OWNERSHIP CONCENTRATION, MONITORING AND OPTIMAL BOARD STRUCTURE

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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. 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. 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. The difference in profits can be sufficiently high to make the large shareholder prefer a two-tier board even if this implies that the manager selects his own preferred project. The paper has interesting policy implications since it suggests that two-tier boards can be a valuable option in Continental Europe where ownership structure is concentrated. It also offers support to some recent corporate governance reforms (like the so-called Vietti reform in Italy) that have introduced the possibility to choose between one-tier and two-tier structure of boards for listed firms.

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Keywords: board of directors, dual board, corporate governance, monitoring, project choice.

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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 very limited[1]. Furthermore, the few theoretical models of how board of directors function are implicitly cast in a dispersed ownership setting where no shareholder has any incentive to monitor the CEO. However, recent studies on corporate governance systems in both rich and developing countries have suggested that the presence of a large shareholder active in …rm's management is much more common than previously thought. 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 …rm rather than lack of monitoring.

Burkart, Gromb and Panunzi (1997) show that interference in the project selection by a large shareholder reduces managerial discretion and prevents the manager from appropriating private bene…ts. However, this may also prevent the manager from making …rm-speci…c investment. For example, the manager can exert e¤ort to select a new investment project. In this case, the large shareholder's right to reverse the manager's decision and in general to interfere with his initiative, can destroy the manager's incentive to take initiative and to make uncontractible investments. An appropriate ownership structure can alleviate this problem because, by decreasing her own stake in the …rm, 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 …rm-speci…c investment[2]. Note however that this decreases also large shareholder's incentive

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

[2] Another theoretical paper that deals with the advantages of manager's discretion in project selection is Inderst and Muller (1999). They show that managerial discretion can alleviate the agency problem between shareholders and debtholders because the manager may avoid the excessive risk taking in project selection that characterize shareholders' behavior when a project is …nanced by debt. Then, as in the previous paper, ownership structure can be a useful commitment device to leave the manager with discretion in project choice.

to monitor the manager[3].

The present paper is a …rst attempt to provide a model that analyzes the optimal structure of board of directors with a controlling shareholder actively involved in corporate governance. It focuses on the choice between one-tier and two-tier structure in a setting where the board performs two tasks: information gathering to select an investment project, and monitoring. It investigates how the separation of the two tasks provided by a two-tier board can alleviate the problem of large shareholder's interference underlined by Burkart, Gromb and Panunzi. In particular, it shows that, a two-tier structure can restore the manager's incentive to exert e¤ort and get informed without reducing the large shareholder's incentive to monitor the manager. To this end the paper compares a one-tier structure where all tasks are performed by the sole board controlled by the large shareholder, with a two-tier structure where some tasks are allocated to the management board and other tasks to the supervisory board. In a one-tier board, project selection is discussed in board's meeting and the large shareholder can impose the project she prefers. After the project is selected, the board/large shareholder also performs its monitoring task and decides whether to replace the manager or not. In a two-tier board, the management board chooses the project and the supervisory board has the task to monitor the manager. We focus on the case in which large shareholder controls the supervisory board but not the management board. The two boards act independently and their behavior re‡ect the di¤erent objectives of their members.

The main …nding of the paper is that the manager exerts a higher level of e¤ort in the dual board case where he can choose the investment project without interference by the large shareholder. This in turn, leads to higher expected pro…ts in a two-tier structure. The di¤erence in pro…ts can be su¢ ciently high to induce the large shareholder to prefer a two-tier board despite the fact that

[3] The negative e¤ects 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 signi…cantly reduces the agent's willingness to act in the interest of the principal. Explicit incentives back…re and performance is lower if the principal controls compared to if he trusts" (Falck and Kosfeld 2004, page 1).

in this case the manager chooses his preferred project rather than the project preferred by the large shareholder.

Thus, the paper suggests that a two-tier structure of board can be a useful commitment device that enables the large shareholder to restrain from interfering with manager's choice and therefore it may be a valuable option in Continental Europe where firms' ownership (including large corporation) is concentrated and founding families may be "too active" in firm management.

The small theoretical literature on board of directors has focused mainly on CEO monitoring by board of directors. In these papers the ability of the CEO is unknown and the board is in charge of assessing the quality of the CEO in order to decide whether to retain or dismiss him. Monitoring is regarded as the most important task performed by the board. See for example Hermalin and Weisbach (1998), Hirshleifer and Thakor (1998), and Warther (1998). A broader view on the tasks of boards of directors is taken in Graziano and Luporini (2003) where the board has two tasks: first CEO selection and then CEO dismissal/retention decision.

Finally, two recent papers have analyzed the interplay of board structure and information transmission within its members. Information sharing is central to the model by Harris and Raviv (2005) where board directors are both monitors and suppliers of expertise. Because of the agency problems neither outside directors nor insiders communicate fully their information. The authors characterize when it is optimal to have insiders in control of the board and when it is optimal to have outsiders controlling it. Furthermore, they determine the optimal number of directors from the tradeoff between the increase in the overall expertise provided as the number of directors increases and the reduced incentive for each director to spend effort to become informed.

Closest to our paper is the model by Adams and Ferreira (2003) who consider the advisory role of the board as important as the monitoring role and focus on the tradeoff between these two tasks. On the one hand, if the manager shares his information with the board he can get better advises from the directors. On the other hand, the information provided by the manager may increase the risk that he will be fired. The authors compare the sole with the dual board structure, focusing on information sharing between the CEO and the board. Although the first best solution consists of a sole board, they conclude that in some cases it is better to choose a dual board so as to separate the advisory from the monitoring role. In a sole board in fact the CEO may restrain from sharing his information because it can be used to better control him. Then, their model suggests that a two-tier board structure may provide the correct incentive to share information and it illustrates cases where a two-tier board may be superior to a one-tier structure. Despite the similarities our paper differs from their in one crucial aspect: what drives our result is not the incentive to share information in the dual board case but the different roles played by the large shareholder in the two board structures. A central element in our model, absent in Adams and Ferreira's, is the concentration of firm's ownership and the resulting interference by the large shareholder.

