Optimal Board Structure in the Presence of a Large Shareholder

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Abstract

The paper analyzes the optimal structure of the board of directors in a firm with a large shareholder sitting on the board. It focuses on the choice between a one-tier and a two-tier structure. In a one-tier structure the sole board performs all tasks, while in a two-tier structure the management board is in charge of project selection and the supervisory board is in charge of monitoring. We consider the case in which the large shareholder sits on (and controls) the supervisory board but not on the management board. Thus in the dual board structure the large shareholder retains the monitoring task and the firing decision while she delegates project choice to the management board. We show that such a two-tier structure can limit the interference of the large shareholder and can restore manager's incentive to exert effort to become informed on new investment projects without reducing the large shareholder's incentive to monitor the manager. This results in higher expected profits. If the difference in profits is high enough, the large shareholder prefers a two-tier board even if this implies that the manager selects his own preferred project. The analysis refers to private corporations but it also applies to State participated firms where the problem can be that of limiting political interference.

JEL classification: G34, L22

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1 Introduction

Recently, in the wake of corporate scandals like Enron, the reform of internal governance mechanisms has been a highly debated issue. In particular, the structure of board of directors has been under scrutiny and several reform projects have been proposed. Despite the debate, the theoretical literature on boards of directors is still limited[1] and the few theoretical models of how boards of directors function are implicitly cast in a dispersed ownership setting where no shareholder has incentive to monitor the CEO. However, recent studies on corporate governance systems have suggested that the presence of a large shareholder active in a firm's management is much more common than previously thought[2]. Contrary to what happens in public companies with dispersed ownership, in companies where ownership is concentrated there is an 'excessive' involvement of owners in the management of the firm rather than lack of monitoring. For example, the fear of excessive control by the owner is the main motivation reported by De Sole when in 2004, together with Tom Ford, left Gucci, the Italian fashion group after the acquisition of Gucci by Pinault. In the same line of reasoning, in a recent interview Franz Humer, CEO of the Swiss pharmaceutical firm Roche, stated that one of the strengths of Roche is the fact that the Hoffman family, controlling shareholder of Roche, never got involved in firm's management[3].

The problem has been analyzed by Burkart, Gromb and Panunzi (1997) who show that an active large shareholder reduces managerial discretion in project selection and prevents the manager from appropriating private benefits. However, this may also prevent the manager from taking initiative and from making uncontractible investments. For example, the manager may fail to exert effort to select a new investment project[4]. The authors show that an appropriate

[1] See for example the survey by Hermalin and Weisbach (2001)

[2] See among others La Porta et al. (1999) and Holderness (2005).

[3] Sole 24Ore "Mano Libera nella Gestione", March 25, 2006.

[4] The negative effects induced by 'excessive control' are documented in an experiment conducted by Falck and Kosfeld (2004) who analyze the interaction of motivation and control in a principal-agent setting where the principal decides whether to leave a choice to the agent's discretion or to limit the agent's choice set. They show that "the decision to control significantly reduces the agent's willingness to act in the interest of the principal. Explicit

ownership structure can alleviate this problem. By decreasing her own stake in the firm, the large shareholder decreases her incentive to interfere with the manager's decision and this, in turn, can restore the manager's incentive to make firm-specific investments. A lower stake in the firm however, reduces also the large shareholder's incentive to monitor the manager.

The present paper is a first attempt to analyze the optimal structure of the board of directors with a controlling shareholder actively involved in corporate governance. It focuses on the choice between one-tier and two-tier structures in a setting where the board performs two tasks: information gathering on investment projects, and monitoring of the manager. It investigates if the separation of the two tasks provided by a two-tier board can alleviate the problem of a large shareholder's interference underlined by Burkart, Gromb and Panunzi without reducing her incentive to effectively monitor the manager. In other words, we analyze whether a dual board structure allows to maintain the monitoring incentive, that has always been considered the main advantage of concentrated ownership, without paying the price of reducing managerial initiative.

In a one-tier structure all tasks are performed by the sole board controlled by the large shareholder. Thus, when project selection is discussed in board meetings, the large shareholder can impose the project she prefers. After the project is selected, the large shareholder also performs her monitoring task and decides whether to replace the manager or not. In a two-tier structure some tasks are allocated to the management board and other tasks to the supervisory board: the management board chooses the project while the supervisory board monitors the manager and makes the firing/retention decision. In order to show how the different roles of the large shareholder can affect the manager we focus on the case in which the large shareholder controls the supervisory board but not the management board. Thus the large shareholder retains the monitoring task and delegates the project choice to the management board. The two boards act independently and their behavior reflects the different objectives of their members. This assumption may look unrealistic in some environments

incentives backfire and performance is lower if the principal controls compared to if he trusts" (Falck and Kosfeld 2004, page 1).

where large shareholders have a tight control on the firm. An alternative interpretation where the large shareholder plays a bigger role, could be the following: the investment is selected by the supervisory board/large shareholder while the management board decides how to implement it. Private benefits result from the implementation of the project. For example, the project under discussion can be the decision to enter a new market. In this case, the large shareholder would decide whether to expand the firm's operations by entering a new market. Once this decision is taken, the management board would decide the best way to enter the market: for instance, opening new stores owned by the firm, starting a chain of franchisee stores or selling the product through independent multi-brand stores. In the sole board case, instead, the large shareholder would make both decisions: whether to enter the new market and how to do it. Although both interpretations fit our model in the following sections we will talk about project selection as the task of the management board rather than project implementation.

The main finding of the paper is that a two-tier structure can restore the manager's incentive to exert effort and get informed. This in turn leads to higher expected profits. The difference in profits can be sufficiently high to induce the large shareholder to prefer a two-tier board even if this implies that the manager will choose his favorite project which brings no private benefits to the large shareholder. Thus, the paper suggests that a two-tier structure can be a useful commitment device that enables the large shareholder to restrain from interfering with the manager's choices.

Our model refers to a private corporation contest, however our analysis is clearly relevant for the case of State owned firms. In that case, government representatives in the board play the role of a large shareholder who may have politically defined objectives that may differ from management objectives. Again the problem of limiting the large shareholder interference may arise whenever directors nominated on political grounds may favor the implementation of specific projects that enable them or their interest group to extract private benefits. In this case separating the board in a two-tier structure, where government repre-

sentatives sit in the supervisory board and managers sit in the lower-level board could be a credible means to limit political interference.

The small theoretical literature on boards of directors has focused mainly on how the board can assess the unknown ability of the CEO in order to decide whether to retain or dismiss him. See for example Hermalin and Weisbach (1998), Hirshleifer and Thakor (1998), and Warther (1998). Some papers have taken a broader view on the role of boards by considering the selection of the CEO, in addition to the monitoring task (see Graziano and Luporini (2003) and Hermalin (2005)). Two recent papers, Harris and Raviv (2006), and Raheja (2005), have analyzed optimal board size and the optimal board composition between insiders and outsiders. Song and Thakor (2006) examine project selection when both CEO and board have career concerns that interact. This may result in inefficiencies and may distort project choice recommendations by the board procyclically.

Closest to our paper is the model by Adams and Ferreira (2006) who compare the sole and the dual board structures focussing on the tradeoff between the advisory and the monitoring role of the board. If the manager shares his information with the board he can get better advice from the directors but information sharing increases the board's control over projects. As a result, in a sole board the CEO may refrain from sharing his information and therefore a dual structure may sometimes be optimal.

Our paper differs from Adams and Ferreira's in several aspects. First, while they consider a context of dispersed ownership, the concentration of firm ownership and the resulting 'excessive' activism of the large shareholder is a central element of our model. This leads to the main difference between the two models: what drives our result is the different role played by the large shareholder in the two board structures and not the different incentive to share information. In our setting, the large shareholder chooses how many tasks to perform: in the sole board she performs all tasks, in the dual board structure she performs the monitoring task and makes the firing/retention decision while she delegates project choice to management board. Second, Adams and Ferreira, consider a

problem of different preferences over projects where there is no role for managerial quality. In our model, on the contrary, we have both a problem of opposite preferences over projects and a problem of discovering the unknown ability of the CEO.

