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Department of **COMMERCE**

The University of British Columbia
Vancouver, Canada

Date **JULY 07, 2002**
ABSTRACT

This thesis is comprised of three essays dealing with outside directors. The first essay addresses the signaling role that outside directors play. This is a role that is especially important for entrepreneurial firms, and has been relatively neglected in corporate governance research. The primary contribution of this chapter is in developing an analytical model and predictive framework on which future empirical and analytical research on directors' signaling role can be based. This chapter also contributes to the signaling theory literature by deriving a new type of equilibrium — the "stochastic separating equilibrium" — which may well be applicable in a broader set of models that incorporate signaling through middlemen. This equilibrium has an important realistic feature in that it permits the coexistence of both high and low quality firms in equilibrium.

In the second study, I address directors' monitoring role. This essay examines whether a systematic relationship exists between a board's composition and discrete strategic decisions of a firm, which have been addressed in the literature as involving potential conflicting interests between managers and shareholders. To explore this question, I conducted seven meta-analyses of relevant strategic decisions, on which I could obtain data. The results provide evidence for the presence of systematic relationships between a board's composition and five out of the seven strategies examined. Interestingly, these systematic relationships provide only limited support to the predictions of agency theory, which is the predominant rational behind this line of research.
In the third essay, I examine the effects of outside directors' stock-based compensation on one indicator of board monitoring effectiveness: firms' research and development (R&D) intensity. The results suggest that both the percentage of stock-based compensation and the proportion of stock options within it are positively related to firms' R&D expenditures. Moreover, stock-based compensation moderates the relationship between board composition and R&D intensity. These results highlight the need to reevaluate previous findings that addressed the effects of board composition on both firm performance and firm strategic decisions.
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## CHAPTER 1
YOU ARE KNOWN BY THE DIRECTORS YOU KEEP: REPUTABLE DIRECTORS AS A SIGNALING MECHANISM FOR YOUNG FIRMS*

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ACKNOWLEDGEMENTS

I am deeply indebted to Raffi Amit and Thomas Ross for the guidance, direction, and support that they have provided during my program of study at UBC. I am also very grateful to Werner Antweiler, James Brander, Sabrina Deutsch Salamon, Keith Head, Martin Puterman, and John Ries for their very helpful guidance and advice. David Patient and Jennifer Wohl provided invaluable assistance as readers and editors of the many drafts through which this thesis has evolved. I am grateful for the generous financial support of the W. Maurice Young Entrepreneurship and Venture Capital Research Center and the SFU-UBC Center for the Study of Government and Business. I am solely responsible for any errors or omissions contained herein.
INTRODUCTION AND OVERVIEW

This thesis contains three essays dealing with outside directors' roles and compensation schemes.

The first essay, entitled “You Are Known By The Directors You Keep: Reputable Directors As a Signaling Mechanism for Young Firms,” focuses on outside directors signaling role—a role, which is especially important to young firms. To address this issue, an analytical signaling model is developed in which new ventures “rent” the reputational capital of directors to credibly signal their type. In this signaling model, superior entrepreneurial firms “rent” the reputation of prestigious outside directors in order to separate themselves from lesser types in the attempt to attract stakeholders crucial for their survival. The model address previously unanswered questions including: (1) can young firms credibly signal their attributes through the appointment of reputable outside directors? and (2) if so, what factors determine the effectiveness of the signaling?

The essay makes an important contribution both to corporate governance literature and to signaling theory. The results of the analytical model developed here suggest that high quality new ventures can enhance their survival prospects by credibly signaling their quality through reputable directors. Both the level of the directors' reputation and the quality of their information determine the effectiveness of this strategy. Firms can choose from a range of
potential directors the one who provides the needed signal at the lowest cost. When the
directors' information is incomplete, high quality and low quality firms may coexist in
equilibrium. The higher the quality of directors' information about the new ventures' type,
the higher will be the percentage of the high quality new ventures' among the surviving
firms.

The essay contributes to the signaling theory literature by developing the idea of a "stochastic
separating equilibrium." This new type of equilibrium is obtained when the middleman's (the
director's) information regarding the firm quality is incomplete. The stochastic separating
equilibrium concept may well be applicable in a broader set of models that incorporate
signaling through middlemen. This equilibrium has an important realistic feature in that it
permits the coexistence of both high and low quality firms in equilibrium without pure
pooling.

The second essay, entitled "Meta-Analytical Reviews of Board Composition and Strategic
Decisions," aims to shed light on directors' monitoring role. Using meta-analyses, I examine
whether a systematic relationship exists between a board's composition and each of seven
discrete strategic decisions of a firm. These seven strategic decisions have been addressed in
the literature as involving potential conflicting interests between managers and shareholders,
and are decisions on which sufficient data was available to conduct the research.

Corporate governance researchers have extensively investigated the relationship between the
level of independence of a board and its monitoring performance by examining the adoption
of strategic decisions that involve a conflict of interest between management and shareholders (e.g., Kosnik, 1987; 1990; Mallette & Fowler, 1992; Sundaramurthy, 1996). A recent review of the research on the effect of board composition on discrete strategic decisions has found, however, that research evidence is rather equivocal (Bhagat & Black, 1999).

In addition to examining whether a systematic relationship exists between board composition and each of several discrete strategic decisions of a firm, I evaluate the extent to which the systematic relationships found across strategies are consistent with the predictions of two theoretical perspectives that address the effect of board composition on a firm’s strategic decisions. To achieve these ends, I conducted seven meta-analyses of relevant strategic decisions on which I could obtain data. These strategic decisions include unrelated diversification, takeover defenses, research and development (R&D) intensity, debt intensity, a CEO’s total compensation, intensity of a CEO’s incentive pay, and the rate of CEO turnover.

This study’s contribution lies in not only revealing the presence of systematic relationships between board composition and a firm’s strategic decisions, but also in evaluating the extent to which the predictions of two theoretical frameworks are consistent with the estimates of the systematic relationships across several strategies. This wide outlook sheds new light on an extensively studied area in corporate governance research, suggests that research on board composition and strategic decisions offers interesting avenues for future research, and
emphasizes the need to develop a new conceptual framework that could enhance our understanding of this issue.

The third essay, entitled “Does Directors’ Compensation Matter? The Influence of Stock-Based Pay on Firms R&D,” aims to shed light on both the direct effect of including stock-based compensation in outside directors’ pay on firms’ R&D intensity, and on the moderating effect of outside directors’ compensation schemes on the relationship between boards composition and firms’ R&D intensity.

This essay addresses the trend in the last decade toward including stock and stock options in outside directors’ compensation. The community of institutional investors and several researchers support this trend by arguing that stock-based compensation more closely aligns outside directors’ goals to those of shareholders and provides incentives for vigilant board monitoring of management decisions (Carey, Elson & England, 1996). In contrast, other researchers suggest that firms should be cautious in adopting this practice, at least until there is sound evidence that this compensation scheme does in fact benefit stockholders (Daily, Certo & Dalton, 1999). This debate reveals that to date it is not clear whether including stock-based compensation in outside directors’ pay improves boards’ monitoring performance.

This essay’s main contribution lies in providing important empirical evidence supporting the argument developed in the paper that stock-based compensation and board independence are complementary measures for enhancing boards’ monitoring performance. The positive and
significant relationship found between the interaction of outside directors’ representation and the intensity of stock-based compensation with R&D intensity suggests that boards can become effective guardians of shareholders’ interests when outside directors are both properly motivated and given sufficient representation.

Furthermore, this interaction suggests a new explanation, based on agency theory, for the negative relationship found in earlier studies, and revealed in the meta analysis reported in chapter two, between the proportion of outside directors and firms’ R&D intensity (e.g. Baysinger, Kosnik & Turk, 1991; Hill & Snell, 1988). This study has shown that the relationship between outside directors’ representation and firms’ R&D intensity is moderated by stock-based intensity. When stock-based intensity is low, the relationship between outside directors and R&D intensity is negative; however, when the stock-based intensity is high, this relationship becomes positive. Including stock-based compensation in directors’ pay, however, is a relatively new trend, whereas the empirical evidence indicating a negative relationship between the proportion of outside directors on boards and firms’ R&D is based on data collected before stock-based compensation became a common practice. Therefore, the negative relationship reported in previous studies is consistent with the results of this study.

