal environment that in turn may also determine the interests some investors are willing to take in a firm’s equity (Demsetz, 1983; Himmelberg, et al., 1999). Cho (1998) argues that there is actually a reverse causation between managerial ownership and firm value. Thus, the impact of ownership structure on firm performance is biased because the present value of firm performance is influenced by its past values which may also have influenced the current ownership structure. Demsetz and Villalonga (2001) demonstrate the endogeneity of ownership structure and argue that any measure of a direct relationship with performance is bound to be biased.

The present study aims to identify the various regimes that may exist in the impacts of large shareholdings. The methodology developed in this purpose will address the two fundamental limits that were just pointed out about large and managerial ownership studies, namely pre-determined thresholds or change points, and the endogeneity issue. First, instead of a 5% minimum regulatory threshold and pre-determined breakpoints above that point, I rely on shareholding data starting at a 1% ownership level and I then use the panel threshold model developed by Hansen (1999) that not only enables to identify the threshold shareholding values but also to empirically determine the number of regimes of control. Second, to address the endogeneity issue of ownership with firm

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<sup>2</sup> The positive impact between 5% and 25% is interpreted as “entrenchment” and the negative impact as an “alignment” of interests. Other studies tested their specification but do not find similar results: Hermalin and Weisbach (1991) find a negative impact between 1% and 5%, positive up to 20% and negative above. McConnell and Servaes (1990) find a consistent positive impact up to 5% but a positive or not different from zero impact above 5% and above 25%.

<sup>3</sup> The authors hypothesize that there are two other turning points in addition to the two turning points below 50% already exhibited with cubic specifications: they think managers become again entrenched at the 50% level because they control the firm but still do not have aligned interests with other shareholders, and that only at “very high” levels of ownership do they have aligned interests.

value, I use CEO compensation as a dependent variable, and not firm value or performance, because its relationship with the degree of control is much more straightforward. Indeed, CEO compensation is directly determined by the monitors of a firm. A shareholder who takes the control of a firm, and consequently takes the control of the board of directors, has the power to oust the incumbent management and/or to redefine in an annual basis the management pay packages. The argument that some investors may acquire or sell significant equity positions in a firm because of past values of CEO pay would not hold. Thus, the current ownership structure cannot be deemed as directly influenced by past values of CEO pay, the latter do not bear the same endogeneity issue as firm value does, and the current CEO compensation schemes can then provide a satisfying yearly measure for the existence of an effective management monitoring.

This latter assertion is also supported by a large literature about the effects of monitoring on management compensation. The existence of an effective management monitoring, either measured by the presence of outside or independent directors (Allen, 1981; Lambert, et al., 1993; Core, et al., 1999), ownership concentration (Dyl, 1988), or the existence of blockholders (Beatty & Zajac, 1994; Mehran, 1995; David, et al., 1998; Core, et al., 1999; Cyert, et al., 2002; Chhaochharia & Grinstein, 2009), is consistently found to exert a negative pressure on the level of management pay and on the proportion of incentive-based pay.

Building on this relationship between management compensation and the control of a firm, I investigate the impacts and threshold effects of large shareholdings in three ways. First, this study identifies who, among all large shareholders, indeed exert a control. Second, it looks for thresholds effects in the degree of control and, third, in the seniority of control. Based on panel data about large shareholders on a sample of 123 French listed companies between 2003 and 2012, I find as a first and preliminary result that the relevant measure of controlling shareholding stands in the equity position held by the largest shareholder who, directly or indirectly<sup>4</sup>, is represented on the board of directors, plus the interests held by shareholders, also represented on the board, that concluded a shareholding agreement with the former. Conversely, the interests held by other blockholders, either represented on the board or not, are not relevant to measuring the exercise of control. Second, based on this preliminary result and on a panel threshold model, I look for the relevant thresholds and regimes in the degree of control. I find three significant thresholds and four regimes: firms with large shareholders between 1% and 11% provide the same compensation schemes as in firms with no large shareholders on the board, they overall define a regime of “noncontrolled firms”. A large shareholder starts exerting an effective control on CEO compensation when it crosses an 11% threshold (with a [10%, 16%] confidence region) with a homogenous threshold effect up to 34%; then, the control exerted is significantly stronger above a 46% threshold (with a [45%, 48%] confidence region). The 34% threshold presents a specific pattern: above this threshold and up to 46%, large shareholders define a level of CEO cash compensations similar to the one found in noncontrolled firms; a parallel can be drawn with some results found in the managerial ownership literature for these levels and may be interpreted as an “entrenchment” effect. Though, the confidence region for this threshold is wider and this threshold effect may range between 31% and 42%.

The control of a firm is usually approached according to two criteria, either in terms of the degree of control, as aforementioned, or in terms of the type of control. The type of control refers to the identity of the main shareholders (i.e. families, governments, financial or nonfinancial

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<sup>4</sup> In the above cited studies, the criteria about board characteristics and blockholders are most often treated with separate explanatory variables, precisely, indirect representation of blockholders is most often no identified. As noticed by Holderness (2003), ownership databases include the individual holdings of officers and directors in the “insider ownership” category. A blockholder in the form of a company, a bank, or a holding, represented indirectly by one of its employees on a board of director, would not have its positions included with insider ownership and would be considered as an “outside blockholder” in the surveys. Thus, the equity interests represented indirectly on the board of directors require manually collected data about the links between directors and blockholders.

companies...), this criteria is beyond the scope of this paper and will merely be accounted for as control variables. Yet, the present study suggests a third criteria absent from the literature to consider the exercise of the control on a firm. This criteria is referred to as the seniority of control, and is measured as the number of years of control. It also denotes the experience in monitoring and the firm-specific knowledge the largest shareholder could acquire over time. Based on a panel threshold model, this study finds that the controlling shareholder needs about eight years (six at the minimum in the confidence interval) to design compensation schemes that relies significantly less on alternative mechanisms of control as compared to noncontrolled firms. This result suggests that a monitor needs about six to eight years to effectively monitor the top management and that it takes that length of time to significantly reduce the asymmetries of information with the management. Also, this seniority can be considered as the minimum horizon of investment before a controlling shareholder can be considered as long-term oriented: in this perspective, a long-term controlling shareholder is a monitor who defines strategies and goals in the long run and has the ability to supervise their implementation, which together make it unnecessary to tie CEO compensation to short or medium term measures of performance.

Eventually, this study will use the methodologies found in the managerial ownership literature (namely, piecewise and polynomial specifications), first as a robustness test for the identified regimes in the degree of control, second as a base for discussion about the relevance of a discontinuous and threshold effect as opposed to a continuous and nonlinear impact from ownership patterns. These tests conclude to the relevance of threshold effects in the degree of control. Plus, a comparison between the panel threshold model and the polynomial specification shows that the spline and polynomial functions may approximate the changepoints from one regime to another by calculating the inflexion points of the functions. This comes into contradiction with the previous studies about managerial ownership that use extremums as point estimates which may have led to misidentifications in the piecewise and nonlinear managerial ownership effects.

The remainder of this paper is organized as follows. A first section presents the methodology for measuring the controlling shareholdings and identifying the thresholds in the degree and seniority of control. A second section describes the sample data and provides descriptive statistics. The following section presents the empirical results, and the last section discusses the results and concludes.

## 2 METHODOLOGY

### 2.1 The controlling shareholder

In the absence of management monitoring, top managers may have enough influence over the board of directors to determine their own pay (Gomez-Mejia, et al., 1987; Hambrick & Finkelstein, 1995; Bebchuk, et al., 2002). As the degree of control by large shareholders and/or by the board increases, the level of cash compensation (Core, et al., 1999; Chhaochharia & Grinstein, 2009) and of equity-based compensation (Cyert, et al., 2002) decreases significantly. The negative relationship between the control of a firm and the level of management compensation is consistently supported in the literature. However, the measures of the control are inconsistent, arbitrary or imprecise in several dimensions: the identification of the monitor, the levels of required holdings or voting rights, the links between the so-called “external” shareholders and the directors. The surveys use either one measure or another, but none try to disentangle their respective effects or to identify the most relevant measure of controlling shareholdings.

A preliminary test in this study relates to the relevant identification of controlling shareholders. First, the largest measure of controlling shareholdings is the percentage of equity held by all blockholders. Then, blockholders can be separated between those directly or indirectly represented on the board of directors and those who are not. Second, the largest shareholder may have a specific influence, either among other shareholders represented on the board, or as an external first shareholder if no greater shareholder is represented on the board. Third, the largest shareholder can enhance his/her control with devices such as shareholder agreements, or voting rights in excess to their equity positions. Fourth, the largest shareholder may be a company or any type of organization that may itself be ultimately controlled or ultimately diffusely-held with possibly different effects on its monitoring role. Most of these alternative measures can be found in one or another article reviewed in Table 1. Nevertheless, the literature provides no supportive references to disentangle among these many alternatives and to draw up a hypothesis on the most relevant measure of the controlling shareholdings. Also, I adopt an empirical approach based on a set of measures aimed at distinguishing the respective multiple shareholdings that potentially exert some control. The holdings are thus sub-divided into eight categories presented in Table 2 and included in the following specification. These variables are aimed at identifying the blockholders who effectively play a management monitoring role and at providing a relevant definition of controlling holdings for the purpose of the panel threshold analysis described in the next section.

$$\begin{aligned}
 Compensation_{j,i,t} = & \alpha_j + \sum_{k=1}^8 \vartheta_{k,j} Holdings_{k,i,t} + \sum_{k=1}^5 \delta_{k,j} CEO\ characteristics_{k,i,t} \\
 & + \sum_{k=1}^4 \beta_{k,j} Firm\ characteristics_{k,i,t} + \sum_{k=1}^{10} \rho_{k,j} Industry_{k,i,t} + \sum_{k=1}^2 \mu_{k,j} Type\ of\ control_{k,i,t} + \varepsilon_{j,i,t}
 \end{aligned} \tag{1}$$

This equation is specified for pooled panel data, with robust errors clustered at the firm level in order to account for correlations within the firms. Panel data with fixed individual effects would not be a relevant alternative in the present study, notably because CEO compensation and ownership patterns mostly vary from one firm to another rather than within each firm. Thus, the specification aims to estimate the impacts of differentiated ownership patterns on CEO compensation from one firm-year to another, and not only the impacts of ownership variations within each firm over the sample period as a fixed effect model would do. The subscript  $j$  in Equation (1) takes value 1 or 2 and stands for, alternatively, cash compensation and total compensation, as defined in Table 2. Firm and CEO characteristics are control variables listed and described in Table 2. One of the most influential determinant of CEO pay according to the literature is *firm size* (Gabaix & Landier, 2008; Cyert, et al., 2002), as it grows the complexity of the organization and the number of hierarchical levels increase and push top compensations upwards. The age of the company denotes similarly the complexity and also the maturity of a firm's organization. Capital intensity is a proxy for measuring the asymmetry of information between the CEO and shareholders about growth opportunities: a high proportion of tangible assets would reduce such asymmetries (Margaritis & Psillaki, 2010) and thus have a negative impact on CEO compensation. Earlier studies found that a high profitability, as measured by the *averaged ROA*, is positively related to management compensation (Dyl, 1988); high profitability is also associated with a lower firm's risk which in turn increases the contingent portion of pay and the level of total compensation for risk-averse CEOs (Beatty & Zajac, 1994). CEO's tenure is expected to have a positive impact on the salary because the CEO gains bargaining power over the years. According to Hambrick and Finkelstein (1995), *CEO's tenure* has a positive impact on pay raises in the first years because of experience and of increased bargaining power of the CEO over time (Cyert, et al., 2002), but long-tenured CEOs may have lower pay raises because they develop firm-specific human

Table 2: Description of variables

*Note:* Large (Largest) shareholders are shareholders owning at least 1% of the common stock. Blockholders are shareholders owning at least 5% of the common stock.