The rest of the paper is organized as follows. Section 2 presents the basic framework. The choice of monitoring intensity by the large shareholder is analyzed in Section 3. Section 4 and 5 illustrate the choice of effort by manager and board/large shareholder in a one-tier and in a two-tier structure, respectively. Section 6 compares the two board structures and presents the main results of the paper. Finally, Section 7 offers some concluding remarks.

2 The model

Consider a firm run by a risk neutral manager who operates under the advice and supervision of the board of directors. Ownership is concentrated in the hands of a large shareholder who holds a fraction α of shares and sits in the board. The remaining $(1-\alpha)$ of shares are dispersed among small investors not represented on the board. The board has a dual role. First, it supports the manager in making investment decisions and, more importantly, it approves the choice of investment projects. Then, once a project has been undertaken, it supervises the behavior of the manager and decides whether to retain or dismiss him. We assume that there are two types of manager: high (H) and low (L) ability. The manager's type is unknown to the board/large shareholder. However, as we explain below, the large shareholder can engage in monitoring to find out whether the ability of the manager is high or low.

Project Choice

Following Burkart et al. (1997) we assume that the firm faces N investment projects, but only three of them are relevant. The other $N-3$ projects (indexed from 4 to N) yield negative returns and negative benefits. Neither the manager nor the large shareholder wants to undertake them.

Project 1 is a safe project, whose return is known and normalized to zero. It does not give any private benefit, neither to the large shareholder nor to the manager.

Expected monetary returns for projects 2 and 3 are positive and dependent on the manager's ability. The two projects yield positive profits ($\widetilde{\pi} = \pi$) when successful, and zero profits ($\widetilde{\pi} = 0$) when unsuccessful. Both projects are successful with probability p if the manager is high ability and with probability q if the manager is low ability, with $p > q > 0$. This assumption is equivalent to saying that profits are a random variable whose realization can be positive or equal to zero depending on the (unknown) ability of the manager and on an unobservable component. When such component takes very low (high) realizations, profits are equal to zero (to π), regardless of the manager's ability. For intermediate realizations of the state of nature, the manager makes the difference. The fraction of high ability managers in the population is λ. Thus, $\lambda p + (1 - \lambda)q$ denotes the probability of success in the project, i.e. the expected probability of obtaining π.

The choice of a risky project, i.e. project 2 or 3, allows the firm to acquire some skills that produce positive long term effects. We define second-period profits as the discounted value of future expected profits. Since the type of the manager affects the firm's profits also in the long run, we assume that second period profits are $\overline{\pi}$ if the manager is high-ability and $\underline{\pi}$ if the manager is low-ability, with $\overline{\pi} > \underline{\pi} \geq 1/2\alpha$. If instead project 1 is selected second-period profits are equal to zero.

Projects 2 and 3 differ in the private benefits they yield to the large shareholder and to the manager[5]. Project 2 yields private benefits b to the manager and zero to the large shareholder. Project 3, on the contrary, is the project preferred by the large shareholder: it yields her private benefits B and zero to the manager. Private benefits are obtained in all states of nature, even in the case of zero profits. For example, the benefit may arise from the possibility of

[5] The possibility to extract private benefits has been largely documented in the literature. For a discussion of the possible ways in which controlling shareholders may expropriate minority shareholders see for example Shleifer and Vishny (1997).

hiring a friend or a relative, or from the possibility of doing business with a company controlled by a friend or relative. We assume that the manager enjoys his private benefits only if he stays with the firm also in the second-period. Summarizing, the overall first-period return of project 2 is $\pi + b$ in the case of success, and it is $0 + b$ in the case of failure. Similarly, total first-period return from project 3 is $\pi + B$ if successful and $0 + B$ otherwise. This formulation implies that the consumption of private benefits (either by the manager or by the large shareholder) does not reduce firm's profits. In section 6.1 we will discuss this assumption and we will show that private benefits in our model can be easily reinterpreted as monetary benefits.

Board Structure

As to the structure of the board, we consider two different cases. First, we analyze a one-tier structure where both tasks, investment selection and monitoring of the manager, are attributed to a sole entity. In the sole board case the large shareholder controls the board. As a result, she controls both tasks: project selection and CEO monitoring. Thus, if large shareholder and manager disagree on the choice of project, the large shareholder is able to impose her decision on the manager.

We then examine a two-tier structure where the management board deals with investment decisions and the supervisory board controls the behavior of the manager. Since we want to analyze how to optimally use the advantage the large shareholder has in monitoring the manager, we assume that in the dual board case the large shareholder sits on the supervisory board, where she has the majority, and that the same person cannot sit in both boards. It follows that she does not take part in the investment decision made by the management board while she performs the monitoring function attributed to the supervisory board.

The management board is composed mainly of managers with executive functions who are close to the CEO. Therefore, we focus on a situation where the preferences of the management board are aligned to those of the CEO. In

particular, we assume that the board can enjoy part of the private benefits b. For example, the CEO can expand the firm beyond the optimal size for the personal prestige and power derived from being the CEO of a large firm. However, all members of the management board benefit from the increased visibility of a larger firm.

Information structure

With the exception of project 1, the safe project that is immediately identifiable, all other projects cannot be distinguished from one another without additional information. The manager has to become informed in order to choose the 'good' project. By exerting effort e, he becomes informed with probability e, at cost $e^2/2$.

The large shareholder or the management board also can obtain some information by exerting effort ε at cost $\varepsilon^2/2$, but in order to use this information they need the information gathered by the manager. How the information gathered by different individuals is combined, depends on the structure of the board, because alternative structures give the manager different incentives to share his information.

The manager decides if and how much information is to be shared with the board/large shareholder on the basis of his personal interests. We model this feature by assuming that the probability that the board becomes informed is:

$$\Pr\left(board\ is\ informed\right) = e(z+\varepsilon) \tag{1}$$

where $0 \leq z \leq 1$ is a parameter controlled by the manager. The latter's incentive to share information depends on the structure of the board because this in turn determines who chooses the project. In the sole board structure, the large shareholder can impose her decision on the manager. Thus, if the large shareholder is informed, the manager knows that project 3 will be chosen. If instead, the large shareholder has no information while the manager is informed, project 2 will be chosen. Then, given that project 2 is the favorite project of the manager, the latter chooses the lowest value for z, i.e. $z = 0$ so that the large

shareholder will be informed with probability $e\varepsilon$. In Aghion and Tirole (1997) terminology, the formal and the real authority to select the project may differ because the real authority rests with the person who is informed. Then, the case in which only the manager is informed can be regarded as a case in which the large shareholder delegates the choice of the project to the manager.

In the dual board structure, the objectives of the CEO and management board are aligned: they both like project 2. In this case only project 1 or 2 will be selected. Since the manager wants to maximize the probability of implementing project 2 he shares his information with the board by setting $z = 1$. Then, project 2 is chosen with probability $e(1 + \varepsilon)$ and project 1 with complementary probability.

The manager has an incentive to refrain from sharing his information with the sole board as in Adams and Ferreira (2006), but the assumption on information sharing is not crucial to our result. As it will be clear in the sequel, our main result holds even if we set $z = 0$ both in the sole and in the dual board case.

Monitoring

Following the first models on board behavior (see for example Hermalin and Weisbach (1998) and Hirshleifer and Thakor (1998)) we use the word monitoring to indicate the activity of the large shareholder aimed at discovering the true ability of the manager in order to decide whether to retain or fire him[6].