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 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 gives advice and 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. Manager's ability 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 return 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 return for project 2 and 3 are positive and dependent on manager's ability. Both projects are successful with probability p if the manager is high ability and with probability q if the manager is low ability, with $p > q > 0$. The two projects yield profits $\tilde{\pi} = \pi$ when successful, and they yield zero profits ($\tilde{\pi} = 0$) when unsuccessful. This assumption is equivalent to say 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), no matter the ability of the manager. For intermediate realizations of the state of nature, the manager makes the difference.

Manager's type affects firm's profits also in the long run. Since our model is not dynamic, we capture this feature by introducing second period profits and by assuming that these profits are the discounted value of future expected profits. Second period profits are $\overline{\pi}$ if the manager is high-ability and $\underline{\pi}$ if the manager is low-ability, with $\overline{\pi} > \underline{\pi}$. These profits depend only on the ability of the manager and are independent of the project's choice. In other words, overall profits from the project under scrutiny are represented by $\tilde{\pi}$, while second-period pro…ts represent pro…ts that are expected from future projects undertaken by the management of the …rm. In order to avoid cases in which future compensations have such a high weight in the decision problem of the high-ability manager as to make current private bene…ts irrelevant, we restrict $\overline{\pi}$ to satisfy $\frac{\overline{\pi} - \underline{\pi}}{\underline{\pi}} < \frac{p-q}{1-p}$.

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 two projects di¤er in the private bene…ts they yield to the large shareholder and to the manager[4]. Project 2 yields private bene…ts 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 bene…ts B and zero to the manager. Private bene…ts are obtained in all states of nature, even in case of zero pro…ts. For example, the bene…t may be the possibility of hiring a friend or relative, and this does not directly depend on the level of realized pro…ts. Summarizing, the overall return of project 2 is $\pi + b$ in case of success, and it is $0 + b$ in case of failure. Similarly, total return from project 3 is $\pi + B$ if successful and $0 + B$ otherwise.

Board Structure

As to the structure of the board, we consider two di¤erent 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 the project, the large shareholder is able to impose her decision on the manager.

Then, we examine a two-tier structure where the management board deals with investment decisions and the supervisory board controls the behavior of the manager. In the dual board case we assume that the same person cannot sit on

[4] The possibility to extract private bene…ts 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).

both boards and that the large shareholder sits in the supervisory board. The idea is to analyze how to optimally use the advantage that the large shareholder has in monitoring the manager. Given that the large shareholder sits only on the supervisory board, it follows that she does not take part in the investment decision taken by the management board. We will discuss this assumption and its possible interpretations in the …nal section.

The management board is composed mainly by managers with executive functions in the …rm and 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 bene…ts b. For example, the CEO can expand the …rm beyond the optimal size for the personal prestige and power derived from being the CEO of a large …rm. However, this is a bene…t enjoyed by all members of the management board, not only by the CEO. The monitoring function is performed by the supervisory board where the large shareholder has the majority.

Information structure

Except project 1 that is immediately identi…able, all other projects cannot be distinguish from one another without additional information. The manager has to become informed to choose the "good" project. By exerting e¤ort e, he becomes informed with probability e, at cost $e^2/2$.

Also the large shareholder or the management board can obtain some information by exerting e¤ort 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 di¤erent persons combine, depends on the structure of the board, because alternative structures give the manager di¤erent incentives to share his information.

The manager decides if and how much information to share with the board/large shareholder on the basis of his personal interest. We model this feature by assuming that manager's and board/large shareholder's e¤orts combine in the following way:

$$\Pr(manager\ and\ board\ are\ informed) = e(z + \varepsilon) \qquad (1)$$

where $0 \le z \le 1$ is a parameter under manager's control. The latter's incentive to share information depends on the structure of the board since 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 is not informed but the manager is, project 2 will be chosen. Then, given that project 2 is the favorite project of the manager, in the sole board case the latter sets the lowest possible value for z, i.e. $z = 0$ so that he is informed with probability e while large shareholder is 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 the manager only 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, CEO's and management board's objectives 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.

As in the model by Adams and Ferreira (2003), in our model the manager has an incentive to restrain from sharing his information with the sole board, but the motivation for this behavior is quite different. In Adams and Ferreira the information is used to update the prior on the manager's type and this in turn increases the probability that he will be fired. In our model, instead, the manager does not share his information with the large shareholder to increase the probability that he (the manager) will be delegated to choose the project. Furthermore, the different incentive to share the information provided by the two board structures is not crucial to our result. As it will be clear in the sequel, our main result holds even with $z = 0$ in the dual board case.

Monitoring

When either project 2 or 3 has been undertaken, a signal s on period-1 pro…ts becomes available to the (supervisory) board and consequently to the large shareholder. Given the positive correlation between …rst-period pro…ts and manager's type the signal allows the large shareholder to revise his prior on the manager's ability. Nonetheless, gathering additional information may be pro…table as it may allow a better retention/…ring decision. Given her stake in the …rm, 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.

According to the result of such monitoring, the manager can be con…rmed or …red. A monitoring intensity M allows the shareholder to become informed on the ability of the manager with probability M at cost $M^2/2$.