Variable	Description
<i>Measure of control:</i>	
Holdings:	Equity shares held by:
1. Largest sh. on BoD	- the largest shareholder ( $\geq 1\%$ ) represented on the board of directors
2. Concert with largest sh.	- shareholders that have concluded an agreement with the "largest sh. on BoD"
3. Other block. on BoD	- all blockholders represented on the board who are neither a "largest sh. on BoD", nor in "concert with largest sh."
4. Largest sh. not on BoD	- the largest shareholder, if he/she owns more shares than "largest shareholder on BoD"
5. Other block. not on BoD	- all blockholders not represented on the board, who are not a "largest sh. not on BoD"
6. Largest sh. on BoD is ultimately controlled	- the largest shareholder represented on the board who is not a diffusely-held company or organization
7. Largest sh. on BoD is ultimately diffusely-held	- the largest shareholder represented on the board who is a diffusely-held company or organization
8. Excess in voting rights	Share of voting rights in excess to equity shares.
Seniority	Number of years the largest shareholder has been represented on the BoD.
<i>CEO compensation:</i>	
Cash compensation	Salary + Bonuses
Total compensation	Cash compensation + Long-term incentives (stock-options, restricted stocks, and differed compensation)
<i>Control variables:</i>	
<i>CEO characteristics:</i>	
Tenure	Number of years the CEO has served as a CEO.
New insider CEO	Takes value 1 if the CEO has been appointed less than two years ago and had been in the firm for more than 2 years before his/her appointment.
New outsider CEO	Takes value 1 if the CEO has been appointed less than two years ago and had been in the firm for less than 2 years before his/her appointment.
CEO is chairman	Takes value 1 if the CEO is also the chairman of the board.
CEO is founder	Takes value 1 if the CEO is the founder of the company and is not the main shareholder.
<i>Firm characteristics:</i>	
Size	Sales; and Market value of equity.
Capital intensity	Tangible assets (gross property, plant and equipment) / Total assets
Av. ROA	Return on Assets (EBIT/Total assets) averaged over the past five years.
Age of company	Years since foundation of the firm $\times$ Years since firm is listed
Industries	Ten industries from the Euronext ICB classification (dummies).
<i>Type of control:</i>	
Investment company	Takes value 1 if the largest shareholder is an investment company.
Passive families	Takes value 1 if the largest shareholder is a passive family (family conglomerate, or family with no incumbent or past executive member).

capital and loose attractiveness in the managerial labor market which in turn reduces their bargaining power (Hambrick & Finkelstein, 1995), also CEOs may have accumulated stock ownership over the years which reduces the need for equity-based and contingent compensation (Chourou, et al., 2008). Hence CEO's tenure is expected to have a nonlinear negative impact on compensation. CEO's age is not included among the control variables because it captures a similar information to CEO's tenure (Crocì, et al., 2012). Hambrick and Finkelstein (1995) predict and show that newly nominated CEOs are paid less than their predecessors if they were internally-promoted (*new insider CEO*), conversely *new outsider CEOs* should be paid a premium so as to attract

them and are expected to have at least the same level of compensation as their predecessors. Other control variables include industry specific effects (Gomez-Mejia, et al., 2003; Cyert, et al., 2002), and indicator variables that control for the positive impact expected from CEOs who are also the chairman (Core, et al., 1999; Cyert, et al., 2002) and for the premium provided to CEOs who are the founders of the firm but do not own a large share of equity.

Beyond the degree of control, the type of control as defined by the identity of the largest shareholder can also influence the design of CEO compensation. Two specific types of control, characterized by their diversified or passive involvement in firms (namely, *investment companies* and *passive families*), were found to be significantly associated with higher levels of compensation in an earlier study (Almeida, 2014); the effects of these two categories are then controlled for with an indicator variable in order to avoid biased analyses of the degree of control.

## 2.2 Degree of control and PTR model

The procedure applied to define classes of the degree of control is based on the panel threshold regression (PTR) model developed by Hansen (1999). This procedure derives from the earlier literature on time series structural changes with unknown changepoints and provides an extension to panel data with threshold effects. This procedure consists of defining a threshold variable and determining if a number  $m$  of point estimates in the threshold variable (i.e. the threshold values, denoted  $\gamma$ ) enables to significantly discriminate  $m+1$  regimes. The procedure provides testing techniques to measure the relevant number  $m$  of thresholds and to determine a confidence region or interval for each point estimate (for  $\gamma_1$  to  $\gamma_m$ ). In the present study, the threshold variable is the percentage of equity shares held by the controlling shareholder. The control variables included in equation (1), namely firm and CEO characteristics, industry specific effects and the type of control, are unchanged in the following equations. But the “holdings” variable in (1) is replaced by a set of  $m+1$  indicator variables representing the  $m+1$  distinct regimes of shareholding control. Let’s  $m$  be equal to two; the equation then takes the following form:

$$\begin{aligned} \text{Compensation}_{j,i,t} = & \alpha_j + \theta_{j1} \{Holdings_{i,t} < \gamma_1\} + \theta_{j2} \{\gamma_1 \leq Holdings_{i,t} < \gamma_2\} + \theta_{j3} \{Holdings_{i,t} \geq \gamma_2\} \\ & + \text{Control variables}_{k,i,t} + \varepsilon_{j,i,t} \end{aligned} \quad (2)$$

Where  $\{\cdot\}$  denotes the indicator function used to measure the specific effect of one regime of control on CEO compensation. This measure is discontinuous and assumes that there is a homogenous effect of the degree of control in each regime, in other words, it assumes the effect does not depend on the relative percentage of holdings in each regime and that the fixed effect of the regime of control is measurable as soon as the controlling shareholder crosses a given threshold point. This specification with threshold effects per controlling regime is another reason why a panel regression with fixed firm-individual effects would not be suitable: in addition to the aforementioned reasons, another justification for a pooled panel is that the threshold variable in a fixed-effect specification would be required to be not time invariant. The percentage of equity is typically not strictly time invariant, however, some degrees of control may be more stable than others. Specifically, a shareholder with a majority control (above 50% of shares) may maintain his/her majority position all over the sample period more often than a shareholder with a large minority control which positions may vary more widely over time. In that case, the effects of the more stable class of control would be captured, at least partially, by firm-individual specific effects whereas the effects of less stable classes of control would not. A firm-specific effect would then create biases among the classes of control the PTR procedure is purposely intended to isolate.

The holdings variable measures the equity shares held by the controlling large shareholders. Also, the indicator variables per regime measure the specific effect of one regime as compared to

the implicitly omitted category of firms, i.e. firms with no identified large shareholders. Besides, this specification notably aims to identify the first threshold, denoted  $\gamma_1$ , above which the presumably controlling large shareholder effectively monitors the management. For this reason, the first regime denoted  $\{Holdings_{i,t} < \gamma_1\}$  will be omitted. This is equivalent to imposing a constraint of  $\theta_{j1}$  being equal to zero, hence the first omitted regime actually includes firms with large shareholders below the first threshold value, plus firms with no identified large shareholder. The first estimate point  $\gamma_1$  will thus measure a threshold below which large shareholders define similar compensation schemes as the ones defined in firms with no identified large shareholders; in other words,  $\gamma_1$  defines a threshold below which firms can be considered as diffusely-held or noncontrolled, and above which large shareholders start to engage in management monitoring. Also, the omitted regime of diffusely-held or noncontrolled firms serves as the benchmark for the specific effects of the other regimes.

The procedure of identification of the threshold values starts with a single threshold model ( $m=1$ ) and first consists of an iteration aimed to determine the value of  $\gamma_1$  that minimizes the sum of squared errors of equation (2), denoted  $S_1$ . The least-square estimator of  $\gamma_1$  is then as the following:

$$\hat{\gamma}_1 = \underset{\gamma}{argmin} S_1(\gamma)$$

As recommended by Hansen (1999) and in order to avoid defining regimes by picking out outliers,  $\gamma$  should take values so that a sufficient number of observations lie in each regime; the iteration will thus be applied with values of  $\gamma$  starting with the lowest decile of controlling shareholdings in the whole sample and incremented by 1% up to the top decile. The second step consists of testing the significance of the single threshold model with the estimated point as compared to the null hypothesis of a zero threshold model; in other words, it consists of testing the alternative of the existence of a threshold effect in controlling shareholdings, as opposed to the null hypothesis of a CEO compensation scheme that is similar in every firm whatever the level of shareholdings, all other things being equal. The null hypothesis is then represented by the following constraint:

$$H_0 : \theta_{j1} = \theta_{j2}$$

Where, as stated above,  $\theta_1$  is constrained to be equal to zero. The sum of squared errors under the null hypothesis is denoted  $S_0$  and the test statistic takes the following form<sup>5</sup>:

$$F_1 = \frac{S_0 - S_1(\hat{\gamma}_1)}{\hat{\sigma}^2}$$

Where  $\hat{\sigma}^2$  is the residual variance under the alternative hypothesis<sup>6</sup>. Under the null hypothesis, the sum of squared errors ignores the presence of a threshold point  $\gamma$ , Hansen (1996) shows that this creates a nuisance in the F-statistic, consequently the asymptotical distribution of the test statistic is non-standard and do not follow a chi-squared distribution. Hansen (1999) shows that a bootstrap procedure can approximate the asymptotic distribution of  $F_1$  and its p-values in the context of panel data. The bootstrap procedure is based on a number of random draws<sup>7</sup> used to resample the residuals returned under the  $H_0$  specification. The  $H_1$  specification and the test-statistic are simulated under each of these random resampling. The estimated p-value of  $F_1$  is the

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<sup>5</sup> It can be noticed that the iterative process described in the first step is tantamount to looking for the highest value of this test statistic.

<sup>6</sup> Calculated as:  $\hat{\sigma}^2 = \frac{S_1(\hat{\gamma}_1)}{n(T-1)}$ , where n denotes the number of firms and T the number of periods on the panel.

<sup>7</sup> The bootstrap procedure will be implemented in the present study with 400 draws.

percentage of draws for which the simulated statistic is higher than the actual  $F_1$  statistic. The null hypothesis of a “zero threshold model” is then rejected for a p-value under a chosen  $\alpha$  % significance level.

If the single threshold model is thus validated, the second stage consists of testing for a double threshold model. An iterative procedure can search simultaneously for the two threshold points,  $\gamma_1$  and  $\gamma_2$ , that minimize the sum of squared errors of equation (2). Nevertheless, Bai (1997) demonstrated for multiple changepoint models that a sequential search is also consistent and Hansen (1999) extend this argument to multiple threshold models. This will also prove necessary to estimate the confidence intervals in the last stage. Thus, the iterative grid search takes the threshold value  $\hat{\gamma}_1$  found in the first stage as given, and look for a second threshold value  $\gamma_2$  that minimizes the sum of squared errors. If this threshold value proves to be significant,  $\hat{\gamma}_1$  is asymptotically inefficient because it was estimated while neglecting the presence of this second threshold point. Following Bai (1997), the first threshold is estimated again at this stage (“refinement estimation”) by repeating the latter procedure taking this time  $\hat{\gamma}_2$  as given and looking for the value of  $\gamma_1$ . At the end of this process, both threshold estimates are asymptotically efficient. The validity of a double threshold model against a single threshold model is tested based on the following statistic:

$$F_2 = \frac{S_1(\hat{\gamma}_1) - S_1(\hat{\gamma}_2)}{\hat{\sigma}^2}$$

The null hypothesis of a single threshold model is rejected for large values of  $F_2$ , with critical values obtained from the bootstrap simulated distribution of  $F_2$ . If the alternative hypothesis of a double threshold model is not rejected, the next stage consists of looking for a third threshold point  $\gamma_3$  with a grid search iteration taking  $\hat{\gamma}_1$  and  $\hat{\gamma}_2$  as given, followed by a refinement estimation of the these two first thresholds, and then, by a test for a triple against a double threshold model with bootstrap estimated p-values. These stages are repeated as long as the alternative hypothesis of  $m$  threshold points against  $m-1$  threshold points is not rejected. At the end, the procedure defines the relevant number of thresholds and regimes that are significant for the sample.