Given the positive correlation between first-period profits and manager type, the observation of first-period profit allows to revise the prior on the manager's ability. If $\widetilde{\pi} = \pi$ the probability that the incumbent manager (I) is high-ability becomes $\Pr(I = H|\widetilde{\pi} = \pi\ ) > \lambda$, if $\widetilde{\pi} = 0$ it becomes $\Pr(I = H|\widetilde{\pi} = 0) < \lambda$. This implies that, unless the large shareholder obtains some additional piece of information confirming the poor quality of the manager, she will never fire

[6] In some of the papers mentioned above (Burkart, Gromb and Panunzi(1997) and Adams and Ferreira (2006)) monitoring refers to the control by the board of manager's choice over possible projects. This is due to the fact that these papers consider a problem of different preferences over projects where there is no role for managerial quality.

the CEO after $\widetilde{\pi} = \pi$. Besides being the prior on the ability of the CEO, λ represents the probability that a new manager is good, $\Pr(R = H)$ where R stands for replacement. Hence the revised probability that the incumbent manager is high-ability after $\widetilde{\pi} = \pi$ is higher than the probability of picking a high-ability manager in case of replacement. When $\widetilde{\pi} = 0$ on the contrary, in the absence of additional information, the manager will be fired because the probability of picking a good replacement is higher than the probability of having a good incumbent.[7]

First-period profits provide some information on manager type but gathering additional information may nonetheless be profitable as it may allow a better retention/firing decision. Given her stake in the firm, the large shareholder has the strongest incentive to engage in monitoring and we assume that both in a one-tier and in a two-tier board structure, monitoring is performed only by the large shareholder. The motivation is that other board members either tend to free ride, like the other shareholders who are assumed to have small fractions of shares, or they may collude with the manager as it is often the case for executives directors whose career depends on the incumbent CEO.

A monitoring intensity M allows the shareholder to become informed of the ability of the manager with probability M at cost $M^2/2$. According to the result of such monitoring, the manager can be confirmed or fired. While the large shareholder may find it profitable to fire the manager, the manager has no incentive to voluntary leave the firm when either project 2 or 3 has been selected. We assume that the costs the manager faces on leaving the firm (foregone future profits, waiting time, reputation loss, psychological costs etc.) are larger than the benefits.

Timing

Summarizing, the sequence of events is as follows:

- the large shareholder chooses the board structure;

[7] For simplicity, we abstract here from the cost of firing and replacing the manager. As shown in a previous version of the paper, introducing firing costs would not alter our results (see Graziano and Luporini, 2005).

- a manager is randomly selected from the population of managers;

- the manager learns his ability and, given the board structure, decides how much information to share;

- the manager and the board simultaneously decide effort levels to get informed about projects;

- given the overall information available, either the manager (in a dual board structure) or the large shareholder (in a sole board structure) decides which project to undertake;

- first-period profit is realized;

- the large shareholder observes first-period profit and then chooses monitoring intensity;

- on the basis of the information obtained through monitoring, the large shareholder decides whether to fire or retain the manager;

- if the incumbent manager is fired, a new manager is hired;

- second-period profits and private benefits are realized.

When making their decisions on the level of effort, both the manager and the large shareholder anticipate the latter's subsequent choice of monitoring intensity. We then proceed by backward induction, examining first the large shareholder's decision on monitoring and using this result to analyze the choice of effort levels.

3 The Choice of Monitoring Intensity

If one of the risky projects is undertaken, the large shareholder chooses the intensity with which she wants to monitor the manager. Recall that monitoring is aimed at increasing second period profits and that the latter depend on the type of the manager. Since both projects 2 and 3 yield the same expected profits, we can analyze monitoring independently of the choice between the two

projects.

Before choosing monitoring intensity M, the large shareholder observes first-period profits and revises her prior on the ability of the manager. Note that $\widetilde{\pi}$ provides only indirect information on the manager type. As a consequence, after observing $\widetilde{\pi} = 0$, the large shareholder might fire a high ability manager who has just been unlucky. If the incumbent happens to be substituted with a low ability manager, the large shareholder will forego the high second-period profits that the good manager would have earned. Conversely, after $\widetilde{\pi} = \pi$, she might retain a bad but lucky manager who might be profitably substituted. The large shareholder may then find it profitable to engage in monitoring so as to find out the ability of the manager.

Monitoring after $\widetilde{\pi} = 0$

The optimal level of monitoring is found from the maximization of the expected profits of the large shareholder. Recall that if the large shareholder chooses monitoring intensity M, she knows with probability M whether the manager is good while she is unable to identify the type of the manager with probability $(1 - M)$. Monitoring costs $M^2/2$ are entirely borne by the large shareholder. When first-period profits are zero, the large shareholder has then to solve the following problem.

$$\max_{M} E(\Pi^{LS} | \widetilde{\pi} = 0, M \geq 0)$$

where $E(\Pi^{LS} | \widetilde{\pi} = 0, M \geq 0) \equiv$

$\alpha\overline{\pi}\left\{\left[\Pr(I = H | \widetilde{\pi} = 0) + \Pr(I = L | \widetilde{\pi} = 0)\Pr(R = H)\right] M + \Pr(R = H)(1 - M)\right\} +$
$\alpha\underline{\pi}\left\{\Pr(I = L | \widetilde{\pi} = 0)\Pr(R = L)M + \Pr(R = L)(1 - M)\right\} - M^2/2$

The first and second terms represent expected second-period profits. When monitoring is successful, $\overline{\pi}$ is obtained if the incumbent manager is good and if a bad manager is replaced by a good one. $\overline{\pi}$ is also obtained when monitoring is unsuccessful (implying that the manager is fired irrespective of his unknown ability) if the replacement is good. $\underline{\pi}$ is realized when the incumbent manager is replaced with a bad CEO. The third term represents monitoring costs.

From the first order condition, we obtain:

$$M' = \alpha(\overline{\pi} - \underline{\pi})(1 - \lambda)\Pr(I = H|\widetilde{\pi} = 0) \tag{2}$$

Thus the optimal level of monitoring after $\widetilde{\pi} = 0$ is

$$M_0 = \min[M', 1]$$

From eq (2) it follows that the optimal monitoring intensity M_0 is positively related to: i) the large shareholder's fraction of shares α, and ii) the loss in expected second-period profits if a good manager is replaced by a low ability one. Since monitoring is aimed at retaining a good manager who has been unlucky, these terms are multiplied by the probability that the incumbent is good conditional on zero first-period profits.

Monitoring after $\widetilde{\pi} = \pi$

When first-period profits are π, the large shareholder solves:

$$\max_{M} E(\Pi^{LS}|\widetilde{\pi} = \pi, M \geq 0)$$

where $E(\Pi^{LS}|\widetilde{\pi} = \pi, M \geq 0) \equiv \alpha\overline{\pi}\left\{[\Pr(I = H|\widetilde{\pi} = \pi) + \Pr(I = L|\widetilde{\pi} = \pi)\Pr(R = H)]\,M\right\} +$
$\alpha\underline{\pi}\left\{\Pr(I = L|\widetilde{\pi} = \pi)\Pr(R = L)M + \Pr(I = L|\widetilde{\pi} = \pi)(1 - M)\right\} - M^2/2.$

The first and second terms represent again expected second-period profits. Now however, $\overline{\pi}$ is obtained if the incumbent manager is good and if, following successful monitoring, a bad manager is replaced by a good one. $\underline{\pi}$ is realized when a bad incumbent is either replaced with another bad CEO or is not detected because monitoring is not successful. The last term represents monitoring costs.

From the first order condition, we obtain:

$$M'' = \alpha(\overline{\pi} - \underline{\pi})\lambda\Pr(I = L|\widetilde{\pi} = \pi) \tag{3}$$

Thus the optimal level of monitoring after $\widetilde{\pi} = \pi$ is

$$M_\pi = \min[M'', 1]$$

From eq (3) it follows that the optimal monitoring intensity M_π is now positively related to: i) the large shareholder's fraction of shares α, and ii) the gain in expected second-period profits if a bad manager is replaced by a high ability one. Due to the fact that monitoring is aimed at firing a bad manager who has been lucky, these terms are multiplied by the probability that the incumbent manager is bad conditional on positive first-period profits.

4 The choice of efforts in a sole board structure

Let us first consider the manager's choice of effort in a one-tier structure. Project selection is discussed by the board where the large shareholder has the majority of votes. The large shareholder wants to maximize her expected gains $E(B + \alpha\Pi^{LS})$ while the manager wants to maximize $E(b+\delta\Pi)$ where $\delta\Pi$ represents his share of profits (possibly deriving from stock options), having normalized to zero his fixed salary. Given that an informed large shareholder imposes the choice of project 3 on the manager, there is no information sharing, i.e. the manager sets $z = 0$. As a consequence manager and large shareholder become informed with probability e and $e\varepsilon$ respectively. The latter represents the probability of project 3 being selected. With probability $e(1-\varepsilon)$ only the manager is informed. He can then choose project 2, his preferred project. Finally, with probability $(1 - e)$ neither the manager nor the owner is informed and project 1 is chosen yielding zero profits and zero private benefits.