Finally, the results of the third essay provide evidence regarding the effects of including stock options in directors’ compensation. I have shown that the inclusion of stock options in outside directors’ compensation affects firms’ adoption of risky strategies, such as R&D. This finding is consistent with previous research on executive compensation, which has
found that the different risk characteristics of stock pay and stock options pay will result in
different behavior by managers (e.g., Bloom & Milkovich, 1998).
REFERENCES


CHAPTER 1

YOU ARE KNOWN BY THE DIRECTORS YOU KEEP: REPUTABLE DIRECTORS AS A SIGNALING MECHANISM FOR YOUNG FIRMS*
1.1 ABSTRACT

In this paper we develop an analytical model of outside directors' signaling role -- a role that is especially important for entrepreneurial firms and has been relatively neglected in corporate governance research. We show that in the face of a market failure in which stakeholders refuse to align themselves with new firms, high quality new ventures may be able to credibly signal their type by appointing reputable directors to their boards. However, this option is not universally feasible. Both directors' reputations and the quality of their information determine the effectiveness of this strategy. In contrast to earlier adverse selection models, we demonstrate that when the middlemen (directors) have incomplete information on firm quality, bad and good firms can coexist in equilibrium. In this equilibrium, the quality of the directors' information determines the mix of good and bad firms in the population of surviving firms. Avenues for future research and normative implications for practitioners are discussed.
1.2 INTRODUCTION

The ability of a new venture to establish working relations with potential stakeholders is a crucial determinant of its survival. Yet, in an environment of information asymmetries, stakeholders remain cautious about establishing working relations with new ventures when they need to make relationship-specific investments. Potential investors may not be willing to invest if they are unable to determine that a firm is going to be sufficiently profitable to make the investment worthwhile. Similarly, in such a case, strategic alliance partners may be unwilling to devote scarce resources to foster cooperative activity. Furthermore, in the face of little information about a new product or service, customers may not be willing to learn how to use the firm’s offerings. In this environment, how are new firms to attract the stakeholders so critical to their success?

While established firms can rely on their reputations to attract stakeholders, new firms have not yet had the opportunity to build reputations of their own. Lacking their own reputation, the management of superior new firms will look for alternative ways to credibly signal their quality. In this paper, we develop an analytical model in which new ventures “rent” their directors’ reputations to generate a credible signal. We also analyze the factors that determine the effectiveness of this strategy under different conditions.

Despite extensive research on the different roles of boards of directors, the literature has seldom addressed the role of reputable directors as signaling mechanisms. In particular, there
is no analytical model developed to examine this role. Consequently, we lack insight into this strategy and its effectiveness. The purpose of this study is to fill this gap in our understanding by investigating analytically a number of unanswered theoretical questions: Can young firms credibly signal their quality through the appointment of reputable directors? What factors determine the effectiveness of this strategy? What elements affect the cost of this signaling?

1.3 RENTING A REPUTATION

Economic agents frequently must contract with each other without full information about important characteristics of the other party. For example, buyers may not know the quality of the product a seller offers, employees may be uncertain about the quality of a prospective employer’s work environment, and investors may have little knowledge of the likely profitability of a new company. It is well known that these informational asymmetries may lead to market failures (Akerlof, 1970).

When markets are vulnerable to this kind of failure, it is in many parties’ interests to find ways to communicate the missing information. In particular, firms that are “better” than average (e.g., they offer products that are higher in quality than other products) would benefit if their potential stakeholders had this information. The literature on asymmetric information has suggested a number of mechanisms to correct this problem, including the use of
reputational mechanisms (Spence, 1974). Stakeholders, for example, often rely on a firm's reputation when making investment, product, and career decisions (Dowling, 1986).

Reputation can be thought of as the probability that the firm is of a certain type or will act in a certain way (see e.g., Shapiro, 1983; Tadelis, 1999). When we say, for example, that a firm has a reputation for selling goods of high quality, we imply that if we were to buy a good from that firm, we would attach a high probability to its being of high quality. Seen this way, firms can develop reputations for many aspects others may care about. For example, a firm may be seen as having a reputation for high quality products, poor labor relations, questionable environmental practices, etc. Since a firm's reputation determines how willing others are to deal with the firm (and on what terms), the firm cares a great deal about cultivating the “right” reputation (Weigelt & Camerer, 1988).

It is well recognized that a firm’s reputation is an important and valuable intangible resource (Hall, 1992; 1993). To be valuable, a firm’s reputation must be rare and difficult to trade and imitate (Mahoney & Pandian, 1992). A good reputation, properly maintained, can thus provide a firm with a source of sustainable competitive advantage (Barney, 1986; 1991; Amit & Schoemaker, 1993) and enhance its survival probability (Rao, 1994). For example, with a good reputation a firm can charge premium prices for its products (Shapiro, 1983; Milgrom & Roberts, 1986b), attract better employees (Gatewood, Gowan & Lautenschlanger, 1993; McMillan & Deeds, 1998), attract investors (Milgrom & Roberts, 1986a), and enhance alliances and other inter-organizational relationships (Oliver, 1991; Dollinger, Golden & Saxton, 1997).
Most often, today’s reputation is built on yesterday’s actions—a process that can disadvantage new firms (McGuire, Sundgren & Schneeweis, 1988; Fombrun & Shanley, 1990). A new entrant in a market in which established firms have solid reputations may have trouble getting enough business to build a positive reputation for itself. If informational asymmetries are prevalent in that particular market, the new firm may not be able to make itself attractive enough to stakeholders to operate. Stinchcombe (1965) argued that this inability of young organizations to develop relations with other organizations and individuals in their environment is one of the main causes of the negative correlation between a firm’s age and its mortality rate (the “liability of newness”). Empirical support for this proposition has been found in several studies (e.g., Singh, Tucker & House 1986; Baum & Oliver, 1991).

Nonetheless, lacking their own reputations, young firms may be able to “rent” the reputations of other agents in order to enhance their own legitimacy and positions in the market. For example, a manufacturer may signal a product’s quality by renting the reputation of a respected retailer (Chu & Chu, 1994). The reputable agent then serves as a middleman between the firm and the stakeholder. In markets where an adverse selection problem exists, the assurance given by a middleman helps reduce inefficiencies and market failures (Biglaiser, 1993). Several studies have addressed the issue of signaling with a reputable middleman. These studies explore the middleman service provided by auditors (e.g. Datar, Feltham & Hughes, 1991; Clarkson & Simunic, 1992), investment banks (e.g. Tinic, 1988; Johnson & Miller, 1988; Carter & Manaster, 1990), venture capitalists (e.g. Amit, Brander & Zott, 1998; Amit, Glosten & Muller, 1990; 1993), and other service providers.
Having prestigious outside directors can also enhance the legitimacy of a firm and its ability to extract important resources from its environment by providing cues regarding the firms' attributes (e.g., Pfeffer and Salancik 1978). These cues are most importance to young firms that by virtue of their newness were not able yet to establish their own reputations (Selznick 1949). Prestigious outside directors, therefore, can serve as means of uncertainty reduction, increasing the willingness of different potential stakeholders, such as suppliers and customers, to establish working relations with the entrepreneurial firm (Schoorman et al 1981), and thereby enhancing the firm's survival prospects.

Surprisingly, although directors' signaling role has been previously addressed, the literature on this role is still in its infancy. Noteworthy are two empirical studies that have found that directors' prestige is positively correlated with bequests to human services agencies (Provan 1980), and negatively correlated with under-pricing offered by firms in their IPO (Certo, Daily and Dalton 2000). Yet, to the best of our knowledge no analytical work has addressed this signaling role. As a result, many theoretical questions regarding this role remain unanswered and a predictive framework is yet to be developed. As a first step towards filling this gap, we have developed a signaling model, in which new ventures "rent" the reputational capital of outside directors to credibly signal their quality.
1.4 THE MODEL

Our model is one of adverse selection in which stakeholders are cautious in aligning themselves with new ventures about which they lack important information. We believe that the underlying informational problem addressed in this model is a significant contributor to the "liability of newness" that many young firms face. Here, young firms need to attract stakeholders (including customers, employees, and joint venture partners) in order to operate profitably.

We consider a population of two types of new ventures — for expositional convenience we label these types "good" and "bad." A new venture's type is determined in this research from the stakeholders' point of view, and depends on the attribute the particular stakeholder cares about most. Potential investors, for example, define a new venture as "good" if its expected profitability is higher than that of other firms, whereas potential employees define a new venture as "good" if its expected employment conditions are better than those of other firms.

A stakeholder takes some risk in committing to a firm, as doing so requires that he or she make an irreversible investment. We assume that investments in "bad" new ventures are completely lost, but this assumption is only for the purpose of normalization. The important consideration is that the return is sufficiently low to warrant withdrawal from the commitment. However, both "bad" and "good" firms need to attract stakeholders in order to make profits; both would like to pass themselves off as good. For ease of exposition, we assume that each firm needs to attract only one stakeholder.
We assume that the stakeholder does not have enough information to distinguish between good and bad firms. Rather, based upon the information he or she does have, the stakeholder forms a belief about the proportion of good firms in the market. For ease of exposition, we assume that this belief is correct, but this assumption is not essential.

The model is developed in four steps. In the first step, we describe the basic adverse selection problem. In the second, we introduce the concept of directors as a potential signaling mechanism. In this step, we make the following assumptions: (a) directors have complete information regarding a new venture’s type, and (b) good new ventures have higher revenues than do bad new ventures. We relax assumption (a) in the third step and assume that directors have incomplete information regarding the new venture’s type. In the fourth step, we relax assumption (b) and allow the revenue of good new ventures to be lower than that of bad new ventures.