The final stage consists of constructing confidence intervals for the true values of the estimated points. For simplicity, let’s the number of significant thresholds  $m$  found in the previous stages be equal to three. The construction of the confidence interval for  $\hat{\gamma}_1$  is based on the determination of a “no-rejection region” around this estimated point. Taking the values of  $\hat{\gamma}_2$  and  $\hat{\gamma}_3$  as given, the triple threshold regression is estimated for all possible values of  $\gamma$  and the sum of squared errors for each regression is kept in  $S_1(\gamma)$ . The “no-rejection region” will be defined for values of  $S_1(\gamma)$  that are not too distant from  $S_1(\hat{\gamma}_1)$ , i.e. the sum of squared errors obtained when  $\gamma$  is equal to  $\hat{\gamma}_1$ . The test statistic then takes the form of the following likelihood ratio test:

$$LR_1 = \frac{S_1(\gamma) - S_1(\hat{\gamma}_1)}{\hat{\sigma}^2}$$

By construction, the LR-statistic takes value zero when  $\gamma$  is equal to  $\hat{\gamma}_1$  and the confidence interval will be defined by the low values (below the critical value) of the LR-statistic around its null point. This statistic is free of a nuisance parameter (both sums of squared errors are obtained from specifications with the same number of threshold points) and does not require a bootstrap estimated p-value. However, its asymptotic distribution is non-standard and Hansen (1999) provides a distribution function that brings the following fixed critical values<sup>8</sup>: 6.53, 7.35 and 10.59 for, respectively, the 10%, 5% and 1% confidence levels. Thus, at the 5% level of confidence, LR values below 7.35 define the “no-rejection region”, or confidence interval for the true value of  $\hat{\gamma}_1$ .

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<sup>8</sup> The critical value at the  $1 - \alpha$  confidence level is given by:  $c(\alpha) = -2\log(1 - \sqrt{1 - \alpha})$ .

The same procedure is then run for  $\widehat{\gamma}_2$  taking  $\widehat{\gamma}_1$  and  $\widehat{\gamma}_3$  as given, and eventually for  $\widehat{\gamma}_3$  taking  $\widehat{\gamma}_1$  and  $\widehat{\gamma}_2$  as given, which constructs the confidence intervals for the true values of  $\gamma_2$  and  $\gamma_3$ , respectively.

### 2.3 Seniority of control and PTR model

The controlling shareholder is identified as a shareholder owning more than  $\gamma_1\%$  of interest in the firm, and the regimes derived from the above described methodology define different degrees of control. Among these regimes of control, recent monitors may behave distinctly because they have not yet acquired enough firm-specific knowledge and experience in monitoring the firm. There may be a number of years of control, denoted  $\omega$ , below which the controlling shareholder still relies on alternative mechanisms of control in the form of contingent remuneration, so as to mitigate their asymmetry of information with the CEO. Consequently, the use of higher ratios of bonuses and other incentive-based pay would push upwards the levels of cash and total compensation. The following specification assumes that there is a threshold  $\omega$  of seniority below which the controlling shareholder behaves differently, all other things being equal including a given regime for the degree of control. Other control variables are the same as in Equation (2).

$$\begin{aligned} \text{Compensation}_{j,i,t} = & \alpha_j + \tau_j \{ \text{Seniority}_{i,t} < \omega \} + \theta_{j2} \{ \gamma_1 \leq \text{Holdings}_{i,t} < \gamma_2 \} \\ & + \theta_{j3} \{ \gamma_2 \leq \text{Holdings}_{i,t} < \gamma_3 \} + \theta_{j4} \{ \text{Holdings}_{i,t} \geq \gamma_3 \} + \beta_j \text{Control variables}_{j,i,t} + \varepsilon_{j,i,t} \end{aligned} \quad (3)$$

The seniority of control only concerns controlling shareholders above a  $\gamma_1\%$  of interest in the firm and the coefficient  $\tau$  is expected to be positive for the aforementioned reasons. The addition of the coefficients  $\tau$  and  $\theta_2$  provides the effect of a “recent” controlling shareholder in the first regime of the degree of control as compared to the omitted non-controlled firm-years. The additions of  $\tau$  and  $\theta_3$ , and of  $\tau$  and  $\theta_4$  provide the same information for “recent” controlling shareholders in the second and third regimes of the degree of control. The threshold value  $\omega$  in the seniority of control is estimated with the same procedure based on the PTR model described in the previous section. The iteration looking for the minimum value of the sum of squared errors is run taking integer values of seniority from the lowest to the top deciles of seniority as measured in the whole sample. The non-rejection of the hypothesis of one seniority threshold against zero threshold is based on the same F-statistic and bootstrap p-values as above described. In case of no rejection, the LR-statistics are calculated for each tested value of  $\omega$  between the lowest and top deciles of seniority, and they are used to define the 95% and 99% confidence intervals defined as the  $\omega$  values for which the LR-statistics are respectively below the 7.35 and 10.59 critical values. This specification also assumes that there is only one threshold point, and there is *a priori* no rationale for the existence of other seniority thresholds in the context of controlling shareholders. The existence of other thresholds will still be tested as a robustness check.

## 3 THE DATA

### 3.1 Sample data

The sample firms are a selection from 180 French firms listed on Euronext Paris and member of the SBF120 Index for at least one year between 2003 and 2012. The sample was restricted to

public limited companies headquartered in France<sup>9</sup> and to firms that had fully available data for at least four years. This left a sample of 1,119 firm-year observations for 123 firms from 2003 to 2012. CEO characteristics and compensation data are manually collected from annual reports, and firm characteristics are extracted from Datastream. *Thomson One Banker – Ownership* provides the annual percentages of equity held by shareholders. Blockholders (i.e., shareholders above a five percent share) are isolated, cross-checked with ownership data provided in annual reports, and corrected when necessary<sup>10</sup>. Based on the identity of directors and their list of mandates disclosed in annual reports, I discriminate between blockholders that are directly or indirectly represented on the board of directors, and those who are not. In case no blockholder is represented on the board, I identify the largest shareholder represented on the board, provided there is at least one large shareholder (i.e., shareholders with at least one percent of ownership) represented on the board<sup>11</sup>. Shareholders that are part of a shareholder agreement with the largest shareholder are also identified. Lastly, voting rights of the largest shareholder, and of shareholders part of a shareholder agreement with him/her, are collected when company's by-laws provides that some shareholders benefit from a double voting right<sup>12</sup>.

As concerns the seniority of control, ownership databases do not provide such information, I then collect this information for the largest shareholder represented on the board of directors from annual reports. For each largest shareholder represented on the board, the seniority of control starts on the first year when a representative was nominated on the board. This takes into account the several directors who may have succeeded to each other as representatives of a given shareholder. In cases where a shareholder becomes the largest shareholder but was already nominated on the board prior to being the largest one, the seniority as a non-first shareholder on board is also taken into account, as the shareholder is considered as having acquired experience and firm-specific knowledge in those prior years. The available data from annual reports enables to collect this information on the first year of nomination on the board back to the late 1990s. The seniorities prior to this period are obtained from the history of the company provided in annual reports or in companies' websites, or from other sources found in the press<sup>13</sup>. The first year of control may coincide with the foundation of the firm<sup>14</sup> for founding shareholders, to a nationalization for governmental shareholders, or to a takeover in other cases.

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<sup>9</sup> This leaves apart foreign companies, in order to put aside country-specific effects, and companies that are not public limited, namely companies with a limited partnership with shares legal status where CEOs have a specific status and, most often, specific pay packages.

<sup>10</sup> A number of errors need some attention in the ownership database. Specifically, shareholdings that are not updated are maintained unaltered for two fiscal years in the database, some of these blockholders have then to be retrieved; these time differences can also create significant inaccuracies in the event of a capital transaction (splitting or combining of shares, capital increase...) in the meantime. Also, because of multiple sources of data, the database may include some duplicates. Apart from inaccuracies related to the measure of equity shares, the database is quite comprehensive in terms of the number of identified blockholders; this could be checked by comparing with ownership data in annual reports, where companies are legally required to disclose equity shares of their blockholders.

<sup>11</sup> Below 1% of ownership represented on the board, annual reports and the Thomson database do not provide exhaustive or detailed data.

<sup>12</sup> In France, voting rights in excess to cash flow rights take the form of shares with a double voting right entitled to shareholders that have been registered for more than, typically, two or four years.

<sup>13</sup> The historical data provide a quite comprehensive information about the seniority of control, with the unique exception of one largest shareholder for which the oldest year of control that was known was entered by default.

<sup>14</sup> In case of a firm created by a spin-off and still controlled by the historical mother company, the control is actually anterior to the creation of the spun-off independent company, in these instances, the first year of control is considered to be the year when the mother company first acquired the spun-off subsidiary or as the year when the mother company started to develop its specific business or activity.

## 3.2 Descriptive statistics

Table 3 displays some descriptive statistics of the data. The average size of sample firms is €11,764 million in terms of sales and €9,477 million in terms of market capitalization. The average firm has a capital intensity of 23.39%, a ROA averaged over five years of 3.01%, was first established 87 years ago, and went public 23 years ago. The average CEO has served as CEO for 10 years, is also the board chairperson for 54% of the firm-year observations, and is the founder of the company, but not a blockholder, for 4% of firm-year observations. His/her mean cash and total compensation are respectively €1,274 thousand and €2,164 thousand. Following previous studies (Finkelstein & Boyd, 1998; Gomez-Mejia, et al., 2003), the value of stock options is estimated by the number of options multiplied by 25 percent of the exercise price. Other stock-based compensation are estimated with the value of the stock on the day of the grant<sup>15</sup>. Companies provide their CEOs with equity-based compensation unregularly, some provide it on an annual basis, other from one year to another, or triggered by a specific event (newly nominated CEO, IPO, an exceptional operating or financial success...), and some firms do not provide any stock-based pay. This accounts for a large dispersion of the total compensation and high relative values in the last decile. Hence, the regressions of the following sections will be based on two-year averaged equity-based compensation in order to mitigate the irregular practices in these grants (the averaged equity-based pay included in the total compensation for 2003, i.e. for the first year in the sample period, is then the averaged grants of 2002 and 2003). Still, this does not attenuates the very high relative values for a number of these grants. Equity-based compensation is then winsorized in the following way: the ratio of equity-based to total compensation has a top decile of 56%, the value of equity-based pay is then trimmed so as to represent a maximum of 56% of the total pay.