The maximization problem of the manager

When making his decision, the manager knows his own type. Hence, a high ability manager chooses the optimal level of effort e_S^{H*}(where subscript s stands for sole board) taking into account that if project 2 or 3 is selected, he will be retained with probability $p + (1 - p)M_0$. He then solves:

$$\max_e \; e\varepsilon_S^* p\delta\pi + e(1-\varepsilon_S^*)\left[b\left(p+(1-p)M_0\right) + p\delta\pi\right] + e\left[p+(1-p)M_0\right]\delta\overline{\pi} - e^2/2.$$

In case of interior solution, from the first-order condition we obtain:

$$e_S^H = (1 - \varepsilon_S^*)\left[p + (1-p)M_0\right] b + p\delta\pi + \left[p + (1-p)M_0\right]\delta\overline{\pi}. \tag{4}$$

Hence

$$e_S^{H*} = \min\left[e_S^H, 1\right].$$

Analogously, a low ability manager chooses the optimal level of effort e_S^{L*} taking into account that if project 2 or 3 is selected, he will be retained with probability $q(1 - M_\pi)$. He then solves:

$$\max_e \; e\varepsilon_S^* q\delta\pi + e(1 - \varepsilon_S^*)[qb + q(1 - M_\pi)\delta\pi] + eq(1 - M_\pi)\delta\underline{\pi} - e^2/2.$$

If there is an interior solution, the first-order condition gives:

$$e_S^L = (1 - \varepsilon_S^*)q(1 - M_\pi)b + q\delta\pi + q(1 - M_\pi)\delta\underline{\pi}. \tag{5}$$

Hence

$$e_S^{L*} = \min\left[e_S^L, 1\right].$$

Given that $p > q$, and $\overline{\pi} > \underline{\pi}$, it immediately follows that

$$e_S^H > e_S^L,$$

implying

$$e_S^{H*} \geq e_S^{L*} \;\; with \;\; e_S^{H*} = e_S^{L*} \quad iff \;\; e_S^{L*} = 1.$$

From eq. (4) and eq. (5) it follows that manager effort is negatively correlated with large shareholder effort, ε_S^*. This is so because a higher value of ε_S^* reduces the probability of implementing project 2, the preferred project of the manager. When the variable component δ is positive, the effort of the manager positively depends both on first-period and on second-period profits.

Notice that the effort of the good manager positively depends on the level of monitoring exerted after the realization of zero first-period profits, while the effort of the bad manager negatively depends on monitoring exerted after the realization of π. This happens because the higher the monitoring intensity M_0, the higher is the probability that an unlucky good manager will be confirmed,

which in turn increases his incentive to exert effort. The bad manager instead is always fired when the return of the project is zero, independently of the outcome of monitoring. In fact he is fired both when the large shareholder is able to identify his type and when she is not. On the contrary, when first-period profit is π, the bad manager is fired only if he is identified. This is the reason why his effort negatively depends on the probability of being detected M_π.

The maximization problem of the Board/Large Shareholder

Given that the large shareholder is in control of the sole board, we identify the board with the large shareholder. When making her decision on the optimal level of effort ε_S^*, the large shareholder does not know the type of the manager. She then expects a level of managerial effort equal to $e_S^* \equiv \lambda e_S^{H^*} + (1-\lambda) e_S^{L^*}$. Taking into account that a bad manager will be replaced with probability $[1-q(1-M_\pi)]$ and a good one with probability $(1-p)(1-M_0)$ she solves:

$$\begin{aligned}\max_{\varepsilon} \; & \varepsilon \left\{ \lambda e_S^{H^*} \left[B + \alpha\pi p \right] + (1-\lambda) e_S^{L^*} \left[B + \alpha\pi q \right] \right\} + \\ & (1-\varepsilon)\alpha\pi \left\{ \lambda e_S^{H^*} p + (1-\lambda) e_S^{L^*} q \right\} + \alpha\overline{\pi} \Pr(MA_2 = H, proj = 2,3)_S \\ & + \alpha\underline{\pi} \Pr(MA_2 = L, proj = 2,3)_S - \left[\lambda e_S^{H^*} (1-p) + (1-\lambda) e_S^{L^*} (1-q) \right] \frac{(M_0)^2}{2} \\ & - \left[\lambda e_S^{H^*} p + (1-\lambda) e_S^{L^*} q \right] \frac{(M_\pi)^2}{2} - \frac{\varepsilon^2}{2}.\end{aligned}$$

where $\Pr(MA_2 = H,\ proj = 2,3)_S$ and $\Pr(MA_2 = L,\ proj = 2,3)_S$ are the probabilities that the manager running the firm at time 2 is high or low ability and that either project 2 or 3 has been selected, i.e.

$$\Pr(MA_2 = H, proj = 2,3)_S = \lambda e_S^{H^*} \left[1 - (1-p)(1-M_0)(1-\lambda) \right] + (1-\lambda) e_S^{L^*} \left[1 - q(1-M_\pi) \right] \lambda$$

$$\Pr(MA_2 = L, proj = 2,3)_S = \lambda e_S^{H^*} (1-p)(1-M_0)(1-\lambda) + (1-\lambda) e_S^{L^*} \left[1 - \lambda(1-q(1-M_\pi)) \right].$$

Note that such probabilities do not depend on ε. In case of interior solution, we then obtain:

$$\varepsilon_S = B e_S^*. \tag{6}$$

Hence

$$\varepsilon_S^* = \min\left[\varepsilon_S, 1\right].$$

The effort level chosen by the large shareholder positively depends on her private benefit B and on the expected effort of the manager e_S^*. When B tends to zero, also the large shareholder's effort ε_S^* tends to zero because she becomes indifferent between project 2 and 3. For B positive but smaller than 1, the optimal effort level is lower than one ($\varepsilon_S^* < 1$). Finally, when the private benefit is sufficiently large, ε_S^* becomes equal to one. Let $\overline{B}$ denote the size of the private benefits such that $\varepsilon_S^* = 1$ when $B \geq \overline{B}$. When the share of profits of the manager is high enough to induce him to exert the highest level of effort ($e_S^{H*} = e_S^{L*} = 1$) also the large shareholder chooses $\varepsilon_S^* = 1$ provided that her private benefit is not smaller than 1. Observe that when $\varepsilon_S^* = e_S^{H*} = e_S^{L*} = 1$, the large shareholder is informed with certainty, which implies that she will choose her preferred project, i.e. project 3. The effort of the large shareholder is positively related to that of the manager because the higher e_S^*, the higher is the marginal benefit of an increase in ε_S^* in terms of increased probability of choosing project 3. Note that in general the probability of choosing project 3 is higher than that of choosing project 2 only if $\varepsilon_S > 1/2$. The effort of the manager however is negatively related to that of the large shareholder. Indeed, for low values of B and e_S^* the large shareholder has no incentive to exert a high level of ε_S because the probability of choosing project 3 is "too low" compared to that of choosing project 1.

Define:

$Z_H \equiv b(p + (1-p)M_0)$,

$Z_L \equiv bq(1 - M_\pi)$

$Z \equiv \lambda Z_H + (1-\lambda) Z_L \equiv b\left[\lambda(p + (1-p)M_0) + (1-\lambda)q(1-M_\pi)\right]$,

$\Delta_H \equiv \delta\pi p$

$\Delta_L \equiv \delta\pi q$

$\Delta \equiv \lambda\Delta_H + (1-\lambda)\Delta_L \equiv \delta\pi(\lambda p + (1-\lambda)q)$

$F_H \equiv [p + (1-p)M_0]\delta\overline{\pi}$

$F_L \equiv q(1 - M_\pi)\delta\underline{\pi}$

$F \equiv \lambda F_H + (1-\lambda)F_L \equiv \lambda[p + (1-p)M_0]\delta\overline{\pi} + (1-\lambda)q(1-M_\pi)\delta\underline{\pi}$

Substituting the values of e_S^H and e_S^L, (6) becomes:

$$\varepsilon_S = \frac{B(Z + \Delta + F)}{1 + BZ} \tag{7}$$

If the manager does not receive any share of profits, i.e., $\delta = 0$ implying $\Delta = F = 0$, the optimal effort of the large shareholder is smaller than one, $\varepsilon_S^* = \varepsilon_S < 1$. This implies that when her private benefits B increase, her effort to become informed increases as well ($\partial\varepsilon_S/\partial B > 0$) but never reaches 1. At the same time e_S^{H*} and e_S^{L*} asymptotically tend to 0.