If the incumbent is …red and a new manager is hired, the …rm incurs in …ring costs C. The …ring cost captures the fact that the hiring process is costly and it may take a while before a new manager is selected. Furthermore, the new manager needs some time to become fully operational in the new environment. We assume that it is too costly to change project once its realization has started, so that even if a new manager is hired he cannot change it. However, the probability of success in the project depends on the ability of the new manager. A gain, both in the …rst-period and second period pro…ts, may occur if a low ability manager is replaced by a high ability one.

Summarizing, the sequence of events is the following:

- 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 decide e¤ort 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;

- if a risky project is selected the large shareholder observes a signal s on …rst-period pro…t and then chooses monitoring intensity;

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

- if the incumbent manager is …red, a new manager is hired. The new manager cannot change the project but he can a¤ect pro…ts' realization;

- …rst-period pro…ts and private bene…ts are realized;

- second-period pro…ts are realized.

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

3 The Choice of Monitoring Intensity

After the project is selected, the large shareholder chooses the intensity with which she wants to monitor the manager. We focus our attention on monitoring when project 2 or 3 are undertaken and, as explained below, we rule out monitoring when project 1 is selected.

Recall that monitoring is aimed at increasing expected pro…ts while leaving private bene…ts una¤ected. Both project 2 and project 3 yield the same expected pro…ts. As a consequence we can analyze monitoring independently of the choice between such projects.

Before choosing monitoring intensity the large shareholder observes a signal s on …rst-period pro…ts. The signal provides information on the realization of project's return and only indirectly on manager's ability. However, manager's ability is the only determinant of second-period pro…ts. This makes it important to know the ability of the manager before deciding whether to retain or to dismiss him. For example, if the large shareholder …res the incumbent manager after observing a bad signal, she might …re a high ability manager who has just been unlucky. This in turn may prevent her from getting the high second-period pro…ts that such a manager would have earned. Then, the large shareholder may …nd it convenient to engage in monitoring to …nd out the ability of the manager.

We assume that the signal s on …rst-period pro…ts is perfectly informative, so that its probabilities are equal to the true probabilities of the return from the project: the signal is $s = \pi$ with probability p if the manager is high ability, and with probability q if the manager is low ability, and it is $s = 0$ with complementary probabilities.

After observing s, the large shareholder revises her prior on the ability of the manager. If $s = \pi$ the probability that the incumbent manager is good becomes $\Pr(I = H|s = \pi) > \lambda$, if $s = 0$ it becomes $\Pr(I = H|s = 0) < \lambda$. This implies that, unless the large shareholder obtains some additional piece of information speaking in favour of a bad quality of the manager, she will never …re the CEO after $s = \pi$. Besides being the large shareholder's prior, λ represents the probability that a new manager is high ability, $\Pr(R = H)$. Hence the revised probability that the incumbent manager is good after $s = \pi$ is higher than the probability of picking a good manager in case of replacement. When $s = 0$ on the contrary, in the absence of additional information the behavior of the large shareholder depends on the size of the …ring cost C.

We assume that the …ring cost C is su¢ciently small to make it pro…table for the large shareholder to replace the manager when $s = 0$ and no additional information is received. In this case first-period profits under the incumbent manager are zero while expected first-period profits are positive if the incumbent is replaced. Recall that zero profits are due either to a very bad state of nature or to an intermediate state of nature coupled with a bad manager. In the latter case, first-period profits may become π if a bad manager is replaced by a good one which happens with positive probability. Furthermore, given that $\Pr(R = H) = \lambda > \Pr(I = H|s = 0)$, also expected second-period profits are higher under a replacement than under the incumbent manager. In order to establish whether the incumbent manager should be fired, such increase in expected profits should be compared to the firing cost.

It can be easily verified (see Appendix A (i)) that firing the manager after a bad signal is profitable when $C < \overline{C}$ where

$$\overline{C} = [\lambda - \Pr(I = H|s = 0)](\overline{\pi} - \underline{\pi}) + \pi \Pr(\pi|s = 0, R = H)\Pr(I = L|s = 0)\lambda.$$

In the following sections we restrict our attention to the case where $C \leq \overline{C}$. In the absence of additional information on the ability of the manager, the large shareholder prefers to fire the manager after $s = 0$.

In order to obtain additional information on the ability of the manager, the large shareholder may invest in monitoring. Recall that if the large shareholder chooses to monitor the manager with intensity M, she knows with probability M whether the manager is good while with probability $(1 - M)$ she is unable to identify the type of the manager despite monitoring. Monitoring costs $M^2/2$ are entirely borne by the large shareholder.

A positive level of monitoring is always profitable after a bad signal because, when successful, monitoring enables to save on firing costs and avoids the risk of firing a high-ability but unlucky manager. If the manager is good, not only there is no way to increase first-period profits by replacing him, but there is also the risk to replace him with a low-ability manager thereby reducing second-period profits. If monitoring takes place, the large shareholder's expected first plus second-period profits are:

$$
\begin{aligned}
E(\Pi|s=0,M>0) \equiv\ & \alpha\pi\,\Pr(\pi|R=H,s=0)\Pr(R=H)\Pr(I=L|s=0)+\\
& \alpha\overline{\pi}\,\{[\Pr(I=H|s=0)+\Pr(I=L|s=0)\Pr(R=H)]M+\Pr(R=H)(1-M)\}+\\
& \alpha\underline{\pi}\,\{\Pr(I=L|s=0)\Pr(R=L)M+\Pr(R=L)(1-M)\}-M^2/2\ -\\
& \alpha C\,[\Pr(I=L|s=0)M+(1-M)]
\end{aligned}
$$

The first term on the RHS is the first-period profit which is independent of monitoring. This follows from the fact that π can be obtained only if we happen to be in an intermediate state of nature and a bad manager is substituted with a good one. Under our assumption the manager is always fired when monitoring is unsuccessful. Then, a bad manager will be fired both when monitoring is unsuccessful and when it is successful. As a result, the probability that π will be obtained does not depend on monitoring. The second and third 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 fourth term represents monitoring costs. Finally, the last term is the expected firing cost.