In the average sample firm, about 2.1 blockholders own 43.09% of the common stock, and 32.41% is owned by the largest shareholder. Out of the 2.1 blockholders, 1.3 are represented on the board of directors, and the seniority of the largest shareholder represented on the board is on average 33 years. Panel B in Table 2 is comprised of the 929 firm-year observations in which at least one blockholder is represented on the board. In these firms, an average 2.3 blockholders own about half of the company's equity, including 43.58% owned by blockholders represented on the board of directors. The largest shareholder owns on average 37.42% of the equity share as compared to 37.24% for the largest shareholder represented on the board: the slight difference between both shareholdings are explained by the 55 firm-years (not reported) in which the largest shareholder is an outside shareholder owning more shares than the largest inside shareholder represented on the board. Shareholders that concluded an agreement with the largest inside shareholder add an average 3.32% of control reaching 40.55% of interests together<sup>16</sup>. Another control-enhancing device consists of providing double voting rights for certain categories of shares. This adds nearly 6% of interests to the average largest inside shareholder, alone or in concert, who thus reaches a 46.16% voting control<sup>17</sup>. Panel C in Table 2 presents descriptive data for the 190 firm-years where no blockholder is represented, directly or indirectly, on the board. In the average firm on this sub-sample, about 1.6 outside blockholders still hold 12.26% of the outstanding shares, but 42 of these firm-years (not reported) have no blockholder at all. Most of the largest shareholders on this sub-sample (180 out of 190, not reported) are outside shareholders owning a

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<sup>15</sup> Since 2007, listed companies on the panel have to disclose the fair value of the equity-based compensation according to IFRS2 (most of them use the binomial or Black and Scholes methods). Using this data instead of my estimates as above mentioned do not change the quality or significance of the subsequent results.

<sup>16</sup> More specifically, the largest shareholder acts in concert with other shareholders in 184 firm-years. On this sub-sample (not reported in Table 3), the largest shareholder owns an average 28.13% of equity shares, and the shareholders acting in concert with him/her add a complementary 16.74%, totaling an average 44.87% of equity control all together.

<sup>17</sup> On Panel B, a sub-sample of 556 firm-years provide double voting rights to shares that have been registered under the same shareholder's name for more than two or four years. On this sub-sample (not reported), the average largest shareholder, on his own or in concert, holds 38.79% of the common stock and 48.14% of the voting rights.

larger share in equity than the largest shareholder represented on the board. Consequently, the average share of the former is 7.90% as compared to 1.24% for the latter. The seniority of the largest shareholder represented on the board is about 8 years on average, but the median value is zero: there is actually no large shareholder (i.e., owning more than 1% of interest) represented on the board in more than half of this sub-sample (119 firm-years precisely, not reported).

Table 3: Descriptive statistics

Note: "€ thousand" amounts are expressed in constant 2007 Euros."

Variable	Mean	Median	Min	1st decile	9th decile	Max
<i>Panel A: All firms</i>						
<i>Firm characteristics:</i>						
Sales (€ thousand)	11 764 045	2 621 648	2 133	458 232	35 900 500	167 610 992
Market capitalization (€ thousand)	9 477 162	2 894 800	6 904	396 368	26 301 308	148 470 400
Capital intensity	23.39%	16.58%	0.03%	2.30%	53.90%	98.32%
Average ROA (over five years)	3.01%	3.29%	-229.39%	-1.12%	9.11%	28.99%
Years since foundation	87.3	78.0	3.00	23.0	161.0	348.00
Years since listed	22.7	19.0	1.00	6.0	38.0	128.00
<i>CEO characteristics:</i>						
Tenure	9.8	6.0	1.00	1.0	24.0	47.00
New insider CEO	0.12	0.00	0.00	0.00	1.00	1.00
New outsider CEO	0.09	0.00	0.00	0.00	0.00	1.00
CEO is chairman	0.54	1.00	0.00	0.00	1.00	1.00
CEO is founder	0.04	0.00	0.00	0.00	0.00	1.00
<i>CEO compensation:</i>						
Cash compensation (€ thousand)	1 274	1 136	29	362	2 431	7 478
Total compensation (€ thousand)	2 164	1 556	29	394	4 372	22 976
<i>Blockholders:</i>						
% All blockholders	43.09%	46.72%	0.00%	8.24%	72.64%	94.22%
% Largest shareholder	32.41%	29.17%	1.10%	6.75%	66.25%	89.22%
Seniority of largest sh. on BoD	33.4	19.0	0.0	0.0	92.2	309.0
Num. blockholders	2.1	2.0	0.0	1.0	4.0	7.00
Num. blockholders on BoD	1.3	1.0	0.0	0.0	2.0	7.00
N. = 1119 firm-year obs.						
<i>Panel B: Firms with at least one blockholder on BoD</i>						
% All blockholders	49.40%	51.01%	5.00%	22.28%	75.10%	94.22%
% Blockholders on BoD	43.58%	45.51%	5.00%	14.35%	71.98%	89.22%
% Largest shareholder	37.42%	35.70%	5.00%	10.17%	68.38%	89.22%
% Largest shareholder on BoD	37.24%	35.70%	5.00%	9.99%	68.38%	89.22%
% Largest shareholder on BoD + Concert	40.56%	41.81%	5.00%	10.72%	70.86%	93.40%
+(voting rights) Largest shareholder on BoD						
+ Concert	46.16%	46.36%	5.00%	14.25%	75.10%	93.40%
Seniority of largest sh. on BoD	38.6	22.0	1.0	3.0	101.0	309.0
Num. blockholders	2.3	2.0	1.0	1.0	4.00	7.00
Num. blockholders on BoD	1.6	1.0	1.0	1.0	3.00	7.00
N. = 929 firm-year obs.						
<i>Panel C: Firms with no blockholder on BoD</i>						
% All blockholders	12.26%	8.39%	0.00%	0.00%	32.09%	63.90%
% Largest shareholder	7.90%	7.34%	1.10%	3.95%	11.62%	33.30%
% Largest shareholder on BoD	1.24%	0.00%	0.00%	0.00%	4.11%	4.96%
Seniority of largest sh. on BoD	8.2	0.0	0.0	0.0	40.0	55.0
Num. blockholders	1.6	1.0	0.0	0.0	4.0	6.00
N. = 190 firm-year obs.						

Overall, 190 firm-years have no blockholder represented on the board, of which 119 do not have either a large inside shareholder; still, there are outside large shareholders in all of these firm-years and most of them own blocks of equity. 929 firm-years have at least one blockholder represented on the board. In most of these instances, the largest blockholder is an inside blockholder, still, there are also other inside blockholders and there are outside blockholders. Some of the largest blockholders act in coalition with other inside shareholders and some enhance their control with double voting rights. These various patterns leave a variety of alternatives to measure

and identify which shareholders exert an effective control on the firm. The following section aims to disentangle the respective influences of each of these various categories of shareholders by estimating their impacts on CEO compensation monitoring.

## 4 EMPIRICAL RESULTS

### 4.1 Alternative measures of control

A number of studies provide evidence of a negative relationship between the level of CEO compensation and the existence of monitoring by large shareholders. This relationship is also found to be significant on the sample data presented in the previous section, either with the synthetic measure of control (i.e. the shares held by the top five shareholders such as in Dyl (1988)), or with an indicator for the presence of a blockholder, such as in Tosi and Gomez-Mejia (1989) (1989) or in Hambrick and Finkelstein (1995). However, these synthetic measures, not reported here, do not provide an insight about who precisely exert the control. In Table 4, I disentangle the synthetic measures into variables measuring the holdings of the large shareholders according to the criteria presented in Table 2. Taking the effect on cash compensation (column 1), I find that only the holdings of the largest shareholder represented on the board of directors, plus the holdings of the shareholders that concluded an agreement with him/her, present a significant negative relationship with the level of salary and bonus granted to the CEO. The holdings of the other blockholders, either represented on the board or not, have no impact. When the largest shareholder is not represented on the board, it has also no impact on the cash compensation design.

In column 2, the effect of the holdings of shareholders acting in concert is kept, and the largest shareholders are subdivided between those ultimately controlled, and those who are not. The results show that both have a significant negative impact on cash compensation, although the former has a better significance than the latter. The result of interest is that both exert an effective control on cash compensation and are then kept as a measure of effective control. The regression in column 2 also includes the percentage of voting rights in excess of cash flow rights, for the largest shareholder on the board plus shareholders acting in concert. Two opposite results may be expected for this variable. Excess in voting rights may increase the degree of control and have an additional negative impact on compensation. Conversely, in an “entrenchment” perspective, the effect of this variable may be positive because shareholders are expected to use their enhanced influence to extract private benefits and pay higher salaries to their CEOs as a form of private benefit (Core, 1997) or as a mean to buy his/her loyalty. The results in Table 4 exhibit no significant impact of excess in voting control, and neither alternative expected effect is confirmed. Column 3 presents the regression with the relevant measure of the degree of control, i.e. the shareholdings of the largest blockholder represented on the board of directors and of the shareholders acting in concert with him/her. Columns 4 to 6 present the same regressions with total compensation as the dependent variable. The relevant measure of the controlling shareholdings is similar to that found for cash compensation, namely the shares held by the largest blockholder represented on the board, either ultimately controlled or not, on his own or in concert. The impact of these shareholders on total compensation is presented in Column 6. The holdings of these shareholders will be referred to as controlling shareholdings, and will serve as the measure of the degree of control in the following section.

Table 4: Regression results for CEO compensation on alternative measures of control

	Ln(Cash compensation)						Ln(Total compensation)					
	(1)		(2)		(3)		(4)		(5)		(6)	
	coef	t-stat.	coef	t-stat.	coef	t-stat.	coef	t-stat.	coef	t-stat.	coef	t-stat.
<i>Alternative measures of control:</i>												
% Largest sh. not on BoD	-0.33	-0.77					-0.03	-0.06				
% Other block. not on BoD	0.20	0.65					0.12	0.28				
% Largest sh. on BoD	-0.44	-3.53***					-0.80	-5.98***				
% Concert with largest sh.	-0.59	-1.77*	-0.59	-1.74*			-0.93	-2.23**	-0.95	-2.24**		
% Other block. on BoD	-0.02	-0.06					-0.09	-0.25				
% Largest sh. on BoD:												
* Ultimately controlled			-0.41	-3.26***					-0.82	-5.66***		
* Ultimately diffusely-held			-0.42	-1.71*					-0.75	-2.1**		
% Excess in voting rights			-0.13	-0.31					0.20	0.41		
% Largest sh. on BoD + Concert					-0.44	-4.06***					-0.82	-6.19***
<i>Firm characteristics:</i>												
Ln(Sales)	1.37	10.24***	1.36	10.23***	1.35	10.76***	1.41	7.54***	1.41	7.57***	1.40	7.78***
Ln(Sales) <sup>2</sup>	-0.04	-8.4***	-0.04	-8.35***	-0.04	-8.75***	-0.04	-6.54***	-0.04	-6.54***	-0.04	-6.75***
Ln(Market capitalization)	0.16	6.13***	0.16	5.91***	0.16	5.99***	0.26	8.61***	0.25	8.33***	0.25	8.56***
Capital intensity	-0.36	-2.59***	-0.36	-2.66***	-0.35	-2.59***	-0.35	-2.25**	-0.35	-2.28**	-0.35	-2.37**
Av. ROA	-1.45	-4.94***	-1.45	-5.01***	-1.41	-4.79***	-1.42	-3.93***	-1.42	-3.94***	-1.40	-3.9***
Age of company	0.07	3.09***	0.07	3.08***	0.08	3.25***	0.08	2.83***	0.08	2.7***	0.08	2.79***
<i>CEO characteristics:</i>												
Tenure <sup>2</sup>	-0.0004	-4.75***	-0.0004	-4.79***	-0.0004	-5.69***	0.00	-7.16***	0.00	-7.65***	0.00	-7.75***
New insider CEO	-0.09	-2.13**	-0.0873	-2.2**	-0.09	-2.16**	-0.11	-2.11**	-0.11	-2.19**	-0.11	-2.14**
New outsider CEO	0.07	1.22	0.0618	1.14	0.06	1.16	0.15	2.25**	0.15	2.27**	0.15	2.22**
I(CEO is Chairman)	0.12	2.43**	0.12	2.48**	0.12	2.48**	0.09	1.6	0.09	1.6	0.09	1.64
I(CEO is founder)	0.71	7.72***	0.71	8.21***	0.71	8.32***	0.91	14.69***	0.91	14.7***	0.91	14.55***
<i>Type of control:</i>												
I(Investment companies)	0.22	4.87***	0.22	4.9***	0.22	4.85***	0.32	4.96***	0.32	4.93***	0.31	4.88***
I(Passive families)	0.51	4.77***	0.51	4.75***	0.52	4.93***	0.70	5.32***	0.71	5.31***	0.70	5.36***
Intercept	-7.30	-6.74***	-7.23	-6.62***	-7.17	-6.9***	-8.32	-5.59***	-8.34	-5.54***	-8.25	-5.68***
Industry fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Firm-year obs.	1119		1119		1119		1119		1119		1119	
Num. of firms	123		123		123		123		123		123	
Adj. R <sup>2</sup>	0.78		0.78		0.78		0.77		0.77		0.77	

I(.) denotes the indicator function. \*, \*\*, \*\*\*: denotes significance at 10%, 5% and 1% levels.