If we substitute back the optimal value of ε_S in the effort levels chosen by the manager (4) and (5) we get:

$$e_S^H = \frac{[1 - B(\Delta + F)]\, Z_H}{1 + BZ} + \Delta_H + F_H$$

$$e_S^L = \frac{[1 - B(\Delta + F)]\, Z_L}{1 + BZ} + \Delta_L + F_L$$

We can then establish the following lemma.

Lemma 1: The large shareholder's effort ε_S^* is continously increasing in her private benefits B, ranging from $\varepsilon_S^* = 0$ when $B = 0$ to $\varepsilon_S^* = 1$ when $B \geq \overline{B}$ where $\overline{B} = \max\left\{\frac{1}{\Delta+F}, 1\right\}$. Manager effort e_S^{*i} is continously decreasing in the large shareholder's private benefits ranging from $\overline{e}_S^i$ to $\underline{e}_S^i$ where $\overline{e}_S^i = \min\{Z_i + \Delta_i + F_i, 1\}$, while $\underline{e}_S^i = \min\{\Delta_i + F_i, 1\}$, $i = H, L$.

Proof: The result immediately follows from the fact that $\frac{\partial\varepsilon_S}{\partial B} = \frac{\Delta+Z+F}{(1+BZ)^2} > 0$ and $\frac{\partial e_S^i}{\partial B} = \frac{-Z_i(\Delta+Z+F)}{(1+BZ)^2} < 0$.□

5 The choice of efforts in a dual board structure

Let us now consider a two-tier structure with a management and a supervisory board. As discussed above we consider the case where the large shareholder sits on the supervisory board where she has the majority. Recall also that we assume that the management board is composed mainly of managers close to the CEO and that they can enjoy part of the manager's private benefits b. In particular, we assume that the board can enjoy a fraction β_1 of the benefits b and that this does not reduce the private benefits of the CEO. In other words we are considering the benefits b as a sort of 'public' good with respect to the CEO and the members of the management board. Directors care also about the financial return of the project and about future profits. Their objective function is $\beta_1 b + \beta_2 E(\Pi^{MB})$.

This means that both the management board and the CEO have the same preferences among investment projects. If they are informed they will choose project 2, otherwise they will choose project 1. As a consequence, the manager is always willing to share his information with the management board, setting z equal to 1 in eq. (1) . This in turn implies that project 2 will be selected with probability $e(1+\varepsilon)$ while project 1 will be chosen with probability $1-e(1+\varepsilon)$.

The probability of retaining a high or low ability manager is independent of the structure of the board and remains $p+(1-p)M_0$ and $q(1-M_\pi)$ for the high and low ability manager respectively.

The maximization problem of the manager

A high ability manager chooses the optimal level of effort e_D^{H*} by solving:

$$\max_e \; e(1+\varepsilon_D^*)\left\{[b\,(p+(1-p)M_0)+p\delta\pi]+(p+(1-p)M_0)\delta\overline{\pi}\right\}-e^2/2.$$

In the case of interior solution, from the first-order condition we obtain:

$$e_D^{H} = (1+\varepsilon_D^*)[Z_H+\Delta_H+F_H]. \tag{8}$$

Hence

$$e_D^{H*} = \min\left[e_D^{H}, 1\right].$$

Analogously, a low ability manager in order to choose the optimal level of effort e_D^{L*} solves:

$$\max_e \; e(1+\varepsilon_D^*)\left\{q(1-M_\pi)b+\delta q\pi+q(1-M_\pi)\delta\underline{\pi}\right\}-e^2/2.$$

In the case of interior solution, from the first-order condition we obtain:

$$e_D^L=(1+\varepsilon_D^*)[Z_L+\Delta_L+F_L]. \tag{9}$$

Hence

$$e_D^{L*}=\min\left[e_D^L,1\right].$$

Since $Z_H>Z_L$, $\Delta_H>\Delta_L$, and $F_H>F_L$, it immediately follows that

$$e_D^H>e_D^L.$$

Again, due to the different goals of monitoring according to the realization of first-period profits, the effort of the good manager positively depends on M_0, while the effort of the bad manager negatively depends on M_π.

The maximization problem of the Management Board

Given that the manager wholly shares his information with the management board, the latter is unwilling to exert a positive level of effort if the effort of the low-ability manager is $e_D^{L*}=1$, implying $e_D^{H*}=1$. In this case ε_D^* is optimally set to zero. If instead $e_D^{L*}<1$, the management board will choose $\varepsilon_D^*>0$ but such that $e_D^{L*}(1+\varepsilon_D^*)$ does not exceed unity, because $e_D^{L*}(1+\varepsilon_D^*)=1$ ensures that project 2 will be selected.

Provided that $e_D^{L*}<1$ the management board will then solve the following maximization problem.

$$\begin{aligned}\max_\varepsilon (1+\varepsilon)&\left\{\lambda e_D^{H*}\left[\beta_1 b+\beta_2\pi p\right]+(1-\lambda)e_D^{L*}\left[\beta_1 b+\beta_2\pi q\right]\right\}\\&+\beta_2\overline{\pi}\Pr(MA_2=H,proj=2)_D+\beta_2\underline{\pi}\Pr(MA_2=L,proj=2)_D-\frac{\varepsilon^2}{2}\\&s.t.\; e_D^{L*}(1+\varepsilon)\le 1\end{aligned}$$

where $\Pr(MA_2=H,\, proj=2)_D$ and $\Pr(MA_2=L,\, proj=2)_D$ are, respectively, the probabilities that the manager running the firm at time 2 is high or

low ability and that either project 2 has been selected, i.e.

$$\begin{aligned}\Pr(MA_2 &= H, proj = 2)_D \equiv \\ &(1+\varepsilon)\left\{\lambda e_D^{H^*}\left[1-(1-p)(1-M_0)(1-\lambda)\right]+(1-\lambda)e_D^{L^*}\left[1-q(1-M_\pi)\right]\lambda\right\}\end{aligned}$$

$$\Pr(MA_2 = L, proj = 2)_D \equiv (1+\varepsilon)\left\{\lambda e_D^{H^*}(1-p)(1-M_0)(1-\lambda)+(1-\lambda)e_D^{L^*}\left[1-\lambda(1-q(1-M_\pi))\right]\right\}.$$

In case of an interior solution, the first-order condition gives:

$$\varepsilon_D = \lambda e_D^H G_H + (1-\lambda) e_D^L G_L \tag{10}$$

where

$$G_H \equiv \beta_1 b + \beta_2\left[\pi p + \overline{\pi} - (\overline{\pi}-\underline{\pi})(1-p)(1-M_0)(1-\lambda)\right]$$

$$G_L \equiv \beta_1 b + \beta_2\left[\pi q + \underline{\pi} + (\overline{\pi}-\underline{\pi})(1-q(1-M_\pi))\lambda\right].$$

Substituting for the values of the manager's effort e_D^H and e_D^L, we obtain:

$$\varepsilon_D = \frac{\lambda G_H(Z_H+\Delta_H+F_H)+(1-\lambda)G_L(Z_L+\Delta_L+F_L)}{1-\lambda G_H(Z_H+\Delta_H+F_H)-(1-\lambda)G_L(Z_L+\Delta_L+F_L)} \tag{11}$$

Hence

$$\varepsilon_D^* = \min\left[\varepsilon_D, 1,\ 1/e_D^{L*}-1\right]$$

Except for the case where the effort of the low-ability manager is equal to 1, implying $e_D^{H*}=1$ and $\varepsilon_D^*=0$, the effort level chosen by the management board positively depends on its share of private benefit $\beta_1 b$ and on the expected effort of the manager e_D^*. From (11) it immediately follows that $\varepsilon_D < 1$ iff $\lambda G_H(Z_H+\Delta_H+F_H)+(1-\lambda)G_L(Z_L+\Delta_L+F_L) < 1/2$. Note that the effort of the manager and that of the management board are complements: high managerial effort raises the marginal benefit of increasing ε_D.