1.4.1 The Adverse Selection Problem

Consider potential stakeholders who have to decide whether or not to establish working relations with new ventures. A non-recoverable investment, I, is needed from the stakeholder in order to establish such a relationship. The stakeholder’s returns depend on the new venture’s type: good or bad. A relationship with a good new venture provides long-term benefits, A, to the stakeholder, whereas the benefits from a relationship with a bad new venture are normalized to zero. We assume that good ventures are worthwhile, that is, that
Again, although stakeholders do not know ex ante the new venture’s type, they do have (accurate) prior beliefs regarding the proportion of good new ventures (γ) in the population.

It is worth noting that the proportion of good new ventures in the population need not be interpreted as the proportion of all possible firms in the population that are good. We expect that stakeholders will have some information and can do some evaluation of the prospects of firms with which they might partner. In this light, γ is properly interpreted as the fraction of firms that are actually good within the set of firms that survive the initial screening done by the stakeholder. Thus, the better the stakeholder is at screening potential partners, the larger its γ will be.

If the proportion of good new ventures in the population is high enough, the expected gain from forming a relationship with the firm (γA) will equal or exceed the investment made (I). Stakeholders should thus be willing to gamble on finding a good firm in a random draw from the population of firms if γ ≥ I/A (note that since we expect the benefits, A, to exceed the investment, I, we have 0 < I/A < 1). In this case, all young firms, good or bad, will be able to attract stakeholders. Here the stakeholders’ lack of information regarding the new venture’s type does not affect the survival rate of new ventures. However, not all investments will be profitable ex post, as the bad new ventures will cause stakeholders to lose their investments.

When the perceived proportion of good new ventures in the population lies below the critical level (i.e., if γ < I/A), stakeholders will not be willing to invest without more information about firm quality. In the absence of mechanisms to address this situation, the familiar
adverse selection problem (see Akerlof, 1970) will cause this market to fail. No young firm, good or bad, will be able to attract stakeholders. Note that the critical level of $\gamma$ will depend on the costs of the stakeholder’s investment ($I$) and the benefits if the new venture is a good one ($A$), in fairly obvious ways. The lower the required investment, and the higher the benefit, the higher will be the willingness of the stakeholders to establish relations with new firms.

### 1.4.2 Directors as Signaling Vehicles

Clearly, good new ventures have an incentive to try to distinguish themselves from bad new ventures. This is most obviously the case when $\gamma < I/A$, that is, when no firms (good or bad) would be able to operate because no stakeholder would invest in any firm. But could also be true more generally if good firms were able to attract stakeholders on better terms than could bad firms. For simplicity, we will assume that the terms of the deal between a stakeholder and the firm in which it invests are fixed, and that the margin on which informational problems works involves only the stakeholder’s decision to sign on with a firm or not.

In the face of a potential market failure, we see a role for the appointment of outside directors (hereafter, simply referred to as “directors”) to a company’s board of directors as a vehicle by which a good new firm can try to send a credible signal of its quality. However, not all directors have the reputational capital necessary to send credible signals. We begin by considering the use of unknown directors (i.e., those with no reputational capital).
The game begins with new ventures offering directorships to outside agents at a wage, \( W^* \). We assume there is a large enough number of potential directors that they have no market power – if they are offered a wage that matches their other opportunities (i.e., their reservation wage), they will sign on with the offering firm. The game continues as described in the next section.

1.4.2.1 Extensive form of the game:

**Stage I:** The new venture offers the directorship at a wage \( W^* \) to a potential director. This offer is observed by all players.

**Stage II:** The potential director learns\(^1\) the new venture’s type (good or bad) and decides whether to accept or to reject the offer.\(^2\)

**Stage III:** The potential stakeholder observes the director’s decision and decides whether to establish working relations with the new venture.

**Stage IV:** Stakeholders learn the new venture’s type, and players receive their payoffs.

These stages are summarized below in figure one.

---

\(^1\) There may be a cost associated with informing oneself about the quality of a new venture, but we assume that this cost is part of the director’s reservation wage

\(^2\) Important here is our assumption that information is efficiently communicated to directors but not directly to stakeholders. In support to this assumption we suggest that there may be significant efficiencies associated with communicating with a single director rather than a large number of stakeholders. Also since the information conveyed is often strategically sensitive, the firm will not be anxious to have it to widely available.
1.4.2.2 Directors with no reputation

Assume that potential directors are unknown individuals with no particular reputation. They have a reservation wage \( W \), and are offered a compensation \( W^* \) if they accept the director’s position. A good new venture can produce revenue \( R \), whereas bad new ventures can produce revenue \( r \). Both types will produce zero revenue if they do not establish a working relationship with a stakeholder. Assume for the moment that \( R > r \) and that a potential director has complete information (i.e., she knows ex ante the new venture’s type).

If firms are able to attract stakeholders without hiring outside directors, they will not hire outside directors. This will be the case when all firms are able to attract stakeholders and there is no need for the firms to resort to specific signaling techniques. We thus have the following straightforward proposition.
Proposition 1: \(^3\)

In the model with directors, if \(\gamma \geq I/A\), a pooling equilibrium exists. Neither good nor bad new ventures will choose to hire outside directors for signaling purposes. All new ventures will be able to attract stakeholders.

The more interesting results relate to conditions under which directors can be helpful in reducing the adverse selection problem. Under certain conditions, good firms may be able to pay such a high premium to directors that bad firms will not be able to match it. While this premium raises the cost of hiring a director, it can also credibly signal the firm's quality to stakeholders, allowing the good firm to attract stakeholders and operate where this would not otherwise have been possible. This is established in Proposition 2.

Proposition 2:

In the model with directors, if \(\gamma < I/A\), \(R \geq W\), and \(R \geq r\), a separating equilibrium exists. In this equilibrium (i) good new ventures hire directors and pay them a wage of \(W^* = \max\{r, W\}\), (ii) bad new ventures do not hire directors, and (iii) stakeholders sign on only with good new ventures.

The hiring of a director in this case is a means by which a good firm can signal its type by "burning money" in a way analogous to the use of advertising to signal quality in the model of Kihlstrom & Riordan (1984). In this equilibrium, good firms pay so much to directors that

\(^3\) The proofs of all propositions are contained in the appendix.
bad firms cannot profitably imitate them. The equilibrium is supported by the belief by stakeholders that any director receiving a wage less than $W^*$ must be attached to a bad firm.

It is worth noting several points about proposition 2. First, in this equilibrium, while investments are all profitable for stakeholders ex post, we do not achieve the full-information, first-best outcome, as the signaling is costly. Second, if it were the case that $R \leq W$, the signal would be so costly that the outside director would not be hired and no signal would be given. A more complete market failure would thus occur. Third, stakeholders could hold different beliefs that would support a pooling equilibrium. For example, if $\gamma < I/A$ and stakeholders believe that the signal is meaningless, they will not sign on with either type, and regardless of the signal sent, the market returns to the pooling equilibrium in which no firm can attract stakeholders. This pooling equilibrium is vulnerable, however, to a refinement developed by Cho & Kreps (1987) and referred to as the “intuitive criterion.” To see this, consider the stakeholder’s response if he expected the pooling equilibrium but then observed a new venture deviate by offering a director a wage $W^* \geq r$. (It should be noted here that in non-public firms, the disclosure of directors’ compensation is not required by regulators. Good firms, however, may disclose this information voluntarily in order to signal their type.) The intuitive criterion suggests that in this case the stakeholder should infer that the firm must be a good one since a bad firm could not profit from such a deviation. According to the Cho-Kreps intuitive criterion then, the pooling equilibrium in this setting is not reasonable. (For a textbook treatment of the intuitive criterion, see Fudenberg & Tirole, 1992, pp.446-456).
The cost of the signal is determined by $r$ (as long as $r > W$). The higher $r$ is, the more costly the signal will be for the firm that has to pay the director at least $r$ in order to ensure that bad firms cannot imitate the signal. The following case suggests that hiring reputable directors can reduce the cost of the signal significantly.

1.4.2.3 Directors with reputations

Consider the case in which new firms hire outside directors with reputations as a signaling mechanism. We assume that directors’ reputations have been earned from activities outside the model – from a public history of success and truthful speaking, for example. Directors’ reputations act as a type of goodwill – they can be considered assets that pay dividends to the holders by allowing them to make credible promises that they would not otherwise be able to make. The promises of “reputable” directors are credible because their “reputational capital” would be damaged if they did not keep their promises or tell the truth.