Given that without monitoring the manager is always fired when the signal is bad, the large shareholder receives:

$$
\begin{aligned}
E(\Pi|s = 0,M=0) \equiv\ & \alpha\pi\,\Pr(\pi|R=H,s=0)\Pr(R=H)\Pr(I=L|s=0)+\\
& \alpha\overline{\pi}\,\Pr(R = H)+\alpha\underline{\pi}\,\Pr(R=L)-\alpha C
\end{aligned}
$$

Clearly $E(\Pi|s=0,M>0)$ is greater than $E(\Pi,s=0,M=0)$ as long as $\Pr(I=H|s=0)\alpha[C+(\overline{\pi}-\underline{\pi})(1-\lambda)]>M/2$, implying that there always exist positive levels of monitoring that make such activity profitable after $s=0$. The optimal level of monitoring M^* is the level that maximizes expected profits $E(\Pi|s=0,M>0)$. Then, from the first order condition, we obtain:

$$
M^* = \Pr(I=H|s=0)\alpha[C+(\overline{\pi}-\underline{\pi})(1-\lambda)] \tag{2}
$$

Optimal monitoring intensity M^* is positively correlated with i) the expected cost of firing a high-ability manager if the decision is based only on the signal on project's return ($\Pr(I = H|s = 0)C$), ii) the large shareholder's fraction of shares α, and iii) the loss in expected second-period profits if a good manager is replaced by a low ability one.

So far we have focussed on monitoring when either project 2 or project 3 is selected and a bad signal is observed. However, monitoring may be profitable also when project 1 is chosen or when, after selecting project 2 or 3, the observed signal is good ($s = \pi$). In the first case, monitoring could avoid retaining a bad manager who will earn only $\underline{\pi}$ in the second period. In the latter case instead, monitoring could avoid retaining a low-ability manager that has been lucky. In the following sections we assume that the firing cost C is sufficiently large to make monitoring in those cases unprofitable. In Appendix A we show that the threshold level such that monitoring is unprofitable after $s = \pi$ is the same as the threshold level that makes monitoring unprofitable when project 1 is selected. Let $\widehat{C}$ denote such threshold level. Then, in the following sections we will focus on the case in which the firing cost belongs to an intermediate range: $\widehat{C} < C < \overline{C}$. Our conclusions however would remain unchanged even for values of $C < \widehat{C}$.[5]

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 in the board where the large shareholder has the majority of votes. The large shareholder wants to maximize $B + \alpha E(\cdot)$ while the manager wants to maximize $b + \delta E(\cdot)$ where $\delta E(\cdot)$ represents the variable component of his salary, having normalized to zero the fixed component.[6] Given that an informed large shareholder imposes the choice of project 3 on the manager, in a

[5] Proofs that results of Sections 4 and 5 still hold when $\widehat{C} > C$ are available from the authors.

[6] For simplicity we rule out the possibility that the manager owns shares of the firm so that $\delta\pi$ is received only if the manager is still employed by the firm when profits are realized. Finally, to reflect the different roles played by the large shareholder and by the manager we assume that $\delta < \alpha$.

sole board structure there is no information sharing because the manager has no incentive to cooperate with the large shareholder in processing information, i.e. the manager sets $z = 0$. As a consequence the manager becomes informed with probability e, while the large shareholder is informed with probability $e\varepsilon$. The latter represents the probability of project 3 being selected. With probability $e(1-\varepsilon)$ only the manager is informed and in this case he can choose his preferred project, i.e. project 2. 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 $p + (1-p)M^*$. He then solves:

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

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

$$e_S^H = (1-\varepsilon_S^*)b[p+(1-p)M^*] + p\delta\pi - (1-p)(1-M^*)\delta\overline{\pi}. \quad (3)$$

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 is selected, he will be retained with probability q. He then solves:

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

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

$$e_S^L = (1-\varepsilon_S^*)bq + q\delta\pi - (1-q)\delta\underline{\pi}. \quad (4)$$

Hence

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

Given that $p > q$, $b(1 - p)M^* > 0$, and $\frac{\overline{\pi} - \underline{\pi}}{\underline{\pi}} < \frac{p - q}{1 - p}$, it immediately follows that

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

implying

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

Manager's effort is negatively correlated with large shareholder's 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.

Notice that the effort of the good manager depends (positively) on the level of monitoring exerted by the large shareholder, while the effort of the bad manager is independent of M. This happens because, the higher the monitoring intensity, the higher is the probability that a 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. Finally, observe that manager's effort decreases as second-period profits increase. This is so because a high level of effort implies a high probability of choosing project 2 or 3 which entail the risk of being fired in the first period. If project 1 is chosen, which requires no effort, the manager is always retained and receives his fraction of second-period profits.