If we substitute back the value of ε_D in the expressions for the manager's effort, we obtain:

$$e_D^H = \frac{Z_H+\Delta_H+F_H}{1-\lambda G_H(Z_H+\Delta_H+F_H)-(1-\lambda)G_L(Z_L+\Delta_L+F_L)}$$

and

$$e_D^L = \frac{Z_L+\Delta_L+F_L}{1-\lambda G_H(Z_H+\Delta_H+F_H)-(1-\lambda)G_L(Z_L+\Delta_L+F_L)}.$$

6 One-Tier versus Two-Tier board

We are now in a position to make a comparison between the sole and the dual board structure. First of all we consider the level of effort. Comparing (4) with (8) , (5) with (9) and (7) with (11) it follows:

Lemma 2: The level of effort exerted by the manager is higher in a dual board structure independently of his type: $e_D^{*i} \geq e_S^{*i}$ *with* $e_D^{*i} = e_S^{*i}$ *iff* $e_D^{*i} = e_S^{*i} = 1$, $i = H, L$. *The level of effort exerted by the management board in a dual board is higher than that exerted by the large shareholder in the sole board structure* ($\varepsilon_D > \varepsilon_S$) *if and only if the large shareholder's private benefits* B *are lower than the threshold value* $\widetilde{B}$ *where* $\widetilde{B}$ *is defined by*:

$$\widetilde{B} \equiv \frac{\varepsilon_D^*}{\Delta + F + (1 - \varepsilon_D^*)Z}$$

The level of effort exerted by the manager is higher in a dual board structure because the manager, by choosing project 2 when informed, can appropriate private benefits b. As to the effort exerted by the board, we have to consider the private benefits of the owner relative to the threshold level $\widetilde{B}$. $\widetilde{B}$ positively depends on M_0 (which implies higher levels of F and Z), on b and β_1 (which imply a lower ε_D^*) while it negatively depends on M_π (which implies lower levels of F and Z) . In other terms we have to compare the private benefits of the large shareholder (in the sole board case) with the gains appropriable by the management board (in the dual board case). Only if such gains are particularly high, the effort of the management board will be higher than the effort of the large shareholder, $\varepsilon_D > \varepsilon_S$. This can be more easily seen in the special case in which neither the manager nor the members of the management board receive any share of profits, i.e. when $\delta = \beta_2 = 0$. In this case $\widetilde{B} = \frac{\varepsilon_D^*}{Z(1-\varepsilon_D^*)} = \frac{\beta_1 b}{1-2\beta_1 b^2[\lambda(p+(1-p)M_0+(1-\lambda)q(1-M_\pi)]}$. Here the positive relationship between the value of $\widetilde{B}$ and the private benefit of the management board is immediately evident. On the contrary, when the amount of profits appropriable by the manager is particularly high, his effort reaches its highest level, i.e. $e_D^* = 1$ implying $\varepsilon_D^* = 0$ and $\varepsilon_S^* > \varepsilon_D^*$.

Expected profits are equal to

$$E(\Pi_S) = \pi \left\{ e_S^{H*} \lambda p + e_S^{L*}(1-\lambda)q \right\} + \overline{\pi} \Pr(MA_2 = H, proj = 2,3)_S + \underline{\pi} \Pr(MA_2 = L, proj = 2,3)_S \quad (12)$$

under the sole board structure, and to

$$E(\Pi_D) = \pi(1+\varepsilon_D^*) \left\{ e_D^{H*} \lambda p + e_D^{L*}(1-\lambda)q \right\} + \overline{\pi} \Pr(MA_2 = H, proj = 2)_D + \underline{\pi} \Pr(MA_2 = L, proj = 2)_D \quad (13)$$

under the dual board structure. The large shareholder, however, is also interested in her private benefits. As a consequence, her preferences between the two board structures depend on her expected gains rather than on expected profits. Recalling that she obtains B only when project 3 is undertaken (i.e. with probability $e_S^* \varepsilon_S^*$) the expected gains to the large shareholder under the sole board structure are:

$$\begin{aligned} E(G_S) = {} & \varepsilon_S^* B \left[\lambda e_S^{H*} + (1-\lambda) e_S^{L*} \right] + \alpha\pi \left[e_S^{H*} \lambda p + e_S^{L*}(1-\lambda)q \right] + \\ & \alpha\overline{\pi} \Pr(MA_2 = H, proj = 2,3)_S + \alpha\underline{\pi} \Pr(MA_2 = L, proj = 2,3)_S - \\ & - (\varepsilon_S^*)^2/2 - [\lambda e_S^{H*}(1-p) + (1-\lambda) e_S^{L*}(1-q)](M_0)^2/2 \\ & - [\lambda e_S^{H*} p + (1-\lambda) e_S^{L*} q](M_\pi)^2/2 \quad (14) \end{aligned}$$

Under the dual board structure, the expected gains correspond to the fraction of the expected profits obtained the large shareholder net of monitoring costs:

$$\begin{aligned} E(G_D) = {} & \alpha\pi(1+\varepsilon_D^*) \left[e_D^{H*} \lambda p + e_D^{L*}(1-\lambda)q \right] + \\ & \alpha\overline{\pi} \Pr(MA_2 = H, proj = 2)_D + \alpha\underline{\pi} \Pr(MA_2 = L, proj = 2)_D - \\ & (1+\varepsilon_D^*)[\lambda e_D^{H*}(1-p) + (1-\lambda) e_D^{L*}(1-q)](M_0)^2/2 - \\ & (1+\varepsilon_D^*)[\lambda e_D^{H*} p + (1-\lambda) e_D^{L*} q](M_\pi)^2/2 \quad (15) \end{aligned}$$

Let us now assume for simplicity that the values of Z_H, Δ_H and F_H are such that the effort of the manager in the sole board structure is always strictly lower

than 1.[8] We can then prove the following.

Proposition: Expected profits are higher under the dual board structure. Large shareholder preferences, however, depend on the size of her private benefits. We can distinguish two cases:

i) $\delta = 0$. *If* $E(G_D) \geq 1/2$ *the large shareholder always prefers the dual board structure; if instead* $E(G_D) < 1/2$ *there exists a threshold value* $\widehat{B} > 0$ *such that the large shareholder prefers the dual board structure iff* $B < \widehat{B}$.

ii) $\delta > 0$. *There exists a threshold value* $\widehat{B} > 0$ *such that the large shareholder prefers the dual board structure if* $B < \widehat{B}$.

Proof: see Appendix.

The above proposition shows that the higher effort exerted by the manager in the dual structure results in higher profits. As long as the private benefits of the large shareholder are not 'too large', this may lead the large shareholder to prefer such a structure to the sole one despite the forgone private benefits. The large shareholder is more likely to prefer a dual board when the manager does not receive any incentive pay, i.e. $\delta = 0$. This is so because when $\delta = 0$ the manager has no other incentive to exert effort than the private benefit he obtains from project 2 and project 2 is more likely to be implemented in the dual board case. In our model both managerial private benefits and incentive pay induce higher effort. Incentive pay induces higher effort no matter which project is chosen, while the possibility of enjoying private benefits depends on project 2 being chosen. When both are present their effects cumulate and the incentive to exert effort is the highest. As the proposition shows, monetary incentives do

[8] This corresponds to assuming that $Z_H + \Delta_H + F_H < 1$, which implies $Z_L + \Delta_L + F_L < 1$. This assumption simplifies the proof of the Proposition but the result (as well as the line of the proof) does not change if we allow for $\overline{e}_S^H = 1$. Only when $\overline{e}_S^L = 1$, implying also $\overline{e}_S^H = \overline{e}_D^H = \overline{e}_D^L = 1$ and $E(G_D) = E(G_S)_{B=0}$, it might happen that the sole board structure is preferred by the large shareholder even for low values of B. In the sole board structure the large shareholder can select her favorite project with positive probability. Since managerial effort is the same under both structures, this comes with no loss on the side of expected profits. However, the necessary (but not sufficient) condition that $\overline{e}_L^S = \overline{e}_H^S = \overline{e}_L^D = \overline{e}_H^D = 1$ makes this a very peculiar case.

not make the incentive provided by a dual board structure redundant as for any value of δ, profits are higher under the two-tier structure and there are values of B such that the large shareholder prefers the dual board.