We assume that a director suffers damage to her reputation when it becomes known to the stakeholders that this director accepted a directorship with a bad new venture. To avoid additional notation, we assume that all of a director’s reputational capital is lost when she attaches herself to a bad firm. Thus, we represent by $P$ both the current level of a director’s reputation and the punishment she suffers by joining a bad firm. The value of $P$ can vary from director to director but it is always observable to all parties. In fact, $P$ must be observable since it is determined by other people’s perceptions.
As in the former case, a director who signs on with a firm receives compensation $W^*$. In this case, however, we assume that the higher a potential director's reputation is, the higher will be his or her reservation wage (i.e., $W(P)$ is nondecreasing in $P$). To be willing to sign on with a firm, a director in this scenario must be compensated for not only her time, but also for any costs associated with a possible loss of reputation should the firm turn out to be a bad firm. Therefore, she will demand a wage of $W(P) + P$ from a bad firm, and a wage of only $W(P)$ from a good firm.

**Proposition 3:**

*In the model with reputable directors, if $γ < l/A$ and $R ≥ W(0)$, a separating equilibrium exists. In this equilibrium: (i) good new ventures hire directors with reputation $P^*$ and pay them wage of $W^* = r - P^*$ where $P^* = r - W(P^*)$, (ii) bad new ventures do not hire directors, and (iii) stakeholders sign on only with good new ventures.*

In this equilibrium, directors having reputations reduces the cost to the firm of using directors to signal quality because the reputations make hiring directors more expensive, and bad firms will be less able to afford the expense. Because directors with better reputations are likely to demand higher compensation, the new venture must choose from a range of potential directors the one that provides the needed signal at the lowest cost. $P^*$ is achieved when $r - P^* = W(P^*)$. Hiring a director with a greater reputation will increase the cost of the
signal in one way because it will result in a higher reservation wage. However, the greater is the director's reputation, the relatively more expensive he is for a bad firm and therefore the less the good firm needs to rely on burning money to distinguish itself from bad firms.

Straightforward comparative static analysis of the equilibrium conditions reveals that

\[ \frac{dP^*}{dr} = \frac{1}{1 + W'(P^*)} \geq 0 \quad \text{and} \]
\[ \frac{dW^*}{dr} = \frac{W'(P^*)}{1 + W'(P^*)} \geq 0 \]

Where \( W'(P^*) = \frac{dW(P^*)}{dP^*} \).

Therefore, as the profitability of bad firms approaches that of good ones, good firms must employ directors with higher reputations and pay them more.

We make two other points about this proposition. Again, if the signal is too costly to the good firm (i.e., \( R < W(0) \)), no signal is given and the complete market failure obtains.

Second, hiring the reputational capital of a director reduces the costs of signaling and leads to a more efficient solution only if a positive \( P \) exists that satisfies \( r - P \geq W(P) \). Thus, if reputable directors are too costly, the equilibrium will revert to that of Proposition 2. In the equilibrium of this proposition, investments are profitable ex post for stakeholders; if \( r \geq W(0) \), the cost of signaling is lower than in the "burning money" case.
1.4.3 Potential Directors with Incomplete Information.

In the previous step, we assumed that a director could obtain full information about firms (i.e., a director could learn ex ante the new venture’s type with certainty). Now we relax this assumption, and assume instead that a director observes the new venture’s type imperfectly. Specifically, we assume that the probability that a director is correct in her assessment is $\alpha$. The probability that a director is mistaken is thus $1 - \alpha$. Stakeholders, who observe a director’s decision to join a firm, update their beliefs about the firm’s type according to Bayes’ Rule. We also assume that all directors have the same information. All potential directors thus hold the same views about any given firm’s type, so a firm rejected by one director cannot keep “shopping” for a director until it finds one who believes it is a good firm.

1.4.3.1 Directors without reputations

If directors do not have reputations, their decisions about whether or not to join a firm cannot be affected by concerns about loss of reputation. The consequence is that directors can only be used as a way to burn money, as in Proposition 2. We thus have the following proposition.

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4 Without any loss of generality we will assume that $\alpha > 1/2$, noting that if $\alpha < 1/2$ then $1 - \alpha$ becomes a better predictor, since $1 - \alpha > 1/2$. Thus, $\alpha = 1/2$ implies that the directors cannot add information to that already held by stakeholders.
Proposition 4:

When directors have no reputations, the quality of their information about a firm's type does not affect the equilibrium (i.e., it is not affected by $\alpha$). If $\gamma < 1/A$, $R \geq W$, and $R \geq r$, a separating equilibrium exists. In this equilibrium: (i) good new ventures hire directors and pay them a wage of $W^* = r$, (ii) bad new ventures do not hire directors, and (iii) stakeholders sign on only with good firms.

1.4.3.2 Directors with reputations

Using Bayes' Rule, we define: $\beta = \frac{\alpha \gamma}{\alpha \gamma + (1 - \alpha)(1 - \gamma)}$ to be the probability that a new venture is of the good type, conditional on the director having information that it is of the good type. Given the potential damage to valuable reputations (assuming they exist), reputable directors will demand a premium over their reservation wages to compensate them for the possible loss of reputation, should it turn out that the firm is of the bad type. The following three propositions lay out the possibilities for equilibria in this case.

Proposition 5:

When the quality of directors' information is low (i.e., $\alpha$ is close to 1/2),$^5$ directors' reputations do not affect the equilibrium. In the model with reputable directors...
directors, if \( \beta > W(0) \), and \( R > r \), a separating equilibrium exists. In this equilibrium: (i) good new ventures hire directors and pay them wage of \( W^* = r \), (ii) bad new ventures do not hire directors, and (iii) stakeholders sign on only with good new ventures.

In this case, the quality of the information directors have about firm type is so poor that we return to the "burning money" result of Proposition 2, in which good firms hire directors who are willing to sign on for \( W^* = r \). Since only good firms hire directors, the reputations of those directors are irrelevant to hiring decisions.

If \( a \) is high enough, the use of reputable directors by good firms can reduce the cost of signaling. However, for good firms to take advantage of this possibility, it must be the case that bad firms cannot afford to compensate directors, who have the information that those firms are bad. We use Bayes' Rule again to define \( \delta = \frac{\alpha(1 - \gamma)}{\alpha(1 - \gamma) + (1 - \alpha)\gamma} \) as the probability that a new venture is of the bad type given that the directors have information that it is of the bad type. We then have the following proposition.

**Proposition 6:**

Consider a model in which there are reputable directors, \( 1 > \alpha, \beta > I_A \geq \gamma \), and \( R > r \). If \( r > R(1 - \alpha) + \alpha W^* \) (where \( W^* \) is as given below), a stochastic-

\( \alpha = 1/2 \) implies that \( \beta = \gamma \), and this proposition becomes identical to Proposition 1.
separating equilibrium exists in which: (i) a proportion of good firms given by \( \alpha \), and a proportion of bad firms given by \( 1 - \alpha \) hire directors and pay them a wage of \( W^* = r - \delta P^* \), where \( P^* = \frac{r - W(P^*)}{1 - \beta + \delta} \), (ii) \( 1 - \alpha \) of the good new ventures and \( \alpha \) of the bad new ventures cannot hire directors at the necessary wage, and (iii) stakeholders sign on only with new ventures that were able to hire directors.

The equilibrium is supported in part by stakeholders’ beliefs that any firm that has a director with \( P < P^* \) must be bad. The stochastic-separating equilibrium described here has the appealing property that it allows bad and good firms to coexist in equilibrium. The quality of the directors’ information determines the mix of good and bad firms in the population. And the familiar separating equilibrium is, therefore, a special case of the stochastic separating equilibrium, observed when the directors’ information is complete.

The contracts offered by both good and bad firms when directors have information about firm type must satisfy two conditions: (i) they must be too expensive for bad firms (about which directors have correct information) to compensate directors for their opportunity costs (including the expected value of damage to directors’ reputations) – this requires that \( W^* \geq r - \delta P \), and (ii) and they must compensate directors for their opportunity costs (including the expected value of damage to their reputations) \( W^* \geq W(P^*) + (1 - \beta)P^* \).

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6 The authors thank James Brander for suggesting the label for this type of equilibrium. Notice that this equilibrium is different from the "hybrid" equilibrium (see, e.g., Gibbons, 1992, pp. 202-205) in which one type of agent chooses a pure strategy and the other chooses to randomize. In the stochastic separating equilibrium, neither type of agent deliberately randomizes – the random outcomes are determined by moves of nature.
Here, the minimal cost of signaling is achieved when \( r - \delta P = \hat{W}(P) + (1 - \beta)P \). Since \( I/A < 1 \), and the better the information is (i.e., as \( \alpha \) approaches 1) the closer \( \beta \) will be to one, the condition \( \beta \geq \frac{I}{A} \geq \gamma \) is likely to be met when directors have very good information about firm types. It is worth emphasizing that \( \beta \) and \( \delta \) can be close to one even when \( \gamma \) is low if the information is good enough. Notice that the equilibrium level of reputation, \( P^* \), increases with the revenues of the bad firms, \( r \).