These results show that only large shareholders represented on the board carry out management monitoring activities. This qualifies the results found in earlier studies about the effects of “outside” shareholders. Core et al. (1999) and Cyert et al. (2002) find that the existence of large outside shareholders and the holdings of the largest external shareholder, respectively, have a negative impact on the level of CEO compensation. As previously stated, these studies are based on databases that do not take into account indirect representation of large shareholders on the board. Such shareholders are then bound to be included in the outside or external shareholders category. Although the sample data are based on different countries, the results presented above suggest that within these wide category of shareholders, only those who can have their interests voiced on the board of directors may effectively exert such monitoring and that the effects of other large shareholders are not significant<sup>18</sup>.

As concerns the control variables, the size effect is positive and significant. Both sales and market capitalization are included in the regressions. Both measures are correlated, but each contribute independently to explain the levels of CEO compensation: sales better explain the base salary component and market capitalization better explain the contingent components of pay (not reported), hence both measures are kept in the base specification. Capital intensity has a significant negative coefficient, consistent with the prediction that in firms with a high ratio of tangible assets, the discretion of the top manager is lower and needs less to be monitored by contingent pay. Average ROA is also negatively and significantly related to CEO compensation: low average accounting performance is associated with higher pays which may be explained by the need to provide incentives to the CEO in order to improve performance; also, the average ROA is highly negatively correlated to the standard deviation of ROA which is a measure of the risk of the firm, thus, following Beatty and Zajac (1994), a higher risk of the firm induces higher variations in CEO compensation from one year to another and can shorten his/her tenure, the risk-averse CEO bears a risk and is compensated for with a higher pay. Standard deviation of ROA is not included in the regression because of its negative correlation with the average ROA, and the positive impact of the former is captured by the negative impact of the latter, both measures are redundant and the latter provides has a stronger significance. The age of the firm, related to the size of the firm and to the maturity of the business, is positively and significantly associated to the levels of CEO pay. The square of CEO tenure has a negative impact on the levels of pay consistently with the nonlinear relation found by Hambrick and Finkelstein (1995), with a negative impact mostly for long-tenured CEOs who develop skills that are too firm-specific and loose attractiveness in the managerial market. On their two first years of tenure, as measured by the indicator variable “New CEO”, CEOs coming from outside the firm are paid as their predecessors (the coefficient is not significant for “new outsider CEOs”) in terms of cash compensation, but CEOs recruited from inside the firm are paid less (“new insider CEO”) both in terms of cash and total compensation; this is also consistent with the prediction of Hambrick and Finkelstein (1995). Besides, new outsider CEOs receive higher equity-based compensation on the first years of their tenure which explains the significantly positive impact of this indicator variable on total compensation. CEOs who are also the chairman of the board receive higher cash compensation but not higher long-term incentives: the associated coefficient is significantly positive for the former but is not significant for total compensation. CEOs who are also the founder of the firm, but do not own large blocks of shares, are paid significantly more. The type of control in the form of investment companies and passive families have a significant positive impact on CEO pay, as it was expected on the part of diversified or passive largest shareholders. Industry fixed effects are accounted for; consistent with the analysis of Demsetz and Lehn (1985), the media pay among the highest cash and total compensation while

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<sup>18</sup> This result may be different if other large shareholders are categorized by type of control (see for instance, Croci et al. (2012) for the effects of minority institutional investors in family firms). Yet, the influence of outside activism from certain categories of shareholders is beyond the scope of this study focused on the degree and seniority of control.

regulated industries (utilities, banks and insurances) pay among the lowest cash and total compensation.

## 4.2 Estimation of thresholds in the degree of control

This section follows the methodology presented earlier to look for one or several threshold points in the controlling shareholdings (the threshold variable). In a first stage, I look for the point estimate  $\gamma$  that better discriminates between a first class of noncontrolled firms (including firms with no large shareholders on the board) and a second class of controlled firms, estimated by the differing effects of the two regimes of controlling shareholdings on CEO pay monitoring. Controlling shareholdings are, following the results in the previous section, the equity shares held by the largest shareholder, on his own or in concert, represented on the board of directors. I allow  $\gamma$  to take values from the lowest to the top deciles of the controlling shareholdings distribution, i.e. from 1% (actually above the first decile, as 119 out of 1,119 firm-years have no large shareholder on the board) to 68%. If the threshold effect with one estimated point is significant, the following stages consist of looking for the second, third, etc. estimate points, while taking the previously found threshold points as given, as long as the  $m^{\text{th}}$  threshold is significant. Table 5 displays the results of these sequential iterative procedures. Based on the first threshold point found for cash and total compensation in the first iteration, the F-test provide a F-statistic that is much higher than the bootstrap 1% critical value (84.71 vs. 11.40 for cash compensation, and 141.32 vs. 12.10 for total compensation) which provides confidence about the significance of a single threshold model against a zero threshold model. The test for a double threshold model against a single threshold model is also accepted with a high confidence level as simulated by the bootstrap p-value. The existence of a third threshold point is also accepted at the bootstrap 1% and 5% levels of confidence for cash and total compensation, respectively (bootstrap p-values are 0.8% and 4%, respectively). Finally, the tests for a four-threshold model against a triple threshold model are rejected for both dependent variables, with bootstrap confidence levels of 97% and 13%, respectively.

In the single and double threshold models, the estimate points are 11% and 46% both for cash and total compensation. These two points are used in the triple threshold model to find the third estimate point, 34% for both dependent variables. The two first estimate points were found while ignoring the existence of a second or third threshold point. The refined estimation consists of taking 34% and 46% points as given and look again for the third threshold in a first step, and taking 34% and 11% as given and look again for the third threshold in a second step. The refined estimates confirm the 11% and 46% threshold points found in the single and double threshold models<sup>19</sup>. Table 6 displays the confidence interval for the three refined threshold estimates, based on the LR-test described in section 2<sup>20</sup>. The confidence intervals for the 11% and 46% threshold values are quite tight and provide a good confidence on the value of breakpoints separating one regime of the degree of control from another. The confidence interval for the 34% threshold value is wider and varies from 31% to 42% at the 5% level of significance. The specific pattern of this regime,

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<sup>19</sup> As a robustness test, I also run a simultaneous search for  $\gamma$  values in the triple threshold model, i.e. looking for the three threshold values that simultaneously minimize the sum of squared errors in equation (2), instead of the described sequential procedure. The results provide the same three estimate points as the refinement estimates, i.e. 11%, 34%, and 46% both for cash and total compensation.

<sup>20</sup> The graphs in the appendices illustrate the LR-test, and provide the LR-stats values for the all range of  $\gamma$  tested values, i.e. from 1% to 68%. The confidence interval at the 5% level of significance is defined as the “no rejection” region beneath the dotted line in the graph (which is the 5% critical value set at 7.35).

which present a similar CEO pay design as in the omitted regime, further described below, may account for such a loose confidence interval.

Table 5: Tests for a  $m^{\text{th}}$  threshold given  $m-1$  threshold(s)

<i>Cash compensation</i>				
	First	Second	Third	Fourth
F-stat. for $m$ vs. $m-1$ thresholds	84.71	46.15	12.87	2.30
p-value (bootstrap)	0.00	0.00	0.008	0.97
(10%, 5%, 1% critical values)	(7.13, 9.03, 11.40)	(8.08, 9.29, 11.34)	(8.40, 9.63, 12.75)	(9.48, 10.71, 12.80)
<i>Total compensation</i>				
	First	Second	Third	Fourth
F-stat. for $m$ vs. $m-1$ thresholds	141.32	53.55	11.37	8.54
p-value (bootstrap)	0.00	0.00	0.04	0.13
(10%, 5%, 1% critical values)	(6.92, 9.33, 12.10)	(7.99, 8.98, 11.96)	(8.63, 10.95, 15.38)	(9.00, 10.16, 13.19)

Table 6: Threshold estimates

<i>Cash compensation</i>			
	11%	34%	46%
Refined threshold estimates	11%	34%	46%
95% confidence interval	[10%, 16%]	[31%, 42%]	[45%, 46%]
99% confidence interval	[9%, 17%]	[27%, 42%]	[45%, 48%]
<i>Total compensation</i>			
	11%	34%	46%
Refined threshold estimates	11%	34%	46%
95% confidence interval	[10%, 14%]	[31%, 42%]	[46%, 48%]
99% confidence interval	[9%, 15%]	[28%, 45%]	[45%, 48%]

### 4.3 Estimation of seniority thresholds

The previous section narrows the definition of controlling shareholders to the largest shareholders on the board, on its own or in concert, that own at least 11% of the equity share. Below the threshold of 11%, they belong to the same class of control as firms where no large shareholder is represented on the board, hence their control is deemed as non-effective. The present section aims to further precise the definition of effective control using the criteria of the number of years of control. The assumption is that the largest shareholder on the board needs time to acquire firm-specific knowledge and to be able to monitor effectively the top management. Among controlling shareholders above the 11% threshold in the degree of control, the lowest and top deciles of seniority are, respectively, three years and 107 years. The same iteration as in the previous section is applied for each integer value in this range. For each tested value, an indicator variable takes value one when the seniority is below the tested threshold and zero otherwise, and thus captures a specific effect for “recent” controlling shareholders as compared to the three regimes of control identified in the previous section. The threshold point that yield the minimum sum of squared errors is eight years, both for cash and total compensation. The F-statistic is largely above the bootstrap-estimated 1% critical value, leading to the acceptance of the single threshold model against the zero-threshold model, both for cash and total compensation. The values of the

LR-statistic lying below the 5% and the 1% critical values define a confidence interval with a minimum value of six years for both measures of compensation, and a maximum of 14 years. Thus for a given degree of control, the controlling shareholders exert a homogeneous effective control after about eight years of presence on the board, and at the minimum after six years.

Table 7: Estimation of seniority thresholds

	Cash comp.	Total comp.
F-stat. for 1 vs. 0 threshold	31.19	29.42
p-value (bootstrap)	0.00	0.00
(10%, 5%, 1% critical values)	(7.27, 8.85, 11.26)	(7.20, 9.01, 11.71)
Threshold estimates	8 years	8 years
95% confidence interval	[6, 14]	[6, 9]
99% confidence interval	[6, 14]	[6, 10]

The panel threshold specification assumes a unique threshold point for the seniority of control, as there is no rationale for the existence of two or more break points in the acquisition of monitoring insight by the controlling shareholders. As a robustness check, a second point estimate and a test for a double threshold model against a single threshold model are processed (not reported), it rejects the existence of a second threshold value for total compensation with a bootstrap confidence level of 65%. For cash compensation, the alternative hypothesis of a double threshold model is accepted with a bootstrap p-value of 3%. The point estimate is 47 years of control. Nevertheless, the 95% confidence interval is very large (from 36 to 87 years), and the 99% confidence interval cannot be defined: all of the LR-statistics calculated from values in the whole range between three and 107 years are below the 1% critical value. Besides, a simultaneous grid search for the two threshold estimates brings estimate points that are different from the sequential analysis and quite inconsistent (14 and 24 years). This contributes to the low robustness of a double threshold model. Eventually, these results lead to rejecting the significance of a double threshold model for cash compensation. The single threshold model is accepted for both dependent variable, with one threshold point in the seniority of control defining two classes of controlled firms.