The empirical literature on managerial compensation in countries with concentrated ownership like Continental Europe is scant. However, the few existing studies on managerial compensation in Continental Europe seem to indicate that firms with concentrated ownership rely less on incentive pay than firms with dispersed ownership (see Crespi-Cladera and Gispert 2003 and Brunello, Graziano, Parigi 2001). Thus, the case with $\delta = 0$ can be a reasonable approximation for firms with a controlling shareholder.

In general, we can conclude that for sufficiently low values of the private benefits B, the large shareholder prefers the dual board structure because the effect on expected profits of the higher effort exerted in the dual board case exceeds the reduction in private benefits. This also implies that if the large shareholder is given the choice between the two board structures she will choose the optimal one as long as her private benefits are not too large.

Our model assumes that small shareholders owing the fraction $(1 - \alpha)$ of shares are not represented on the board and that they do not enjoy private benefits. The underlying assumption is that small shareholders are interested in maximizing the value of the firm that depends on expected profits. Then, they always prefer the two-tier structure which allows profit maximization. Hence, the proposition illustrates that if the large shareholder's private benefits are not too large the objectives of large shareholder and small shareholders can be aligned.

6.1 Expropriative Private Benefits

So far we have assumed that consumption of private benefits by either the large shareholder or the manager does not affect the profits earned by the firm. In many situations, however, it is realistic to assume that consumption of private benefits reduces firm's profits by the same amount. Our model can be easily

reinterpreted in this light.

Let us denote the potential return from the two projects by $\overline{R}$ in case of success, and by $\underline{R}$ otherwise, and let us interpret π as the return of the project net of private benefits enjoyed by either large shareholder or manager. Using previous notation, we can say that in the case of success, gross return from project 2 is $\overline{R} = \pi + b$ and it is $\overline{R} = \pi + B$ from project 3, otherwise gross returns are $\underline{R} = b$ and $\underline{R} = B$, respectively. Thus, the appropriation of private benefits reduces the amount of profits earned by the firm. When the project is not successful all profits are diverted leaving zero net return. Note that we are maintaining the assumption that project 2 and 3 offer the same monetary return and the assumption that project 2 offers private benefits to the manager whereas project 3 to the large shareholder. As a consequence, the preferences of large shareholder and manager are the same as before. Also their maximization problems and the resulting choices of effort are the same as discussed above. We can therefore conclude that, when we consider expropriative rather than 'additive' private benefits, our proposition still holds.

In this alternative setting, we assume that both projects yield the same net return π, which in turn implies that the amount of private benefits enjoyed by the large shareholder must be equal to the amount of private benefits appropriated by the manager. In other words, we are implicitly assuming that $B = b$ However, in a firm with a large shareholder the ability of the manager to appropriate private benefits is limited by the control exerted by the large shareholder. On the contrary, the large shareholder does not encounter any limit to her ability to divert the firm's profits. Thus, a more realistic assumption would be $b < B$. It can be seen immediately that in such a case the large shareholder would prefer the dual board structure for a larger set of parameter values: she would choose the dual board structure for all values $B < B'$ with $B' > \widehat{B}$. This is so because profits in the dual board structure would now be higher both because of the greater managerial effort and of the higher net return.

7 Concluding Remarks

We have shown in a very simple setting that, when ownership is concentrated in the hands of a large shareholder, a two-tier board of directors, where the large shareholder sits on the upper-level board, can be a useful commitment device to delegate the manager to choose investment projects. By comparing a two-tier with a one-tier structure we show that the two-tier board has the advantage of leaving initiative to the lower level board (the management board) with no reduction in large shareholder's monitoring of the manager's ability and no distortion in the retention/dismissal decision. As a result, the manager's effort in gathering information on projects is higher and this in turn leads to higher profits. The "price" to be paid in order to restore managerial incentives without interfering with ownership structure and monitoring intensity is the exclusion of the large shareholder from the management board. However, we show that the large shareholder may be willing to pay such a price because the increase in profits may more than compensate the loss of private benefits.

The paper has important policy implications since the dual board structure is quite common in Continental Europe where concentrated ownership is still the norm. Faccio and Lang (2002), for example, report that family ownership is predominant in 11 European countries: Austria, Belgium, Finland, France, Germany, Italy, Norway, Portugal, Spain, Sweden and Switzerland. In some of these countries, i.e. Germany, Austria, Belgium, the dual structure is mandatory, in other countries like France and Italy, companies can choose between different board models. Describing the structure and operations of boards in France, Charkham (2005, p.191) reports that: "An organization based on a supervisory board and a management board is also chosen by companies with a family shareholding structure: the chairman of the supervisory board is a member of the family and the chairman of the management board an external manager (Publicis, Pinaultr Printemps Redoute (PPR) until spring 2005, PSA Peugeot Citroen)". In Italy, the choice between one-tier and two-tier structure has been introduced only in 2004. So far it seems that large shareholders prefer to keep a tighter control on firm's management: only two listed companies

and less than one hundred and forty unlisted companies have chosen the dual board structure. However, recently all banks involved in merger activities have announced that they will choose the dual structure and, according to some analysts the example could soon be followed by other (more traditional) companies. Our paper shows that indeed a dual board structure may be the optimal choice for companies with family control and it offers support to the recommendation of the *High Level Group of Company Law expert* of the European Commission.

An important result of our model is that the controlling shareholder can choose the optimal structure of the board even if she has private benefits. The amount of private benefits must only not be 'too large'. This in turn implies that any policy restricting the amount of private benefits that a large shareholder can extract has a positive effect because it makes the optimal choice of board structure more likely.

A dual structure where the large shareholder sits on the supervisory board and does not interfere with the manager's decision, may also reduce the conflict of interests between majority and minority shareholders. Indeed, the large shareholder, by restricting her interference in firm management, also restricts ability to expropriate wealth from minority shareholders. Although other instruments can be used to limit such expropriation, like corporate law or the role of independent directors (see for example Anderson and Reeb 2003), a two-tier board of directors, by separating a firm's management and control, goes in this direction.

Finally, a dual board structure could be an interesting option also in transition economies and in economies with State participated firms. In these cases the problem can be that of limiting the interference from government representatives who might serve politically defined interests. Excluding these directors from the management board could be a credible means to limit political interference. At the same time having them in the supervisory board enables the government to perform a monitoring function.

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9 Appendix

Proof of the Proposition.

Expected profits can be rewritten as

$$E(\Pi_S) = e_S^{H*}\lambda A_H + e_S^{L*}(1-\lambda)A_L$$

$$E(\Pi_D) = (1+\varepsilon_D^*)\left[e_D^{H*}\lambda A_H + e_D^{L*}(1-\lambda)A_L\right]$$

where

$$A_H \equiv p\pi + \overline{\pi} - (1-p)(1-M_0)(1-\lambda)(\overline{\pi}-\underline{\pi}) \tag{16}$$

and

$$A_L \equiv q\pi + \underline{\pi} + [1-q(1-M_\pi)]\lambda(\overline{\pi}-\underline{\pi}) \tag{17}$$

That the expected profits are always higher under the dual board structure follows immediately from Lemma 2, considering that $A_H > 0$ and $A_L > 0$.

To prove the part on expected gains note that $\widehat{B}$ is the value of B, which equates (14) with (15). Denote by $E(G_S)_0$ the expected gain of the large shareholder in the sole board case when $B = 0$. In order to prove that $E(G_D) > E(G_S)_0$, rewrite the expected gains of the large shareholder as follows:

$$E(G_S) = \varepsilon_S^* B e_S^* + \alpha\{e_S^{H*}\lambda X_H + e_S^{L*}(1-\lambda)X_L\} - (\varepsilon_S^*)^2/2 \tag{18}$$

$$E(G_D) = (1+\varepsilon_D^*)\alpha\{e_D^{H*}\lambda X_H + e_D^{L*}(1-\lambda)X_L\}. \tag{19}$$

where

$X_H \equiv A_H - [(1-p)M_0^2 + pM_\pi^2]/2\alpha$, and $X_L \equiv A_L - [(1-q)M_0^2 + qM_\pi^2]/2\alpha$.