With further analysis of the comparative statics properties of this equilibrium, we can consider the effect on the equilibrium level of reputation, \( P^* \), of changes in two critical parameters: the accuracy of directors' information, \( \alpha \), and the initial proportion of good firms in the population, \( \gamma \).\(^7\) Straightforward calculations reveal that: (i) \( dP^*/d\gamma > 0 \), (ii) \( dP^*/d\alpha > 0 \) when \( \gamma > \frac{1}{2} \) and \( dP^*/d\alpha < 0 \) when \( \gamma < \frac{1}{2} \), and. (iii) \( dP^*/dr \geq 0 \), and (iv) if the reservation wage takes the form \( \hat{W}(P^*) = \hat{W} + \hat{W}(P) \), \( dP^*/d\hat{W} \leq 0 \).

The first condition indicates that as the proportion of good firms in the general population of firms increases, firms that hire directors will bring in directors with greater reputations. There are two reinforcing effects at work here. As \( \gamma \) increases, \( \beta \) (the probability that a firm is good given that it looks good to a director) increases while \( \delta \) (the probability that a firm is bad given that it looks bad to a director) decreases. This implies that a good firm will have to pay a smaller risk-compensating premium to high-reputation individuals, making it less expensive to hire them. At the same time, as \( \gamma \) increases \( \delta \) (the probability that a firm is bad

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\(^7\) The derivations of the following comparative statics results are included in the appendix.
given that it looks bad to a director) decreases. This means that a bad firm that directors believe is bad will have to pay a smaller premium as well, creating the need for higher reputations to prevent such firms from hiring directors at all.

The second condition reveals that the effect of improving the quality of directors’ information (\(\alpha\)) will depend on the initial distribution of types of firms. This is because the effects on \(\beta\) and \(\delta\) have opposing influences on the equilibrium reputation. Increasing \(\alpha\) will increase both \(\beta\) and \(\delta\). The net effect turns on the relative probability of directors seeing a firm as good or bad, and this depends on the initial distribution of types. When good firms are relatively scarce, increasing \(\alpha\) has a larger effect on \(\beta\) than on \(\delta\), with the result that the equilibrium level of reputation is higher. And when good firms are relatively common (\(\gamma > \frac{1}{2}\)) the reverse is true, giving us \(dP^*/d\alpha < 0\).

The third condition reveals that as the profitability of bad firms approaches that of good ones, good firms will choose directors with higher reputations. The forth condition suggests that the higher the intercept of the reservation wage of directors, the lower will be the optimal level of reputation.

The restriction that \(r > R(1 - \alpha) + \alpha W^*\) is imposed to guarantee that this solution is less expensive for good firms than simply burning money. If this condition does not hold (i.e., if \(r < R(1 - \alpha) + \alpha W^*\)), it suggests that bad firms are so unprofitable that good firms prefer to distinguish themselves by “burning money.” The equilibrium, then, is identical to that of proposition 2.
An important assumption underlying the result in Proposition 6 is that good firms that cannot attract directors will be out of luck and unable to operate. We can change this assumption and allow good firms that are not able to recruit a reputable director a second chance to signal their type by burning money (i.e., they can hire a director and offer him or her a wage of \( r \)). If a good firm has such a second chance, the condition \( r > R(1-\alpha) + \alpha W^* \) is not relevant. Good firms first try to hire reputable directors. If they fail, they can offer directors a wage of \( r \). In this scenario, in equilibrium, all good new ventures are able to hire directors. However, some lucky bad new ventures will successfully hire directors as well.

Figure 2 illustrates the effect of the quality of the directors’ information about firm type on the different equilibria offered in this section.

Figure 1.2 –The Effect of Directors’ Information about Firm Type on Signaling Outcome

<table>
<thead>
<tr>
<th>0</th>
<th>( \gamma )</th>
<th>( \beta )</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>No need for signal</td>
<td>Stochastic</td>
<td>Directors’ info</td>
<td></td>
</tr>
<tr>
<td>all firms attract stakeholders</td>
<td>separating equilibrium</td>
<td>not good enough</td>
<td></td>
</tr>
<tr>
<td>( \gamma ) and ( \beta ) are bounded between zero and one</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \alpha = 1/2 ), ( \beta = \gamma ); when ( \alpha = 1 ), ( \beta = 1 );</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Recall that:
- \( \gamma \) is a director’s perceived probability that a randomly selected firm is good
- \( \beta \) is the updated probability that a firm that a director thinks is good actually is good
- I/A is the ratio of stakeholders’ investment to the gain from a good firm
- I/A, \( \gamma \) and \( \beta \) are bounded between zero and one
- \( \beta \) is bounded between \( \gamma \) and one. When \( \alpha = 1/2 \), \( \beta = \gamma \); when \( \alpha = 1 \), \( \beta = 1 \);
1.4.4 When the Good Type's Revenue is Lower than that of the Bad Type (i.e., R<r)?

Unlike other adverse selection models, our model does not require that good new ventures be more profitable than other ventures. In contrast to investors, care only about the profitability of the firms in which they may invest, some stakeholders may care more about other attributes of the firm such as its employment conditions or environmental standards than they do about its profitability. We therefore recognize that new ventures that stakeholders consider to be good are not necessarily the most profitable. Significantly, different sets of stakeholders may care about different attributes at the same time.

If R<r, burning money will not going to work as signaling device – bad firms have more money to burn than do good firms. Therefore, if directors have no reputations and \( \gamma<l/A \), neither good nor bad new ventures will be able to attract stakeholders. When directors can be assessed according to reputation, and they have enough information to distinguish good firms from bad, the ability of firms to “rent” directors’ reputational capital becomes even more important – it may be the only way for good firms to signal their distinction from bad firms.

A separating equilibrium exists similar to the equilibrium presented in proposition 3.

In this case, even when R≤r, the separating equilibrium may obtain since bad new ventures have to compensate directors for their potential loss of reputation. We recognize that serving different stakeholder interests might demand that the firm hire a number of directors, each with the kind of reputational capital that protects the interests of a certain group of stakeholders. For example, placing a prominent environmentalist on a board might attract environmentally sensitive customers, but it might not help potential employees who may be
wondering about future working conditions. Such potential employees might be better served by the appointment of a director with a reputation for managing employee-friendly firms. The new venture may then need to find a variety of types of directors to serve on the board.

As with the earlier case, we may observe the stochastic separating equilibrium seen in Proposition 6 if information is incomplete. In this case, however, good firms cannot choose to signal their type by burning money and the condition \( r > R(1 - \alpha) + \alpha W^* \) is not required. We thus have the following proposition.

**Proposition 7:**

In the model with reputable directors with incomplete information, when \( 1 > \alpha, \beta \geq \frac{I}{A} \geq \gamma, \ R > W^*, \) and \( R < r, \) a stochastic separating equilibrium exists. In this equilibrium: (i) the proportion of good new firms \( \alpha \) and the proportion of bad firms \( 1 - \alpha \) hire directors at a wage of \( W^* = r - \delta P^* \), where

\[
P^* = \frac{r - W(P^*)}{1 - \beta + \delta},
\]

(ii) \( 1 - \alpha \) of the good type and \( \alpha \) of the bad type do not hire directors, and (iii) stakeholders sign on only with new ventures that hire directors.
1.5 SUMMARY AND DISCUSSION

This paper was motivated by a desire to shed light on a particular strategy available to new firms to enhance their survival prospects: using outside directors to signal the high quality of the firm. The formal model developed here enables us to examine not only whether this strategy is feasible, but also the factors that determine its effectiveness.

We have shown that in the face of a market failure, in which stakeholders refuse to invest in aligning themselves with new firms about which they have too little information, good new ventures may be able to signal their type by burning money. Signaling by burning money, however, is costly. Moreover, when a good firm’s revenue is lower than that of bad firms, signaling by burning money is impossible.

By appointing reputable directors, a good new venture can significantly reduce the cost of signaling. Moreover, when a good firm’s revenue is lower than that of the bad firms, only reputable directors can provide the needed signal. Because directors with better reputations are likely to demand higher compensation, the new venture must choose from a range of potential directors the one that provides the needed signal at the lowest cost.

Appointing reputable directors is a compelling signaling vehicle, yet it is not always feasible. When directors have incomplete information regarding the new venture type, stakeholders, who have to take into account the possibility that the signal of the directors is inaccurate,
may not establish working relations with any of the new ventures. The better is the directors’ information, the less likely a market failure will occur.

We have demonstrated that even directors with incomplete information can serve as middlemen, provided they have some information that can be added to that of the stakeholders. An important feature of our results is that directors need both reputations and additional information in order to provide the signal of high quality. When directors have no reputations, the quality of their information does not affect the equilibrium, and when they have no additional information, their reputation is of no use.