#### 4.4 Thresholds for the degree and seniority of control

The fixed effects of the identified regimes for the degree of control are integrated in the base regression and displayed in columns 1 and 2 of Table 7. The dependent variable is log-transformed, hence the coefficients of the fixed effects can be interpreted as approximated deviations in percentage from the omitted regime of non-controlled firms. Firms falling into the second regime of monitoring with controlling holdings ranging from 11% to 34% pay about 17% lower cash compensation to their CEOs. After adding the long-term incentives, the discrepancy between the first and second regime increases with a level of total compensation that is about 31% lower in the latter. Controlling shareholders who own 46% or more of the common stock exert a significantly

stronger CEO pay monitoring: the cash and total compensation are about 32% and 54% lower as compared to the first regime, respectively<sup>21</sup>.

Table 7: Regression of CEO compensation in a triple threshold model

	(1)		(2)		(3)		(4)	
	Ln(Cash comp.)		Ln(Total comp.)		Ln(Cash comp.)		Ln(Total comp.)	
	<i>coef</i>	<i>t-stat.</i>	<i>coef</i>	<i>t-stat.</i>	<i>coef</i>	<i>t-stat.</i>	<i>coef</i>	<i>t-stat.</i>
<i>Controlling shareholders:</i>								
<i>I</i> (Seniority of control < 8 years)					0.22	3.14***	0.25	2.99***
Degree of control:								
1st regime: <i>I</i> (0% to 11%) - omitted								
2nd regime: <i>I</i> (11% to 34%)	-0.17	-2.91***	-0.32	-4.39***	-0.25	-3.43***	-0.41	-4.64***
3rd regime: <i>I</i> (34% to 46%)	-0.03	-0.47	-0.16	-1.85*	-0.07	-1.04	-0.20	-2.24**
4th regime: <i>I</i> ( $\geq$ 46%)	-0.31	-5.05***	-0.54	-7.91***	-0.32	-5.18***	-0.56	-8.07***
Intercept	-7.16	-7.11***	-8.15	-5.79***	-6.81	-6.88***	-7.70	-5.61***
Other control variables	Yes		Yes		Yes		Yes	
Year-firm obs.	1119		1119		1119		1119	
Num. of firms	123		123		123		123	
Adj. R <sup>2</sup>	0.784		0.781		0.790		0.787	

\*, \*\*, \*\*\*: denote significance at 10%, 5% and

The intermediate class of control presents a specific pattern. Controlling shareholders who own between 34% and 46% of the equity shares do not behave differently in terms of CEO compensation design as compared to firms with no effective management monitoring. Though, in the first class of non-controlled firms, a higher CEO compensation may be interpreted as a higher influence of the CEO over the board of directors in the absence of a controlling shareholder. In the third class of firms, the similar higher CEO compensation may instead be interpreted as an “entrenchment” effect from the controlling shareholder. This result presents some similarities with the literature on the relationship between management ownership and the firm value: the impact of managerial shareholdings is positive at low and high levels of equity shares, but is negative at intermediate levels (Morck, et al., 1988; Short & Keasey, 1999; Davies, et al., 2005), which the authors interpret as an entrenchment of managers at these levels. This can also make sense in the context of controlling ownership at the threshold level of 34%. Some authors referred to some anecdotal evidence that above a 25% or 30% ownership level, a hostile takeover attempt cannot succeed (Weston, 1979; Holderness, 2003), hence controlling shareholders would no longer be disciplined by this threat<sup>22</sup>. Above a threshold of about one third of equity shares, the controlling shareholder has thus enough influence to make major strategic corporate decisions. Also, he/she bears the full costs of monitoring activities – with other minority shareholders being presumably free-riding (Shleifer & Vishny, 1997) – but he/she does not get all of the returns of these costs

<sup>21</sup> The difference between the estimated impact of the second and fourth regimes of control are statistically significant. A Wald test for the equality of the coefficients is rejected with a level of confidence of 98% and 99.7% for cash and total compensation, respectively.

<sup>22</sup> In the context of French listed companies, the control over one third of the voting rights provides shareholders with a blocking minority in the extraordinary general meetings, which thus provide him/her with a control over every decision related to capital transactions or merger and acquisitions. In addition, under the Paris stock exchange authority rules, a shareholder who crosses the threshold of 33% (30% since 2012) has the obligation to launch a public bid for all remaining outstanding shares, this is aimed to protect other minority shareholders from a potentially undesired change of control. The choice of a 30% or 33% by the market authority provides a complementary anecdotal evidence that this threshold is deemed sufficient to significantly influence the governance of a firm.

because of their minority cash flow rights. Thus, in this intermediate position where the controlling shareholder is not disciplined by external threats but only benefits from minority cash flow returns, he/she may make decisions to increase the cash flow return of his/her monitoring activities, potentially at the expense of other shareholders. In this context, the controlling shareholder may pay a higher cash compensation in order to induce the CEO into managing the firm in the interest of the monitor. High levels of equity-based compensation in this regime would be contradictory with this interpretation, as the entrenched controlling shareholder would not be willing to provide market-based incentives that would align the interests of the CEO with those of outside shareholders. The coefficient found in this regime for total compensation is higher than the ones for the second and fourth regime but is significantly negative which shows that these shareholders pay indeed lower equity-based compensation to their CEOs as compared to non-controlled firms<sup>23</sup>. Thus, the higher level of total compensation in the third regime is mainly comprised of higher cash compensation, which is consistent with the “entrenchment” interpretation.

In columns 3 and 4 of Table 7, an indicator for controlling shareholders with a seniority of less than eight years is added to the specification. The indicator variable takes value one if the controlling shareholder own, on his own or in concert, at least 11% of ownership and has been represented on the board of directors for less than eight years, and zero otherwise. The coefficients are significantly positive both for cash and total compensation. This means that “recent” controlling shareholders provide their CEOs with higher pays than “ancient” controlling shareholders. The coefficients should be added to the coefficients associated with the second, third and fourth regimes of control to measure the impact of these shareholders as compared to non-controlled firms. Cash compensation in firms with a low seniority of control is similar or even higher to the one received by CEOs in non-controlled firms. Regressions of the two components of cash compensation, namely the base salary and bonuses (not reported), reveal that the higher pay is mostly in the form of bonuses and not in the form of base salary. Total compensation is still lower, except for the third regime, than the one perceived by the CEO in non-controlled firms. A regression of long-term incentives only (not reported) reveal that this pay component is lower in all firms with a low seniority of control as compared to non-controlled firms, but higher than in firms of the second and fourth regimes with a high seniority of control. In summary, shareholders who take the control of a firm tend to pay higher bonuses and long-term incentives to their CEOs in the about eight first years of control as compared to shareholders with a higher seniority in the control of the firm. This result is consistent with the prediction that these shareholders suffer higher asymmetries of information with the top management and need to rely on alternative mechanisms of control, especially in the form of bonuses, and also in the form of equity-based pay (although this latter component is still lower than in non-controlled firms).

These results on the degree and seniority of control are also economically significant. First, panel A of Table 8 displays the mean values of the size of firms and of the levels of cash and total compensation in each regime of the degree of control. The differences in the levels of pay observed from one regime to another are mainly explained by the size effect that are controlled for in the base specification<sup>24</sup>. The fixed effects for each regime of control correspond to the coefficients of the indicator variables presented in Table 7. The average CEO in the second class of firms receives a cash compensation of €1,198 thousand and a total compensation of €1,816 thousand which is about 17% and 32% lower to the cash and total compensation, respectively, the CEO would receive if he/she served in a firm falling in the first regime, all other things being equal. This would

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<sup>23</sup> I also ran a regression specifically for equity-based and differed compensation (not reported), this is a limited dependent variable and requires a Tobit model. I find that the level of this component is lower than in the first regime (with a level of confidence of 97%) and similar, *ceteris paribus*, to the one found in the second class of firms.

<sup>24</sup> The differences between size and levels of compensation are not proportional from one regime to another because the relation has a concave shape (captured by the log transformation plus the square of  $\ln(\text{sales})$  in the base specification).

represent a higher pay of about €225 thousand<sup>25</sup> for cash compensation and €692 thousand for total compensation. Similarly, the average CEO in the fourth class of firms receives a cash compensation of €998 thousand and a total compensation of €1,528 thousand, and would receive a supplementary €357 thousand in the form of cash and €1,097 thousand in the form of cash plus equity-based and differed pay if he/she served as a CEO in the first class of firms. The gap for cash compensation is not significantly different from zero between the first and third regime, but is about €344 thousand for total compensation.

Table 8: Mean size and compensation for each regime and estimated excess in compensation.

Panel A: Degree of control (all sample)

<i>(in € thousand, except for fixed effects)</i>	1st regime (0% to 11%)	2nd regime (11% to 34%)	3rd regime (34% to 46%)	4th regime (≥46%)
Sales	18 620 497	12 112 069	7 643 961	8 075 550
Market capitalization	16 182 464	7 282 453	6 344 203	7 443 256
Cash compensation	1 718	1 198	1 310	998
Fixed effect	Benchmark	-0.17	-0.03	-0.31
Estimated gap <sup>1</sup>	0	225	43	357
Total compensation	2 923	1 816	1 948	1 528
Fixed effect	Benchmark	-0.32	-0.16	-0.54
Estimated gap <sup>1</sup>	0	692	344	1 097
N. ( <i>firm-year obs.</i> ):	284	296	144	395

1: Estimated gap if the CEO served in a firm in the first regime (*ceteris paribus*) =  $\exp(\ln(\text{Cash or Total compensation}) - \text{F.E.}) - \text{Cash or Total compensation}$

Panel B: Seniority of control (sub-sample of controlled firms with seniority <8years)

<i>Firm-years in the 2nd to 4th regimes of control, and:</i>	Market		Cash	Fixed	Estimated	Total	Fixed	Estimated
	Sales	cap.	comp.	effect	gap <sup>1</sup>	comp.	effect	gap <sup>1</sup>
Seniority <8years	9 605 012	5 246 163	1 273	0.22	-246	1 840	0.25	-403
<i>N. = 175 firm-year obs.</i>								

1: Estimated gap if the CEO served in a controlled firm with seniority of control ≥8 years (*ceteris paribus*).

Panel B displays the mean values of size and compensation for the sub-sample of firm-years that are control (degree of control higher than 11% of ownership) with a seniority of control lower than eight years. The mean cash and total compensation are close to the ones found in the second regime of control (see panel A) although the size of firms in the former is lower than in the latter; this already illustrates the higher relative pay received by the CEOs when the controlling shareholder has monitored the management for only a few years. More precisely, the CEOs would be paid a €246 thousand lower cash compensation if they served in a similar firm (*ceteris paribus*) but with a more experienced monitor. Similarly, they would be paid €403 thousand less in total compensation were they monitored by an experienced monitor.