When $B = 0$, the first and the third term in (18) are equal to zero. Then, $E(G_D) > E(G_S)_0$ follows from Lemma 2 and from the fact that both X_H and X_L are positive because $M_0, M_\pi \leq 1$ and $\underline{\pi} > 1/2\alpha$.

Given (6) , (18) can be written as:

$$E(G_S) = \alpha \left[X_H \lambda e_S^H + X_L (1-\lambda) e_S^L \right] + \frac{\varepsilon_S^2}{2} \tag{20}$$

when $\varepsilon_S^* < 1$.

The rest of the proof is divided in two parts according to δ being equal to 0 or positive.

Part 1: $\delta = 0$. This implies $\Delta_i = F_i = 0$, $i = H, L$. Effort levels then become:

$e_S^i = \frac{Z_i}{1+BZ}$, $\qquad\qquad$ $\varepsilon_S = \frac{BZ}{1+BZ}$

with derivatives:

$\frac{\partial e_S}{\partial B} = \frac{-ZZ_i}{(1+BZ)^2} < 0$ $\qquad\qquad$ $\frac{\partial \varepsilon_S}{\partial B} = \frac{Z}{(1+BZ)^2} > 0$

We know from Lemma 1 that $\varepsilon_S = 0$ when $B = 0$ and that it is increasing in B, but never reaches 1. When $\varepsilon_S = 0$, $e_S^i = \overline{e}_S^i = Z_i$. As ε_S approaches 1 for $B \to \infty$, e_S^i asymptotically tends to 0.

Given that $\varepsilon_S^* < 1$, (20) holds. Note that $E(G_S) = E(G_S)_0 = \alpha \left[X_H \lambda Z_H + X_L (1-\lambda) Z_L \right]$ when $B = 0$, while $E(G_S) = 1/2 - x$ with x arbitrarily small when $B \to \infty$.

Derivating (20) with respect to B, we obtain:

$\frac{\partial E(G_S)}{\partial B} = \alpha \left[X_H \lambda \frac{\partial e_S^H}{\partial B} + X_L (1-\lambda) \frac{\partial e_S^L}{\partial B} \right] + \varepsilon_S \frac{\partial \varepsilon_S}{\partial B} =$

$\frac{Z}{(1+BZ)^2} \left\{ -\alpha \left[X_H \lambda Z_H + X_L (1-\lambda) Z_L \right] + \varepsilon_S \right\}$

Hence:

(i) for $\alpha \left[X_H \lambda Z_H + X_L (1-\lambda) Z_L \right] \geq 1$, $\frac{\partial E(G_S)}{\partial B}$ is negative independently of the value of B, implying that $E(G_S)$ is continuously decreasing from

$\alpha \left[X_H \lambda Z_H + X_L (1-\lambda) Z_L \right]$ for $B = 0$ to $1/2 - x$ for $B \to \infty$.

(ii) for $\alpha \left[X_H \lambda Z_H + X_L (1-\lambda) Z_L \right] < 1$, $\frac{\partial E(G_S)}{\partial B}$ is negative for

$\varepsilon_S < \alpha \left[X_H \lambda Z_H + X_L (1-\lambda) Z_L \right]$ and positive for higher values of ε_S, implying that $E(G_S)$ is first continuously decreasing (starting from $\alpha \left[X_H \lambda Z_H + X_L (1-\lambda) Z_L \right]$ for $B = 0$) and then continuously increasing up to $1/2 - x$ for $B \to \infty$ (as ε_S

approaches 1).

As a consequence, $E(G_S)$ is maximized either for $B = 0$ when $\alpha [X_H \lambda Z_H + X_L (1-\lambda) Z_L] \geq 1$, or for $B \to \infty$ otherwise.

We know that when $B = 0$, $E(G_D) > E(G_S)_0$. Hence $\widehat{B}$ exists only when $E(G_D) < 1/2$ and $E(G_S)$ is maximized for $B \to \infty$.

Part 2: $\delta > 0$. This implies $\Delta_i, F_i > 0$, $i = H, L$.

Recalling that $e_D^{i*} > e_S^{i*}$ when $e_S^{i*} < 1$, for $i = H, L$, we know that $B = 0$:

$$E(G_S)_0 = \alpha \left[X_H \lambda \overline{e}_S^H + X_L (1-\lambda) \overline{e}_S^L\right] < \alpha \left[X_H \lambda e_D^{H*} + X_L (1-\lambda) e_D^{L*}\right] \leq E(G_D).$$

Again we want to show that $E(G_S)$ is first continuously decreasing and then continuously increasing in B, implying that the threshold level $\widehat{B} > 0$ exists.

Recall that $\overline{B}$ is the level of B such that $\varepsilon_S^* = 1$. First of all note that, given $e_S^{i*} < 1$, (18) implies

$$E(G_S)_{\overline{B}} = \alpha \left[X_H \lambda \underline{e}_S^H + X_L (1-\lambda) \underline{e}_S^L\right] + \tfrac{1}{2} =$$

$$= \alpha [X_H \lambda (\Delta_H + F_H) + X_L (1-\lambda) (\Delta_L + F_L)] + \tfrac{1}{2} \qquad \text{for } B = \overline{B}.$$

(i) Consider first the case of $B \geq \overline{B}$ which implies $\varepsilon_S^* = 1$ and $e_S^i = \underline{e}_S^i$ $i = H, L$ independently of the value of B. From (18) , the expected gain of the large shareholder becomes

$$E(G_S) = \alpha \left[X_H \lambda \underline{e}_S^H + X_L (1-\lambda) \underline{e}_S^L\right] + B \underline{e}_S - \tfrac{1}{2}$$

which is clearly continuously increasing in B, from $E(G_S^1)_{\overline{B}}$ for $B = \overline{B} = 1/(\Delta + F)$ to ∞ for $B \to \infty$.

(ii) Consider then the case of $B < \overline{B}$ and $\varepsilon_S^* < 1$.

The derivative of the expected gain (20) can be written as:

$$\tfrac{\partial E(G_S)}{\partial B} = \alpha \left[X_H \lambda \tfrac{\partial e_S^H}{\partial B} + X_L (1-\lambda) \tfrac{\partial e_S^L}{\partial B}\right] + \varepsilon_S \tfrac{\partial \varepsilon_S}{\partial B} =$$

$\frac{\Delta+Z+F}{(1+BZ)^2}\left[-\alpha\left[X_H\lambda Z_H + X_L\left(1-\lambda\right)Z_L\right]+\varepsilon_S\right]$.

We then have two possible cases:

a) if $\alpha\left[X_H\lambda Z_H + X_L\left(1-\lambda\right)Z_L\right] \geq 1$, $\frac{\partial E(G_S)}{\partial B}$ is always negative for $B < \overline{B}$, implying that $E(G_S)$ is continuously decreasing from $E(G_S)_0$ to $E(G_S)_{\overline{B}}$.

b) if $\alpha\left[X_H\lambda Z_H + X_L\left(1-\lambda\right)Z_L\right] < 1$, $\frac{\partial E(G_S)}{\partial B}$ is negative for $\varepsilon_S < \alpha\left[X_H\lambda Z_H + X_L\left(1-\lambda\right)Z_L\right]$ and positive for $\varepsilon_S > \alpha\left[X_H\lambda Z_H + X_L\left(1-\lambda\right)Z_L\right]$, implying that $E(G_S)$ is first continuously decreasing and then increasing.

Taking into account both case (i) and case (ii), we can conclude that $E(G_S)$ is first monotonically decreasing and then monotonically increasing for B which goes from 0 to ∞. Since $E(G_S)_0 < E(G_D)$, a value $\widehat{B} > 0$ exists so that $E(G_S)_{\widehat{B}} = E(G_D)$.