Four critical parameters in our analysis affect the optimal level of directors’ reputations: (i) The proportion of good firms in the new venture population, (ii) the quality of information directors have, (iii) the revenue of the bad firms, and (iv) directors’ reservation wages. The higher the proportion of good firms in the population and the higher the revenue of the bad firms, the higher will be the optimal level of directors’ reputation. On the other hand, the higher directors’ reservation wage is, the lower will be the optimal level of directors’ reputation. The effect of directors’ information on the optimal level of directors’ reputation depends on the percentage of good new ventures in the population. If the majority of new ventures are good, then the higher the quality of directors’ information, the higher will be the optimal level of their reputation. Whereas, if the majority of the firms in the population are of the bad type, the better the quality of directors’ information, the lower will be the optimal level of directors reputation.
1.5.1 Literature Related to Boards of Directors

This paper contributes to the literature concerned with the roles of boards of directors by highlighting the signaling role of directors. Despite abundant research on the role of directors in linking firms to critical entities in their environments (see Finkelstein & Hambrick 1996 for a review), scholars have seldom directly addressed this signaling role. It is worth emphasizing that the strategy of using reputable directors as signaling vehicles is significantly different from the strategy of co-opting an employee of another organization to a firm’s board of directors (see Pfeffer & Salancik, 1978). Whereas the former strategy assists in linking the firm to numerous entities in its environment, the latter links the firm only to a single organization in its environment. Moreover, our analysis has shown the effects of several parameters on the effectiveness of this strategy.

1.5.2 Signaling Theory

We believe that the “stochastic separating equilibrium” demonstrated here is novel. This type of equilibrium obtains when the middleman’s (the director’s) information regarding the firm quality is incomplete. On the one hand, the “stochastic separating equilibrium” can be seen as a pooling equilibrium since both types of new ventures (good and bad) choose the same action – they offer directors a wage of W*. On the other hand, it appears to be a separating equilibrium because the directors serve to distinguish, to some extent, the good new ventures from the bad. As long as directors have information beyond that which stakeholders have, the
proportion of good firms among all new ventures that attract directors will be higher than in the initial population.

The stochastic separating equilibrium concept may well be applicable in a broader set of models that incorporate signaling through middlemen. This equilibrium has an important realistic feature in that it permits the coexistence of both good and bad types of firms in equilibrium without pure pooling. The quality of the middlemen's information determines the mix of these types in the population. The familiar separating equilibrium can be seen in this context as a special case of the stochastic separating equilibrium, obtained when the middlemen's information is complete.

1.5.3 Future Research

This paper offers interesting avenues for future research: First, we have a set of testable propositions for future empirical investigation. For example, do new firms seeking to establish credibility with stakeholders tend to employ high-reputation directors and, if so, does this improve their ability to attract stakeholders? Second, future research could explore the implications of relaxing the assumption that different outside directors give non-conflicting signals. Another avenue of exploration might consider the effect of directors' compensation schemes on the effectiveness of using them as signaling vehicles. The recent trend toward compensating outside directors with incentive pay may affect their credibility as
middlemen because incentive pay may offset the potential loss of reputation suffered by the directors who attach themselves to the bad firms.

1.5.4 Implications for Practitioners

The results of our analysis have important normative implications for practitioners. The main implication is that, under certain conditions, high-quality, young firms may enhance their survival prospects by hiring reputable directors. Signaling efforts should be directed towards stakeholders who need to invest a high relationship-specific investment in establishing working relations with the young firms, and whose benefits from these relationships are not expected to be high. Furthermore, because directors who are more reputable are likely to demand higher compensation, firms should not necessarily hire the most reputable director available, but rather the one whose reputation is sufficient to provide the needed signal. Finally, firms should bear in mind that it is not sufficient to hire reputable directors in order to provide a credible signal. It is also necessary to provide the director with high-quality information regarding the firm. By providing directors with such high quality information, firms can not only increase the probability they will attract stakeholders, they can also reduce their signaling costs.
1.6 CONCLUSIONS

We have seen that high-quality new ventures can enhance their survival prospects by signaling their quality through reputable directors. Both the level of directors' reputation and the quality of their information determine the effectiveness of this strategy. Firms can choose from a range of potential directors the one who provides the needed signal at the lowest cost. When the information directors have is incomplete, good and bad firms may coexist in equilibrium.
1.7 REFERENCES


1.8 APPENDIX

1.8.1 Proof of Proposition 1

The proof proceeds by demonstrating that in the proposed equilibrium every agent (and agents of each type) is optimizing subject to the strategies of the other agents.

The expected profit of the stakeholder $E(\Pi_s) = \gamma A - I$ when $\gamma \geq I/A$ is non-negative and stakeholders are willing to sign on with any new venture selected at random.

The good new ventures' payoff, $\Pi_g = R - W^*$, is maximized when $W^* = 0$ (i.e., when they do not hire directors); The bad type's payoff, $\Pi_b = r - W^*$, is also maximized when $W^* = 0$.

The stakeholder could not be doing any better, since staying out of the game offers no benefits, whereas randomly choosing a new venture offers a positive expected benefit. The good new ventures have no incentive to buy a costly signal because the stakeholder will establish working relations in any case.\(^8\) Bad new ventures have no incentive to distinguish themselves from good ones. Potential directors who are not offered any wage would not participate in this game.

\(^8\) Of course, this can be relaxed if a new venture seen to be good is able to attract stakeholders on better terms.
1.8.2 Proof of Proposition 2

The equilibrium is supported by beliefs on the part of stakeholders that if they observe the signal (the hiring of the director at a wage $W^* > r$), the new venture is a good one, and if they do not observe the signal, the new venture is a bad one. In this equilibrium the payoffs are as follows:

The stakeholder’s payoff: $\Pi_s = A - I > 0$.

The good new venture’s payoffs: $\Pi_g = R - W^*$

The bad new venture’s payoffs: $\Pi_b = 0$

The director’s payoff: $\Pi_D = W^*$ (or, net of opportunity cost, $W^* - W_*$)

The stakeholder could not be doing any better since the signal costs nothing and provides full information. The good new venture is making a positive profit; this profit would fall to zero if the venture chooses not to signal since potential stakeholders would infer that it was a bad type and would not sign on. The director’s wage of $W^*$ cannot be lower than $r$, since the good firm must offer a wage that prevents the bad type from imitating the signal. This wage must also be higher than the director’s reservation wage. Therefore, $W^* = \max \{ r, W \}$.

The bad firm is shut out of this market and makes zero profits, as the cost of the signal is greater than the revenue it would derive by attracting the stakeholder (i.e., $W^* \geq r$). The directors will sign on because $W^* \geq W$. Therefore, every agent is optimizing, and only good new ventures attract stakeholders.
1.8.3 Proof of Proposition 3

As in the previous case, the equilibrium is supported by stakeholders' beliefs that if they observe the signal, the new venture is of the good type, otherwise it is of the bad type. In this equilibrium the payoffs are as follows:

The stakeholder’s payoff: \( \Pi_s = A - I > 0 \)

The good new venture’s payoffs: \( \Pi_g = R - W^* \)

The bad new venture’s payoffs: \( \Pi_b = 0 \)

The director’s payoff: \( \Pi_D = W^* \) [or net of reservation wage = \( W^* - W(P) \)]

As in proposition 2, the stakeholder could not be doing any better since the signal costs nothing and provides full information. The good new venture is making a positive profit; this profit would fall to zero if the venture chooses not to signal since potential stakeholders would infer that it was a bad type and would not sign on. A good venture should offer a director a wage of \( W^* \), which must be higher then \( r - P \) to ensure that the bad type cannot imitate the signal. It must also be higher than \( W(P) \) or directors will not participate. Since the good type maximizes its payoff when \( W^* \) is minimized, it would choose \( P \) such that \( r - P = W(P) \). Any change in \( P \) will cause an increase in \( W^* \). The bad new ventures are shut out of this market and make zero profit. They can not hire a director because the director’s wage \( W^* \) plus the required compensation for the director’s potential loss of reputation, \( P \), is greater than the revenue the bad type would derive by attracting the stakeholder. Directors will sign on with the good firms because \( W^* \geq W(P) \). They would not sign on with the bad new venture if the offered wage does not compensate for the potential loss of reputation (i.e., \( W^* \leq W + P \)). Therefore, every agent is optimizing.
1.8.4 Proof of Proposition 4

When directors have no reputation, they have no reputation to lose (i.e. \( P = 0 \)) and are thus indifferent between holding a directorship in a good new venture and holding a directorship in a bad new venture. The proof, therefore, is similar to the proof of proposition 1.

1.8.5 Proof of Proposition 5

Stakeholders would participate only if their expected payoff \( E(\Pi_s) \) is positive. Since \( E(\Pi_s) = (A - I)\beta - I(1 - \beta) \geq 0 \), stakeholders will participate only if \( \beta \geq \frac{1}{A} \).

When the director’s compensation is \( r \), the director’s reputation does not affect the equilibrium. Therefore, this equilibrium will be identical to the equilibrium in proposition 1 (see proof of proposition 1).

1.8.6 Proof of Proposition 6

The equilibrium is supported by beliefs on the part of stakeholders that directors would accept a directorship only in firms that directors perceive as good new ventures. In this equilibrium, the expected payoffs are as follows:

The stakeholder’s expected payoff: \( E(\Pi_s) = (A - I)\beta - I(1 - \beta) \).