The maximization problem of the Board/Large Shareholder

Since in the sole board case the large shareholder controls the 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. Taking into account that a bad manager will be replaced with probability $(1 - q)$, she solves:

$$\max_{\varepsilon} \; \varepsilon \left\{ \lambda e_S^{H*}[B+\alpha\pi p] + (1-\lambda)e_S^{L*}[B+\alpha\pi(q+(1-q)\gamma)] \right\} + (1-\varepsilon)\left\{ \lambda e_S^{H*}\alpha\pi p + (1-\lambda)e_S^{L*}[\alpha\pi(q+(1-q)\gamma)] \right\} + \alpha\overline{\pi}\Pr(M=H|t=2) + \alpha\underline{\pi}\Pr(M=L|t=2) - \frac{\varepsilon^2}{2}.$$

where $\gamma = \Pr(\pi|R=H, s=0)\Pr(R=H)$ is the probability of obtaining first-period profits π when a bad manager is replaced following the observation of $s=0$, while $\Pr(M=H|t=2)$ and $\Pr(M=L|t=2)$ represent the probability that the manager running the firm at time 2 is high or low ability. Since such probabilities do not depend on ε, we have not specified their expressions.[7]

In case of interior solution, we obtain:

$$\varepsilon_S = Be_S^{*}. \tag{5}$$

where $e_S^* \equiv \lambda e_S^{H*} + (1-\lambda)e_S^{L*}$.

Hence

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

The effort level chosen by the large shareholder depends positively on her private benefit B and on the manager's effort e_S^*. When the private benefit tends to zero also the large shareholder's effort to become informed tends to zero since in this case she is indifferent between project 2 and 3. For B positive but smaller than 1, the optimal effort level is smaller than one: $\varepsilon_S^* < 1$. Finally, when the private benefit is sufficiently large, the optimal effort becomes equal to one, $\varepsilon_S^* = 1$. Let $\overline{B}$ denote the size of her private benefits such that $\varepsilon_S^* = 1$. When the share of profits of the manager is high enough to induce him to make the highest possible effort, i.e. $e_S^{H*} = e_S^{L*} = 1$, also the large shareholder makes the highest effort provided that her private benefit is not smaller than 1. Observe that

[7] It can be easily verified that $\Pr(M=H|t=2) = \lambda[(1-e_S^{H*}) + e_S^{H*}(1-(1-p)(1-M^*)(1-\lambda))] + (1-\lambda)e_S^{L*}(1-q)M^*\lambda$ while $\Pr(M=L|t=2) = (1-\lambda)(1-e_S^{L*}) + \lambda e_S^{H*}(1-p)(1-M^*)(1-\lambda) + (1-\lambda)e_S^{L*}[1-(1-q)M^*\lambda]$

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. In general the large shareholder's effort is positively correlated with the manager's effort because the higher is e_S^*, and the higher is the marginal benefit of an increase in ε_S^* in terms of an increase in the 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 $\varepsilon_S > 1/2$. Indeed, for low values of B and e_S^* the large shareholder has no incentive to exert high level of ε_S because the probability of choosing project 3 is "too low" compared to that of choosing project 1.

Define:

$Z_H \equiv b(p + (1 - p)M^*)$,

$Z_L \equiv bq$

$Z \equiv \lambda Z_H + (1 - \lambda) Z_L \equiv b[\lambda(p + (1 - p)M^*) + (1 - \lambda)q)]$,

$\Delta_H \equiv \delta\pi p$

$\Delta_L \equiv \delta\pi q$

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

$F_H \equiv (1 - p)(1 - M^*)\delta\overline{\pi}$

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

$F \equiv \lambda F_H + (1 - \lambda)F_L$.

Substituting the values of e_S^H and e_S^L, (5) becomes:

$$\varepsilon_S = \frac{B(Z + \Delta - F)}{1 + BZ} \tag{6}$$

Note that if the manager does not receive any share of profits, i.e., $\delta = 0$ implying $\Delta = F = 0$, the optimal effort of large shareholder is smaller than one, $\varepsilon_S^* = \varepsilon_S < 1$. In this case, 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 e¤ort levels chosen by the manager we get:

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

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

Since the way e¤orts change as private bene…ts increase is crucial for our result, we establish the following lemma.

Lemma 1: Large shareholder's e¤ort ε_S^* is continously increasing in her private bene…ts B, ranging from $\varepsilon_S^* = 0$ when $B = 0$ to $\varepsilon_S^* = 1$ when $B = \overline{B}$ where $\overline{B} = \max\left\{\frac{1}{\Delta - F}, 1\right\}$. Manager's e¤ort e_S^{*i} is continously decreasing in large shareholder's private bene…ts 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 e¤orts 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 by managers close to the CEO and that they can enjoy part of the manager's private bene…ts b. In particular, we assume that the board can enjoy a fraction β_1 of the bene…ts b and that this does not reduce the private bene…ts of the CEO. In other words we are considering the bene…ts b as a sort of "public" good with respect to the CEO and the members of the management board. Directors care also for the …nancial return of the project. Their objective function is $\beta_1 b + \beta_2 E(\cdot)$.

This implies that both the management board and the CEO have the same preferences among investment projects. If they are informed they will always choose project 2, otherwise they will choose project 1. As a consequence, the value of z in eq. (1) will be set equal to 1, implying that project 2 will be selected with probability $e(1+\varepsilon)$ while project 1 will be chosen with probability $1-e(1+\varepsilon)$.

The maximization problem of the manager

A high ability manager chooses the optimal level of effort e_D^{H*} taking into account that if project 2 is selected, he will be retained with probability $p+(1-p)M^*$. He then solves:

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

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

$$e_D^H=(1+\varepsilon_D^*)\left[Z_H+\Delta_H\right]-F_H. \tag{7}$$

Hence

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

Analogously, a low ability manager chooses the optimal level of effort e_D^{L*} taking into account that if project 2 is selected, he will be retained with probability q. He then solves:

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

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

$$e_D^L=(1+\varepsilon_D^*)\left[Z_L+\Delta_L\right]-F_L. \tag{8}$$

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, the effort of the good manager depends on the monitoring by the large shareholder, while the effort of the bad manager does not, because the bad manager is always fired when the return of the project is known to be zero.