#### 4.5 Continuous vs. discontinuous measures of control

The estimations presented above assume a threshold effect at certain points of the controlling holdings and a homogeneity in the degree of control in each regime. This assumption shaped the base specification (Equation (2)) where the measures of the degree of control are indicator

<sup>25</sup>  $\text{Exp}(\ln(1,198)+0.17)-1,198 = 225$ .

variables. The literature about managerial ownership and a number of studies about ownership concentration and large shareholders (see Table 1) use instead a continuous measure of ownership taking the percentages hold and not indicator variables. This section discusses the relevance of such measures against a discontinuous measure of ownership with a threshold effect. If a continuous measure better captures the degree of control, indicator variables would be too restrictive because they do not account for varying degrees of control within one regime. And a specification that includes the percentage of controlling shares for each regime should raise the quality of the estimate. I then ran again regressions (1) and (2) in Table 7 using the percentages of controlling holdings in each regime instead of dummies. Their results are displayed in columns 1 and 2 of Table 9. The coefficients for each regime have the same significance and the adjusted R<sup>2</sup> are similar and very slightly lower (0.7830 vs. 0.7840 and 0.7811 vs. 0.7814 for cash and total compensation, respectively): thus the additional information about the percentage held by the controlling shareholder in each regime does not enhance the measure of the degree of control. The absence of improvement in the estimation is supportive of the assumption of a discontinuous rather than a continuous threshold effect at each estimated point.

Table 9: Continuous measures of control

Panel A: Continuous vs. discontinuous measures of the degree of control

	Continuous (% Holdings per regime)				Piecewise linear form				Discontinuous (indicator per regime)			
	(1)		(2)		(3)		(4)		(5)		(6)	
	Ln(Cash comp.)		Ln(Total comp.)		Ln(Cash comp.)		Ln(Total comp.)		Excess in Cash comp.		Excess in Total comp.	
	<i>coef</i>	<i>t-stat.</i>	<i>coef</i>	<i>t-stat.</i>	<i>coef</i>	<i>t-stat.</i>	<i>coef</i>	<i>t-stat.</i>	<i>coef</i>	<i>t-stat.</i>	<i>coef</i>	<i>t-stat.</i>
<i>Controlling shareholders:</i>												
1st regime (0% to 11%)	omitted		omitted		omitted		omitted		0.13	3.45	0.24	5.67***
2nd regime (11% to 34%)	-0.61	-2.84***	-1.24	-4.59***	-0.49	-1.32	-1.30	-2.63***	-0.15	-2.7***	-0.27	-4.09***
3rd regime (34% to 46%)	-0.02	-0.15	-0.34	-1.62	-0.32	-0.45	0.01	0.01	0.00	-0.02	-0.09	-1.05
4th regime (≥ 46%)	-0.46	-4.4***	-0.83	-6.89***	-0.54	-1.57	-0.95	-2.31**	-0.26	-4.64***	-0.44	-7.01***
Intercept	-7.23	-6.67***	-8.21	-5.25***	-7.37	-7.01***	-8.35	-5.42***	n/a		n/a	
Other control variables	Yes		Yes		Yes		Yes		No		No	
Year-firm obs.	1119		1119		1119		1119		1119		1119	
Num. of firms	123		123		123		123		123		123	
Adj. R <sup>2</sup>	0.783		0.781		0.776		0.772		0.083		0.135	

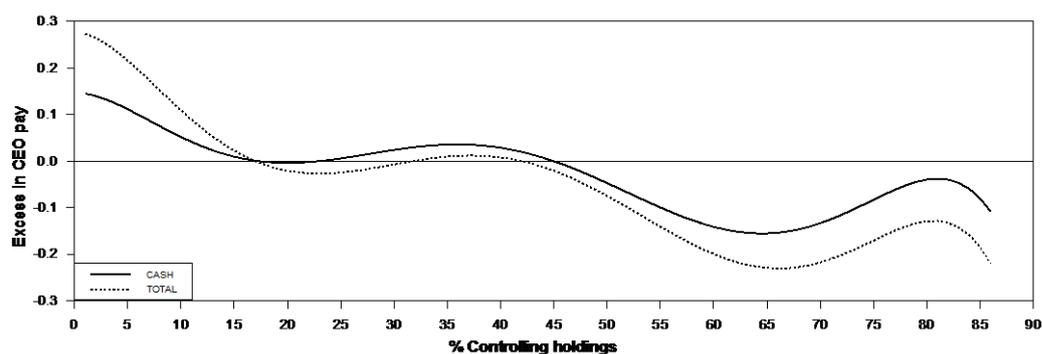
\*, \*\*, \*\*\*: denote significance at 10%,

Panel B: Polynomial continuous relationship between excess in compensation and the degree of control

Dependent variable	Polynomial function					
	<i>Intercept</i>	$cs^2$	$cs^3$	$cs^4$	$cs^5$	$cs^6$
Excess in cash compensation	0.15	-20.59	145.15	-386.43	442.24	-182.94
	3.35***	-2.21**	2.21**	-2.27**	2.35**	-2.42**
	Adj. R <sup>2</sup> : 0.07		Num. of firms: 123		Firm-y. obs.: 1119	
Excess in total compensation	0.28	-33.77	220.30	-555.59	612.05	-246.34
	5.62***	-3.06***	2.89***	-2.86***	2.87***	-2.90***
	Adj. R <sup>2</sup> : 0.12		Num. of firms: 123		Firm-y. obs.: 1119	

cs stands for "% Controlling shareholdings"

Figure 1: Polynomial function



The literature about managerial ownership, as presented in Table 1, relies on continuous measures to estimate the impact of executives' interests on firm value. Morck et al. (1988) and Cho (1998) use a spline function in the form of a piecewise linear regression. The regressions in columns (3) and (4) in Table 9 apply this approach for the present sample panel with the changepoints found with the PTR model. The piecewise specification consists of creating variables defined as follows:

$$\begin{array}{l}
 \text{1st regime} \left\{ \begin{array}{ll} = cs \%, & \text{if } cs \% < 11\% \\ = 11\% & \text{if } cs \% \geq 11\% \end{array} \right. \\
 \text{2nd regime} \left\{ \begin{array}{ll} = 0, & \text{if } cs \% < 11\% \\ = cs \% - 11\%, & \text{if } 11\% \leq cs \% < 34\% \\ = 34\% - 11\%, & \text{if } cs \% \geq 34\% \end{array} \right. \\
 \text{3rd regime} \left\{ \begin{array}{ll} = 0, & \text{if } cs \% < 34\% \\ = cs \% - 34\%, & \text{if } 34\% \leq cs \% < 46\% \\ = 46\% - 34\%, & \text{if } cs \% \geq 46\% \end{array} \right. \\
 \text{4th regime} \left\{ \begin{array}{ll} = 0, & \text{if } cs \% < 46\% \\ = cs \% - 46\%, & \text{if } cs \% \geq 46\% \end{array} \right.
 \end{array}$$

Where *cs %* stands for the percentage held by the controlling shareholders. The first regime is omitted consistently with the base specification for the PTR model. The coefficients for the second and fourth regimes are not significant at usual significance levels (19% and 12% p-values, respectively) for cash compensation<sup>26</sup> but are significant for total compensation. The coefficients for the third regime are not statistically different from zero as in the discontinuous specification. Overall, the results are consistent with the discontinuous specification. However, this specification does not minimize the unexplained variations in the dependent variable, the R<sup>2</sup> are slightly lower, and also does not provide support for a continuous measure instead of a threshold effect.

Lastly, referring to studies about managerial ownership by McConnell and Servaes (1990), Short and Keasey (1999) and Davies et al. (2005), I also used a polynomial equation to estimate a continuous impact of the degree of control on CEO compensation. According to the results of the triple threshold model, the polynomial specification should account for the negative impact of the

<sup>26</sup> The coefficients in column (3) ought to be interpreted as follows: a controlling shareholder owning for instance 50% of the common stock has first a 0.49 negative impact for each percent between 11% and 34%, plus a 0.32 negative impact for each percent between 34% and 46%, plus a 0.54 negative impact for each supplementary percent above 46%.

controlling shareholdings in the second and fourth regime as compared to the first regime, and account for a positive impact in the intermediate third regime where CEO compensation reaches again the levels of the first regime. Contrary to aforementioned studies that used quadratic, cubic or quintic functions, the relationship found in the PTR models requires a six-degree function, with alternatively negative and positive coefficients at each degree. For this purpose, I first run the base specification (Equation (2)), without any controlling shareholding variable. The residuals can be interpreted as deviations of the CEO compensation from its expected value according to its economic determinants, I then denote the residuals as “excess in compensation” and regress it on the six-degree polynomial function<sup>27</sup>, as follows:

$$\text{Excess in compensation}_j = \text{intercept} + cs + cs^2 + cs^3 + cs^4 + cs^5 + cs^6$$

Where  $j$  is alternatively equal to one and denotes excess in cash compensation or is equal to two and denotes excess in total compensation;  $cs$  stands for the percentage of controlling shareholdings with a minimum value of 1%. The intercept can be interpreted as an approximation for the average excess in compensation in firms with no large shareholders on the board. The coefficients that define the polynomial function are displayed in Panel B of Table 9. The first degree of the function was not different from zero and was dropped to precise the estimate of other coefficients. The latter are significant and this nonlinear continuous measure of the degree of control explains about 7% of the deviations between cash compensation and its estimated value, similarly it explains about 12% of the deviations for total compensation. This function, as exhibited in Figure 1, also illustrates the threshold effects found in the PTR model. The non-controlled firms (first regime) and firms with “entrenched” monitors (third regime) provide higher pays to their CEOs (positive residuals or “excess in CEO pay”), while the second and fourth class of firms define lower pay packages for their CEOs, with a much stronger effect on the part of the latter. The excess in total compensation is higher than the excess in cash compensation below 17% of holdings (the total compensation curb is above the cash compensation curb) and is lower afterwards. This illustrates the higher equity-based compensation provided to the CEOs in the absence of a monitor and as an alternative for control (as already found previously). Above 17%, the excess in total compensation is steadily below the excess in cash compensation, illustrating the lower equity-based compensation received by the CEOs in the other regimes, including the intermediate one.

One interesting point is to confront the threshold point estimates from the PTR models with the shape of the graph. In the managerial ownership literature, the authors interpret the extremums of the curve as the changepoints in the behavior of owner-executives. The piecewise specifications aim to identify this changepoints and then each coefficient in the specification measure the slope of the curb between two extremums. Here, the changepoints would be 20%, 36%, 65% and 81% for cash compensation, and 23%, 37%, 66% and 81% for total compensation<sup>28</sup>, and the impact of a 1% increase in ownership between each changepoints would be interpreted as negative if the slope is negative, and positive in the other case. This interpretation of the coefficients in the piecewise specification is very misleading because the negative slope between 0% and 20% of ownership would be interpreted as a negative impact of controlling shareholders in this whole range (each 1% increase in holdings would entail a reduction in the excess of CEO pay), which is

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<sup>27</sup> A two-stage procedure is used because it allows for a direct reading of the positive or negative impact of controlling shareholdings on the ordinate axis in Figure 1. The polynomial function can be directly integrated in the base specification, as it is done in previous studies, and yields similar coefficients with the same significance level.

<sup>28</sup> The higher value of holdings taken for the PTR procedure was 68%, i.e. the top decile. The values above this point that are presented here cannot be supported by the PTR procedure because there are not enough observations to identify a significant regime. Notwithstanding, the effect above 68% is still negative in the polynomial function (curbs are largely below the abscissa axis after 68%) and does not question the higher degree of control above the 46% threshold as compared to other regimes.

not representative of what actually happens because the excess of compensation is still positive in this range (as can be read in the ordinate axis), and, in the perspective of a threshold effect, there is indeed a flat positive impact below the 11% threshold.