The good new venture’s payoffs if it hires a director: \( \Pi_g = R - W^* \)
The bad new venture's payoffs: $\Pi_b = r - W^*$.  

Both types' payoff is zero if a director is not hired. 

The director's expected payoff: $E(\Pi_D) = W^* - (1 - \beta)P = \overline{W}(P)$  

The stakeholder could not be doing any better because the signal costs nothing and the expected payoff is positive. The good type's expected profit is positive, but would fall to zero if it did not hire a director. The good type will choose to use directors with reputations as long as the expected payoff is higher than using directors with no reputations and paying them a wage of $r$ (i.e., $\alpha(R - W^*) + (1 - \alpha)0 > R - r$). Rearranging this condition, we get $r > R(1 - \alpha) + \alpha W^*$. Note that when $W^* = r$, a separating equilibrium exists, in which all good new ventures operate. In the stochastic-separating equilibrium, on the other hand, a proportion of the good firms given by $(1 - \alpha)$ does not survive and, therefore, gain zero payoff.  

A director's wage of $W^*$ must not be lower than $r - \delta P$ to ensure that directors will not choose to sign on with new ventures that the directors perceive as bad. $W^*$ must also not be lower than $\overline{W}(P) + (1 - \beta)P$, otherwise directors would refuse to participate. Since good new ventures maximize their payoff when $W^*$ is minimized, they would choose $P$ such that $r - \delta P = \overline{W}(P) + (1 - \beta)P$. Therefore, any change in $P$ will cause an increase in $W^*$. The bad firm will offer the same wage if $r > W^*$, otherwise its payoff will be zero. Bad new ventures will successfully hire directors only when directors erroneously perceive them as good. Therefore, every agent is optimizing.
1.8.7 Proof of Proposition 7

The proof here is similar to the proof of proposition 6. In this proposition, however, because \( r > R \), it is not possible to signal by burning money. Therefore, the condition \( r > R(1 - \alpha) + \alpha W^* \) is not relevant.

1.8.8 Proof of Comparative Statics

Recall 
\[
P^* = \frac{r - W(P^*)}{1 - \beta + \delta}
\]

where 
\[
\delta = \frac{\alpha(1 - \gamma)}{\alpha(1 - \gamma) + (1 - \alpha)\gamma}
\]

\[
\beta = \frac{\alpha\gamma}{\alpha\gamma + (1 - \alpha)(1 - \gamma)}
\]

Let \( 1 - \beta - \delta = D \), so 
\[
P^* = \frac{r - W(P^*)}{D}
\]

\[
DP^* = r - W(P^*)
\]

Total differentiation reveals

\[
DdP + P \frac{dD}{d\gamma} d\gamma = -W' dP
\]

and

\[
DdP + P \frac{dD}{d\alpha} d\alpha = -W' dP
\]

so

\[
\frac{dP}{d\gamma} = \left( -\frac{P}{D + W'} \right) \frac{dD}{d\gamma}
\]

and

\[
\frac{dP}{d\alpha} = \left( -\frac{P}{D + W'} \right) \frac{dD}{d\alpha}
\]

\[
\frac{dD}{d\gamma} = -\frac{d\beta}{d\gamma} + \frac{d\delta}{d\gamma} = -\frac{\alpha(1 - \alpha)}{[\alpha\gamma + (1 - \alpha)(1 - \gamma)]^2} - \frac{\alpha(1 - \alpha)}{[\alpha(1 - \gamma) + (1 - \alpha)\gamma]^2} < 0
\]

Thus, we see that:
\[
\frac{dP}{d\gamma} \left( -\frac{P}{D+W} \right) \frac{dD}{d\gamma} > 0
\]

Then for,

\[
\frac{dD}{d\alpha} = -\frac{d\beta}{d\alpha} + \frac{d\delta}{d\alpha} = \frac{-\gamma(1-\gamma)}{[\alpha\gamma + (1-\alpha)(1-\gamma)]^2} + \frac{\gamma(1-\gamma)}{[\alpha(1-\gamma) + (1-\alpha)\gamma]^2}
\]

so we see that \( \frac{dD}{d\alpha} > 0 \) if \( \alpha\gamma + (1-\alpha)(1-\gamma) > \alpha(1-\gamma) + (1-\alpha)\gamma \)

or if \( \alpha(1-\alpha) < (1-\alpha)(1-\alpha) \gamma \)

since \( \alpha > \frac{1}{2} \) by assumption we know that \( \alpha > (1-\alpha) \)

so \( 1-2\gamma < 0 \Rightarrow \gamma > \frac{1}{2} \)

Thus \( \frac{dD}{d\alpha} > 0 \) if \( \gamma > \frac{1}{2} \)

\( \frac{dD}{d\alpha} < 0 \) if \( \gamma < \frac{1}{2} \)

\[
\frac{dP}{d\alpha} = \left( -\frac{P}{D+W} \right) \frac{dD}{d\alpha}
\]

Thus \( \frac{dP}{d\alpha} < 0 \) if \( \gamma > \frac{1}{2} \)

\( \frac{dP}{d\alpha} > 0 \) if \( \gamma < \frac{1}{2} \).
CHAPTER 2

META-ANALYTICAL REVIEWS OF BOARD COMPOSITION AND STRATEGIC DECISIONS
2.1 ABSTRACT

Various academic studies focus on boards of directors' lack of independence from management as a possible explanation for their failure to fulfill their monitoring role. Yet a recent meta-analysis on board composition and firm performance has found little evidence of a systematic relationship between them and concluded that further research in this area would therefore not likely be fruitful. Another stream of research suggests that rather than examining the monitoring effectiveness of a board, using the firm's performance as a proxy for board monitoring effectiveness, a more accurate evaluation of board monitoring effectiveness might be gained by examining the adoption of strategic decisions that involve a conflict of interests between management and shareholders. A recent review of the effect of board composition on discrete strategic decisions, however, has found that research evidence is rather equivocal.

This study provides meta-analyses for the relationship between board composition and seven strategic decisions of the firm in which a potential conflict of interest between managers and shareholders exist. Results provide evidence for the presence of systematic positive relationships between board composition and the following strategies: unrelated diversification, takeover defenses, debt intensity and CEO turnover; and negative relationships between board composition and the following strategies: R&D intensity and the intensity of CEO incentive pay. No systematic relationship was found between board composition and CEO total compensation. Moreover, I evaluate the extent to which the
systematic relationships found across strategies are consistent with the predictions of theoretical perspectives that address the effects of board composition on the firms' strategic decisions. These findings suggest that research on board composition and strategic decisions offers interesting avenues for future research. The implications of these findings for practice are also discussed.

2.2 INTRODUCTION

A firm's board of directors is often considered an important mechanism for limiting managers' self-serving behavior when a firm's managers and owners have conflicting goals (Eisenhardt, 1989). Yet there is evidence that boards do not always protect shareholders' interests (Mace, 1971; Patton & Baker, 1987). The adoption of poison pills by corporations, for example, suggests that boards do not always prevent managers from employing self-serving tactics, many of which may be in conflict with shareholders' interests (Davis, 1991).

Various academic studies focus on boards' lack of independence from management as a possible explanation for their failure to fulfill their monitoring role (Finkelstein & Hambrick, 1996). Accordingly, it is hypothesized in the literature that the more independent the board, the more effective will be the board's monitoring of management. However, the results of numerous studies that have tried to establish an empirical relationship between measures of
the level of independence of a board and firm performance have been mixed and inconsistent
(Dalton, Daily, Ellstrand, & Johnson, 1998; Finkelstein & Hambrick, 1996; Zahra & Pearce,
1989). In response to these mixed findings, several researchers have conducted meta-
analytical reviews on the relationship between board composition and firm financial
performance. These provide little evidence of a systematic relationship between board
composition and firm financial performance (e.g., Dalton et al., 1998; Rhoades, Rechner &
Sundaramurthy, 2000).

Another stream of research suggests that, rather than examining the monitoring effectiveness
of a board, using the firm's financial performance as a proxy, a more accurate evaluation of
board monitoring effectiveness can be gained by examining the adoption of strategic
decisions that involve a conflict of interest between management and shareholders (e.g.,
Kosnik, 1987; 1990; Mallette & Fowler, 1992; Sundaramurthy, 1996). A recent review of the
effect of board composition on discrete strategic decisions has found, however, that the
evidence regarding this relationship is rather equivocal (Bhagat & Black, 1999).

The purpose of the present study, then, is twofold. First, I examine whether a systematic
relationship exists between board composition and each of several discrete strategic decisions
of a firm, each of which has been addressed in the literature as involving potential conflicts
of interest between managers and shareholders. Second, I evaluate the extent to which the
systematic relationships found across strategies are consistent with the predictions of
different theoretical perspectives that address the effects of board composition on the firm's
strategic decisions. To achieve these ends, I provide seven meta-analyses of relevant strategic
decisions on which I could obtain data: unrelated diversification, takeover defenses, R&D intensity, debt intensity, a CEO’s total compensation, the intensity of a CEO’s incentive pay, and CEO turnover.