The maximization problem of the Management Board

When making its decision on the optimal level of effort ε_D^*, the board does not know the type of the manager[8]. Taking into account that a bad manager will be successfully replaced with probability $(1 - q)\gamma$, it then solves:

$$\max_{\varepsilon} \lambda e_D^H (1+\varepsilon)\left[\beta_1 b + \beta_2 \pi p\right] + (1-\lambda) e_D^L (1+\varepsilon)\left[\beta_1 b + \beta_2 \pi (q + (1-q)\gamma)\right]$$
$$+ \alpha\overline{\pi}\Pr(M = H|t = 2) + \alpha\underline{\pi}\Pr(M = L|t = 2) - \frac{\varepsilon^2}{2}$$

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

$$\varepsilon_D = \lambda e_D^H \left[\beta_1 b + \beta_2 \pi p\right] + (1-\lambda) e_D^L \left[\beta_1 b + \beta_2 \pi (q + (1-q)\gamma)\right]. \tag{9}$$

Let $G_H = \beta_1 b + \beta_2 \pi p$, and $G_L = \beta_1 b + \beta_2 \pi (q + (1-q)\gamma)$ .Substituting for the values of the manager's effort e_D^H and e_D^L, we obtain:

$$\varepsilon_D = \frac{\lambda G_H (Z_H + \Delta_H - F_H) + (1-\lambda) G_L (Z_L + \Delta_L - F_L)}{1 - \lambda G_H (Z_H + \Delta_H) - (1-\lambda) G_L (Z_L + \Delta_L)} \tag{10}$$

Hence

$$\varepsilon_D^* = \max\left[0, \varepsilon_D\right].$$

Note that if $e_D^{H*} = e_D^{L*} = 1, \varepsilon_D^* = 0$ In fact, when the manager is informed with certainty, there is no reason for the management board to acquire additional information because of the information sharing. High managerial effort has opposite effects in the dual and in the sole board structure. In the latter, a high managerial effort leads to a high effort by the large shareholder who does not want to let the manager choose the project. In the first case instead, where manager's and board's efforts are substitutes, high effort by the manager induces low effort by the management board.

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

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

[8] In the dual board case it may be reasonable to assume that the management board knows the type of the CEO. Our main result still holds under this assumption. However, for symmetry with the sole board case we prefer to maintain that the board doesn't know whether the CEO is high or low ability.

and

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

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 efforts. Comparing (3) with (7), (4) with (8) and (6) with (10) it immediately 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 $\bar{B}$ where $\bar{B}$ is defined by:

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

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 relatively to the threshold level $\bar{B}$. $\bar{B}$ is lower the lower is M^* (which implies a lower F and a higher Z) and the lower are b and β_1(which imply a lower ε_D). 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 better understood 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 $\bar{B} = \frac{\varepsilon_D}{Z(1-\varepsilon_D)} = \frac{\beta_1 b}{1 - 2\beta_1 b^2 (\lambda(p + (1-p)M^*) + (1-\lambda)q)}$. Here the positive relationship between the value of $\bar{B}$ 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, $e_D^* = 1$ implying $\varepsilon_D = 0$ and $\varepsilon_S^* > \varepsilon_D^*$.

Expected profits are equal to

$$E(\Pi_S) = e_S^{H*}\lambda p\pi + e_S^{L*}(1 - \lambda)[q + (1 - q)\gamma]\pi + \overline{\pi}\Pr(M = H|t = 2) + \underline{\pi}\Pr(M = L|t = 2) \quad (11)$$

under the sole board structure, and to

$$E(\Pi_D) = \pi(1 + \varepsilon_D^*)\left\{e_D^{H*}\lambda p + e_D^{L*}(1 - \lambda)[q + (1 - q)\gamma]\right\} + \overline{\pi}\Pr(M = H|t = 2) + \underline{\pi}\Pr(M = L|t = 2) \quad (12)$$

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:

$$E(G_S) = \varepsilon_S^* B(\lambda e_S^{H*} + (1 - \lambda)e_S^{L*}) + \alpha\pi\left\{e_S^{H*}\lambda p + e_S^{L*}(1 - \lambda)[q + (1 - q)\gamma]\right\} - (\varepsilon_S^*)^2/2 + \alpha\overline{\pi}\Pr(M = H|t = 2) + \alpha\underline{\pi}\Pr(M = L|t = 2) \quad (13)$$

while under the dual board structure expected gains correspond to the fraction of expected profits the large shareholder obtains:

$$E(G_D) = \alpha\pi(1 + \varepsilon_D^*)\left\{e_D^{H*}\lambda p + e_D^{L*}(1 - \lambda)[q + (1 - q)\gamma]\right\} + \alpha\overline{\pi}\Pr(M = H|t = 2) + \alpha\underline{\pi}\Pr(M = L|t = 2) \quad (14)$$

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.[9] We can then prove the following.

[9] We assume that $Z_H + \Delta_H - F_H < 1$, which implies $Z_L + \Delta_L - F_L < 1$. This assumption sim-

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

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

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

Proof: see Appendix B.

The above proposition shows that, as long as the private bene…ts of the large shareholder are not "too large", the higher e¤ort exerted by manager in the two-tier board structure may lead the large shareholder to prefer such a structure to the one-tier board. It indicates that the large shareholder is more likely to prefer the dual board structure when the manager does not receive any incentive pay, i.e. $\delta = 0$. This is so, because when $\delta = 0$ the manager does not have other incentive to exert e¤ort than the private bene…t he obtains if project 2 is chosen. However, in the sole board structure project 2 is less likely to be implemented and this in turn implies a smaller managerial e¤ort than in the dual board case.