Comparing with the results of the earlier threshold analysis, the extremums of the polynomial function appear indeed as an approximate “middle point” for each regime. The changepoints from one regime to another should rather be approximated by the inflexion points of the polynomial function, i.e. the points where the concavity of the curb changes (calculated as the roots of the second derivative). The inflexion points are 7%, 28%, 52% and 75% for cash compensation, and 8%, 30%, 53% and 75% for total compensation. The third first points are consistent with the threshold estimates found earlier in the panel threshold analysis. The question is whether these inflexion points are a better estimate of changes in the behavior of the controlling shareholders. In other words, the point is whether a smooth and continuous measure of the change from one regime to another is better than a brutal breakpoint between two regimes. Regressions in columns 5 and 6 in Table 9 (panel A) are run with the same dependent variables as the polynomial function (excess in cash and total compensation) but on the four coarse indicator variables for each regime instead of the nonlinear continuous function. The former enhances the quality of the estimate, based on the  $R^2$ , as compared to the polynomial function (0.083 vs. 0.072 and 0.135 vs. 0.123). As a robustness check, I also use the four inflexion points found above and regress the excess in compensation on the five associated indicators per regime, this yields  $R^2$  of 0.045 and 0.096, respectively (not reported), which are even of lower quality. Eventually, if one uses a piecewise or polynomial specification to measure the nonlinear effects of ownership, the most appropriate estimate of the changepoints are inflexion points and not the extremums as found in previous studies. As concern the degree of control, a nonlinear continuous measure may approximate the changes in monitoring behavior, but with less precision and quality than a discontinuous panel threshold analysis.

## 5 DISCUSSION AND CONCLUSION

Large shareholdings and ownership concentration are usually measured with coarse variables such as the interest held by all blockholders, or the weight of top five shareholders. Some studies also distinguish between outside blockholders and inside shareholders, but use databases that do not account for blockholders indirectly represented on the board (i.e. companies or other organizations sitting on the board not as a legal entity but via an individual representative). This study used hand-collected data about the largest shareholder (above 1% of ownership) represented directly or indirectly on the board, data on whether it acts in coalition with other shareholders or not, whether it benefits from double voting rights, and also, data about the representation of all identified blockholders (above 5% of ownership) on the board. After discriminating between these various ways of holding a significant ownership interest in a firm, it was found that the only category of large shareholders exerting an effective control, as measured by their influence on CEO compensation monitoring, is the percentage of ownership of the largest shareholder represented on the board of directors, plus the percentage held by the shareholders acting in concert with it. These controlling shareholdings were then used in the framework of a panel threshold model so as to identify the point at which the shareholder has enough influence to effectively monitor, and other points at which the degree of control may vary. Three threshold points in the degree of control were found. The largest shareholder on board, on his own or in concert, exerts an effective management monitoring after about 11% of ownership. Below this threshold, firms can be considered as non-controlled. The degree of control reach its highest intensity above about 46% of interest, with a significant negative impact on CEO pay in the form of cash and equity-based compensation. An intermediate level of control was identified between about 34% and 46% of

ownership. In this regime equity-based compensation is still lower than non-controlled firms but CEOs receive higher cash compensation. This was interpreted as a mean to induce the CEO into acting in the interest of an “entrenched” shareholder.

Aside from the regime of non-controlled firms, three regimes of control are thus identified. For the purpose of discussion, the three estimated points can be approximated as thresholds of 10%, one third and half of the common stock of a firm. The first regime in the degree of control characterizes large shareholders owning between 10% and one third of the equity share. These shareholders own enough interest to voice their interests and to candidate for a representation on the board but these “influential” shareholders are still in a contestable position in the takeover market or other large shareholders may already own positions close to theirs. Large shareholders owning more than one third but less than half of the equity share are in a “dominant” position. Above this threshold, shareholders benefit from a “minority blocking” interest that enables them to veto any decision in the extraordinary general meetings, hence they do not fear takeover threats. Also, in this position, they may incur all of the monitoring costs of the firm but get less than half of its benefits because they own less than half of cash flow rights and other minority shareholders are presumably free-riding. These “dominant” shareholders may be tempted to provide their CEOs with higher pays so as to ensure that the CEO is loyal to them and so that he/she acts in the first place for their interests and not for the interests of other minority shareholders. Lastly, the largest shareholder who owns more than half of the equity share, “majority” shareholders, do not fear hostile takeovers, and have enough bargaining power to monitor effectively the management.

Three classes of control are then identified, namely influential, dominant and majority controlling shareholders. Beyond the degree of control, a controlling shareholder may have varying skills to effectively monitor the management according to some criteria. A first criteria is the type of shareholder. This study did not focus on this criteria and accounted for only two types of control that were expected to be less effective monitors: investment companies and passive families (used as control variables in the base specification). Because they hold diversified positions or have no members with management experience, these categories may not be able to fully engage in the control of the firm. A second criteria to measure the effectiveness of control is used in this study, referred to as the seniority of control and measures the number of years of control. This criteria was used for the first time in this literature, to the best of my knowledge. The rationale behind this criteria is that the controlling shareholder needs experience and firm-specific knowledge before it will have enough insight and skills to effectively monitor the firm. Using the design of CEO compensation and the panel threshold model, this study finds that a large shareholder needs about eight years, six at the minimum, to behave as an experienced monitor. This latter has enough bargaining power and involvement in governance to restrict the levels of CEO pay, and do not need to rely on alternative mechanisms of control such as high levels of bonuses and of equity-based incentives. Actually, controlling shareholders with low experience provide higher pays to their CEOs mostly in the form of annual bonuses. Annual bonuses tend to reward managers according to short-term performance criteria. Above six to eight years of seniority, controlling shareholders rely much less on short-term incentives in the form of bonuses or on medium-term market value incentives in the form of equity-based pay. The controlling shareholders above a threshold of six to eight years may thus be considered as “long-term” controlling shareholders.

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# APPENDICES

Fig. 1: Degree of control: Confidence interval construction in a single threshold model

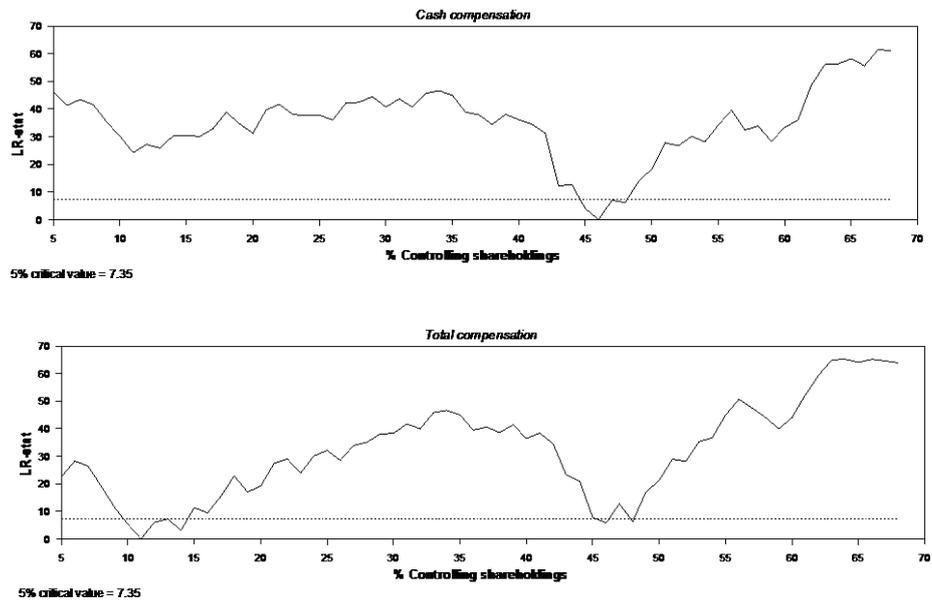


Fig. 2: Degree of control: Confidence interval construction in a triple threshold model

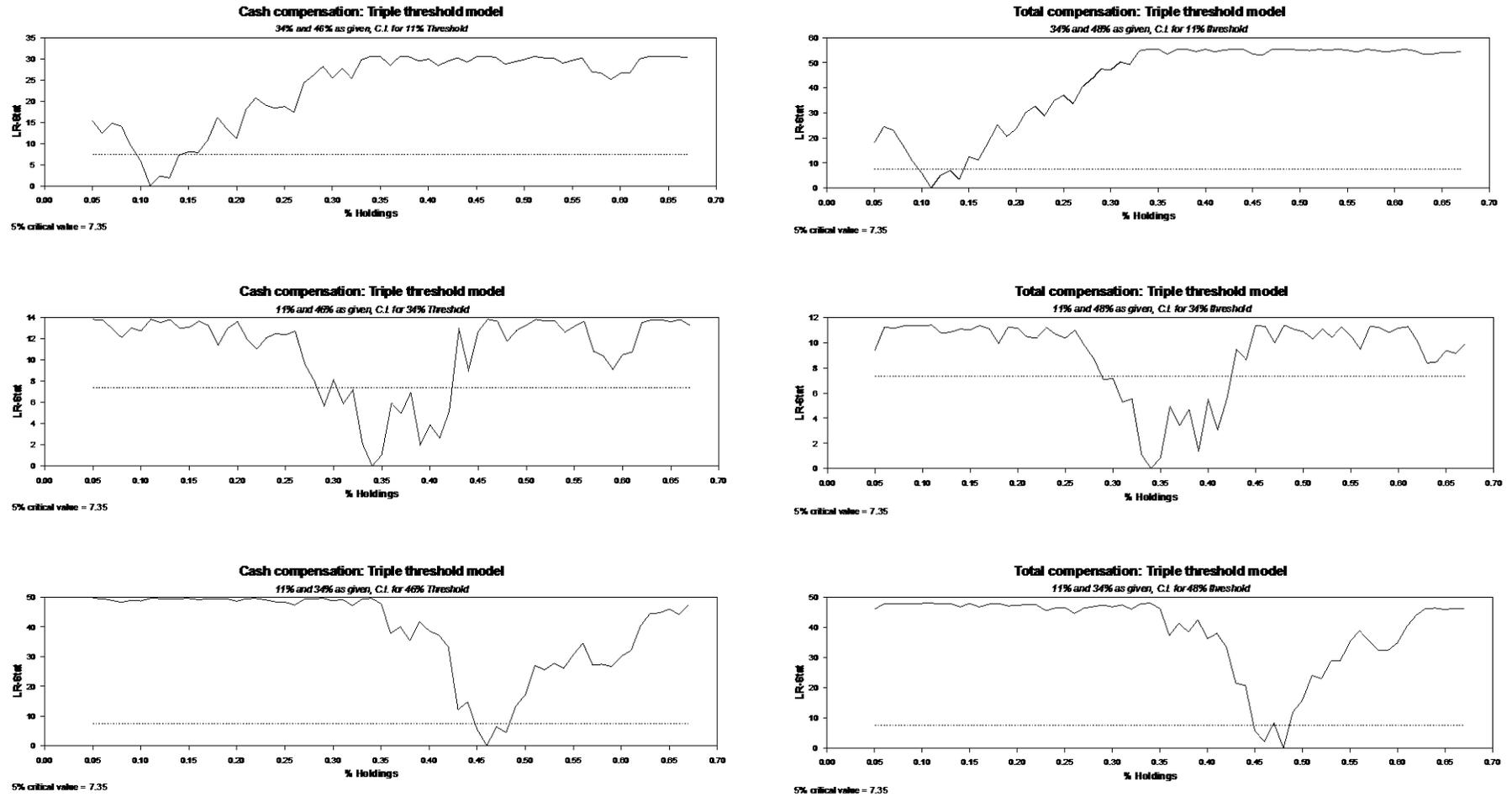


Fig. 3: Seniority of control: Confidence interval construction in a single threshold model