In general, we can conclude that for low enough values of the private bene…ts B, the e¤ect of the higher e¤ort exerted in the dual board case on expected pro…ts more than compensate the reduction in private bene…ts and the large shareholder prefers the dual board structure. This also implies that if large shareholder is given the choice between the two board structure she will choose

pli…es the proof of the Proposition but the result (as well as the line of the proof) would not change if we allow for $\bar{e}_S^H = 1$. When $\bar{e}_S^L = 1$, implying also $\bar{e}_S^H = \bar{e}_D^H = \bar{e}_D^L = 1$ and $E(G_D) = E(G_S)_0$, 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 e¤ort is the same under both structures, this comes with no loss on the side of expected pro…ts. However, the necessary (but not su¢ cient) condition that $\bar{e}_L^S = \bar{e}_H^S = \bar{e}_L^D = \bar{e}_H^D = 1$ makes this a very peculiar case.

the optimal one as long as her private benefits are not toot large.

Our model assumed 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 board structure under which expected profits are maximized. Hence, the proposition illustrates that if large shareholder's private benefits are not too large the objectives of large shareholder and small shareholders are aligned.

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 device to commit not to interfere with manager's initiative. By comparing a two-tier with a one-tier structure we show that the two-tier board has the advantage to leave initiative to the lower level board (the management board). As a result, manager's effort in gathering information on projects is higher in the two-tier structure and this in turn leads to higher profits than in the one-tier structure where large shareholder controls the board.

The higher managerial effort comes with no reduction in shareholder's monitoring of manager's ability and no reduction in her fraction of shares. The "price" to be paid for restoring managerial incentives without interfering with ownership structure and monitoring intensity is the exclusion of large shareholder from the management board. Indeed, a crucial assumption for our result is that in the dual board structure the large shareholder sits on the supervisory board and that investment project is selected by the management board. This assumption may look unrealistic in some environments 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 large shareholder while the management board decides how to implement it. Private bene…ts result from the implementation of the project. For example, the project at discussion can be the decision to enter a new market. In this case, the large shareholder would decide whether to expand …rm'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 …rm, 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 take both decisions: whether to enter the new market and how to do it.

The paper has important policy implications since the dual board structure is quite common in Continental Europe where concentrated ownership is still the norm. In some countries, as Germany, Austria, Belgium, the dual structure is mandatory, in other countries as France and Italy companies can choose between di¤erent board models. Our paper shows that indeed dual boards may be optimal in these countries given their ownership structure, and it o¤ers support to some corporate reforms, like the recent reform in Italy, that, following the recommendation of the High Level Group of Company Law expert of the European Commission, has introduced the choice between one-tier and two-tier board structure (for a discussion of recent European corporate reforms see Hopt and Leyens (2004)).

An important implication of our result is that the controlling shareholder can choose the optimal structure of the board even if she has private bene…ts. The amount of private bene…ts must only not be "too large". This in turn implies that any policy that restricts the amount of private bene…ts that can be extracted by the controlling shareholder has a positive e¤ect since it makes more likely the optimal choice of board structure.

We restricted our attention to the choice between one-tier versus two-tier boards of directors, but the result of the paper may extend to other possible organizations of the board that may limit the power and interference of the large shareholder. The dual board structure represents just an opportunity for the large shareholder not to interfere with the management. In the absence of such a structure, it would be more di¢cult for the large shareholder to credibly commit not to reverse the project choice made by the management, even if ex-ante it could be pro…table for her to do so.

Finally, observe that if the large shareholder sits in the supervisory board and does not interfere with the manager's decision, there is also an important e¤ect on the con‡ict of interest between majority and minority shareholders. Indeed, the large shareholder by restricting her interference in …rm management restricts also her ability to expropriate wealth from minority shareholders. Although there may be other instruments to limit the ability to expropriate minority shareholders, as corporate law or the role of independent directors (see for example Anderson and Reeb 2003) also a two-tier structure of board of directors, by separating …rm's management and control, goes in this direction.

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9 Appendix A

i) Computation of threshold value $\overline{C}$.

Let Π denote the overall profits of the firm, i.e., the sum of first and second period profits minus possible firing costs. In order to find the value of $\overline{C}$ we have to equate the level of expected profits when the manager is fired after $s = 0$ to the level of expected profits when he is retained after $s = 0$:

$$E(\Pi|s = 0, \text{manager is fired}) \equiv \tag{15}$$
$$\alpha\{\pi \Pr(\pi|s = 0, R = H) \Pr(I = L|s = 0)\lambda + \overline{\pi}\lambda + \underline{\pi}(1 - \lambda) - C\} =$$
$$\alpha\{\overline{\pi} \Pr(I = H|s = 0) + \underline{\pi} \Pr(I = L|s = 0)\}$$
$$\equiv E(\Pi|s = 0, \text{manager is retained})]$$

Since $\Pr(I = H|s = 0) < \lambda$ and $\Pr(I = L|s = 0) > (1 - \lambda)$, $\overline{C}$ is strictly positive and equal to $[\lambda - \Pr(I = H|s = 0)](\overline{\pi} - \underline{\pi}) + \pi \Pr(\pi|s = 0, R = H) \Pr(I = L|s = 0)\lambda$.

ii) Computation of threshold value $\widehat{C}$.

Suppose that either project 2 or 3 has been chosen and a good signal has been observed. In order to establish the value of $\widehat{C}$, we have to compare the value of the expected profits of the shareholder with and without monitoring. A good signal, i.e. $s = \pi$, indicates that first-period profits are high under the incumbent manager. Considering that monitoring could only result in a bad manager being substituted, the decision on monitoring will depend only on second-period expected profits. If monitoring takes place, the large shareholder's expected profit is:

$$E(\Pi|s = \pi, M > 0) \equiv \alpha\pi +$$
$$\alpha\overline{\pi}\{[\Pr(I = H|s = \pi) + \Pr(I = L|s = \pi) \Pr(R = H)]M + \Pr(I = H|s = \pi)(1 - M)\} +$$
$$\alpha\underline{\pi}\{\Pr(I = L|s = \pi) \Pr(R = L)M + \Pr(I = L|s = \pi)(1 - M)\}$$
$$- \alpha C \Pr(I = L|s = \pi)M - M^2/2$$

where the first term represents first-period profits which are independent of monitoring. The second and third terms represent second-period profits: the large shareholder obtains $\alpha\overline{\pi}$ either when the incumbent manager is good or when a bad manager is replaced by a good one; while she obtains $\alpha\underline{\pi}$ when the incumbent manager is bad and monitoring is not successful or when following successful monitoring a bad manager is replaced by another bad CEO. The fourth term represents expected firing costs while the last term is the monitoring cost.

In the absence of monitoring, considering that the manager is never fired, the large shareholder's expected profits are:

$$E(\Pi|s = \pi, M = 0) \equiv \alpha\pi + \alpha\overline{\pi}\Pr(I = H|s = \pi) + \alpha\underline{\pi}\Pr(I = L|s = \pi)$$

$E(\Pi|s = \pi, M > 0)$ is greater than $E(\Pi|s = \pi, M = 0)$ if $\Pr(I = L|s = \pi)\alpha[(\overline{\pi} - \underline{\pi})\lambda - C)] > M/2$ implying that monitoring is unprofitable after $s = \pi$ if $C > \hat{C} = (\overline{\pi} - \underline{\pi})\lambda$.

Suppose now that project 1 has been chosen. In this case first period profits are zero independently of the manager and monitoring is aimed at increasing second-period profits. Without monitoring large shareholder's profits are $\alpha\overline{\pi}\lambda + \alpha\underline{\pi}(1 - \lambda)$. With monitoring profits instead become:

$$\alpha\overline{\pi}[M_1(\lambda + (1 - \lambda)\lambda + (1 - M_1)\lambda] + \alpha\underline{\pi}[M_1(1 - \lambda)(1 - \lambda) + (1 - M_1)(1 - \lambda)] - M_1^2/2 - \alpha C M_1(1 - \lambda)$$

It is easy to see that the threshold level that makes no monitoring the optimal choice is given by: $\hat{C} = (\overline{\pi} - \underline{\pi})\lambda$. Then if $C > \hat{C}$, as we assume in the model, monitoring is unprofitable both after a good signal and also after project 1 is selected.

10 Appendix B

Proof of the Proposition. That expected profits are higher under the dual board structure follows immediately from (11) , (12) and Lemma 2.

To prove the part on expected gains note that $\hat{B}$ is the value of B, that equates (13) to (14). Define:

$X_H \equiv p\pi,$

$X_L \equiv [q + (1 - q)\gamma]\pi,$

Since the part of expected gains that accrues in period 2, $\alpha\overline{\pi}\Pr(M = H|t = 2) + \alpha\underline{\pi}\Pr(M = L|t = 2)$, is the same in both (11), (12) we compare only period-1 expected gains and we denote them by $E(G_S^1)$ and $E(G_D^1)$. We can then write:

$$E(G_S^1) = \alpha \left[X_H \lambda e_S^{H*} + X_L (1 - \lambda) e_S^{L*} \right] + \varepsilon_S^* B e_S^* - \frac{(\varepsilon_S^*)^2}{2} \tag{16}$$

Given (5) the above expression can be written as:

$$E(G_S^1) = \left[X_H \lambda e_S^H + X_L (1 - \lambda) e_S^L \right] + \frac{\varepsilon_S^2}{2} \tag{17}$$

when $\varepsilon_S^* < 1$.

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

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

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

with derivatives:

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

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 $\varepsilon_S^* < 1$, (17) holds. Note that $E(G_S^1) = \alpha X \overline{e}_S = \alpha [X_H \lambda Z_H + X_L (1 - \lambda) Z_L]$ when $B = 0$, while $E(G_S^1) = 1/2 - x$ with x arbitrarily small when $B \to \infty$.

Derivating (17) with respect to B, we obtain:

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

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

Hence:

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

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

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

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

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

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

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

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

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

Again we want to show that $E(G_S^1)$ is first continuously decreasing and then continuously increasing in B, implying that the threshold level $\hat{B} > 0$ exists.

First of all however note that, given (16),

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

$\frac{1}{2}$ for $B = \overline{B}$.

(i) Consider first the case of $B \geq \overline{B}$ implying $\varepsilon_S^* = 1$ and $e_S^i = \underline{e}_S^i$ $i = H, L$ independently of the value of B. From (16), the expected gain of the large shareholder becomes

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

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

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

The derivative of the expected gain can be written as:

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

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

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

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

Taking into account both case (i) and case (ii), we can conclude that $E(G_S^1)$ is first monotonically decreasing and then monotonically increasing for B that goes from 0 to 1. Since $E(G_S^1)_0 < E(G_D^1)$, a value $\widehat{B} > 0$ exists such that $E(G_S^1)_{\widehat{B}} = E(G_D^1)$.

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