2.3 Board Composition

A belief widely held among researchers and practitioners is that more outside directors on a firm’s board of directors will increase its effectiveness (e.g., Zahra & Pearce, 1989). This belief is consistent with agency theory rationale, which predominates in the study of board composition (Johnson, Daily & Ellstrand, 1996). Agency theorists argue that in situations in which there is a conflict of goals between the managers (the agent) and the shareholders (the principal), the former are likely to select self-serving actions at the expense of the latter’s welfare (Fama, 1980; Fama & Jensen, 1983a; 1983b; Jensen & Meckling, 1976). A firm’s board is therefore considered an important mechanism for limiting managers’ self-serving behavior (Eisenhardt, 1989). By virtue of their employment with the firm, inside directors are beholden to a CEO for their career (Patton & Baker, 1987); they are therefore unlikely to monitor the CEO’s actions effectively. A higher representation of outside directors is likely to provide better monitoring, so the argument goes.
Another perspective that highlights the benefits associated with the presence of outside directors on a firm's board is resource dependence. This perspective addresses the role of outside directors as boundary-spanning agents of the firm who link the firm to important resources (Pfeffer, 1972; Pfeffer & Salancik, 1978).

In contrast, Baysinger & Hoskisson (1990) highlight the benefits associated with having a high representation of inside directors. Their argument is based on the notion that inside directors' superior information enables them to evaluate and reward the CEO on the basis of the quality of his or her strategic decisions at the time of the decision making (ex ante), whereas boards dominated by outside directors tend to reward the CEO on the basis of the outcomes of those decisions (ex post). The implication of tying the CEO's rewards to financial performance, however, can entail "skewing the direction of managerial effort away from the optimally risky strategies that many shareholders prefer" (Baysinger & Hoskisson, 1990, p.80). According to this view, a lack of information means not only that outside-dominated boards cannot efficiently monitor complex strategic decisions, but also that by tying a CEO's compensation to firm performance, they discourage the CEO from adopting shareholders' preferred strategies.
2.4 Strategic Decisions

In this paper, I focus on seven strategic decisions addressed in the literature as involving potential conflicts of interests between a firm’s shareholders and its managers, and on which I could obtain data to conduct meta-analyses: unrelated diversification, takeover defenses, R&D intensity, debt intensity, a CEO’s total compensation, the intensity of a CEO’s incentive pay, and CEO turnover.

2.4.1 Unrelated diversification

Unrelated diversification, whereby a firm diversifies its offerings into areas unrelated to its current offerings, reduces the non-systematic risk of firms; shareholders can diversify more efficiently through the stock market. Although unrelated diversification often has an adverse effect on a firm’s value, and bidders’ returns on acquisitions are often negative (e.g. Jensen, 1986; Kaplan & Weisbach, 1992; Lang & Stulz, 1994), CEOs often use this strategy to diversify their employment risk (Amihud & Lev, 1981). Moreover, the acquisition of firms can serve CEOs’ aspirations for empire building (Benston, 1985; Myers, 1983) as well as provide the higher compensation that is associated with the management of a larger firm (Tosi & Gomez-Mejia, 1989).

Given the potential conflict of interest between shareholders and managers, the latter are expected to increase the diversification of the firm in order to reduce the risk of bankruptcy, which is often followed by CEOs’ loss of income and tenure and damaged reputation.
(Amihud & Lev, 1981). Thus, according to agency theory, boards with a higher representation of outside directors are expected to mitigate managers' self-serving behavior by limiting the firms' level of unrelated diversification. This reasoning leads to the following hypothesis:

Hypothesis 1a: There is a negative relationship between the fraction of independent directors on firms' boards of directors and the level of firms' unrelated diversification.

In contrast, proponents of insider-controlled boards argue that outside directors often lack the required information to effectively control strategic decisions (Baysinger & Hoskisson, 1990). Moreover, because outside directors often reward the CEO with performance-contingent compensation, this type of board composition may encourage the CEO to diversify the risk of a firm failure. Therefore, a competing hypothesis can be derived:

Hypothesis 1b: There is a positive relationship between the fraction of independent directors on firms' boards and the level of firms' unrelated diversification.
2.4.2 Takeover defenses

Takeover defenses are adopted to deter hostile takeovers. Indeed, Pound (1987) found that the adoption of takeover defenses decreases the likelihood of takeover attempts by 26%. Whereas CEOs favor the adoption of takeover defenses because they protect their positions and provide CEOs with more freedom from the disciplining influence of the market for corporate control, it has been argued that takeover defenses have negative effects on shareholders' wealth (Mallette & Fowler, 1992). For example, research indicates that poison pills, a common takeover defense, have a significant negative effect on a firm's stock price (Malatesta & Walkling, 1988; Ryngaert, 1988). Furthermore, stock prices typically decline following court decisions that validate poison pills, and rise following court decisions that invalidate them. This negative wealth effect may stem from the reduced likelihood that firms that don’t adopt a poison pill strategy will be targets of acquisition, which typically results in an abnormal increase in share prices (De Angelo & Rice, 1983; Jarrell & Poulsen, 1988; Malatesta & Walkling, 1988; Ryngaert, 1988). On average, the stock price increase on tender offers is about 30% (Jensen & Ruback, 1983).

Proponents of takeover defenses, on the other hand, argue that these defenses are in shareholders’ best interests. It has been argued, for example, that takeover defenses allow managers to adopt strategies, such as R&D strategies, that have short-term costs but that lead to long-term benefits to the firm (Drucker, 1984), and enable the board to extract a higher price from takeover bidders (Brickley, Coles & Terry, 1994). Research findings, however, have not been able to show empirically that firms with takeover defenses invest more in long-term projects than do firms that do not adopt such defenses (Mallette, 1991). On the
basis of the existing evidence, it appears that the adoption of takeover defenses serves managers' goals at the expense of those of shareholders (Mallette & Fowler, 1992; Sundaramurthy, 1996; Walsh & Seward, 1990).

According to agency theory, given the inherent conflict of interests between a firm's shareholders and its managers in the adoption of takeover defenses, an independent board is expected to disapprove of the adoption of takeover defenses. This reasoning leads to the following hypothesis:

**Hypothesis 2:** There is a negative relationship between the fraction of independent directors on firms' boards and the rate of adoption of takeover defenses.

### 2.4.3 R&D intensity

An investment in R&D is a high risk-high return strategy (Hay & Morris, 1979). The high return results from the quasi-monopoly rents accruing to the investor following a successful innovation; the high risk comes from the high failure rate of innovation, which has been estimated to be as high as 80-88% (Mansfield, 1969). The characteristics of this strategy create a conflict of interests between the managers of the firm and its shareholders. Whereas an investment in R&D may be in the best interests of shareholders, who can anticipate high performance and are able to diversify the inherent risk by holding a diversified stock
portfolio (Hay & Morris, 1979), this kind of investment is less attractive to managers who have to bear the consequences of a potential failure.

According to agency theory, given the apparent conflict of interests between shareholders and managers regarding the desired level of a firm’s R&D expenditures, an independent board is likely to increase firms’ investment intensity in R&D. This reasoning leads to the following hypothesis:

Hypothesis 3a: There is a positive relationship between the fraction of independent directors on a firm's board and the intensity of that firm's R&D expenditures.

Proponents of inside-controlled boards argue that outside directors often lack the required information to control effectively complex decisions such as the optimal level of R&D investment. Moreover, because outside directors often evaluate managers on the basis of performance criteria, managers will shy away from R&D projects that are risky (Baysinger & Hoskisson, 1990) but that offer long-term returns at the expense of current profits (Baysinger & Hoskisson, 1989). Hence, according to this view, a competing hypothesis is derived:

Hypothesis 3b: There is a negative relationship between the fraction of independent directors on a firm’s board and that firm’s intensity of R&D expenditures.
2.4.4 Debt intensity

The extent to which a firm depends on debt in financing its activity is a fundamental strategic decision. Research that has examined the determinants of corporate borrowing has found that firms in the real world rely more on internal funds and less on external funds than would be optimal based on pure economic criteria (Donaldson, 1961; 1969, cited by Mizruchi & Stearns, 1994). Myers (1984) argues that this phenomenon is explained by the reduction in managerial autonomy that is associated with external financing. Because financial institutions often exercise power over the firms they lend to, managers tend to prefer to use internal capital rather than rely on external funds. Moreover, in the case of payment default by the firm, control rights are often transferred to large creditors (Agarwal & Knoeber, 1996), thus reducing a CEO's power.

Another managerial consideration against increasing a firm's leverage by borrowing is the higher risk of bankruptcy that is involved (Grossman & Hart, 1982). Bankruptcy may lead not only to the dismissal of the CEO (Wagner, Pfeffer & O'Reilly, 1984), but may also damage the CEO's prospects for future employment (Gilson, 1989; 1990).

Resource dependence theory, which highlights the importance of decreasing a firm's dependence on its environment, views outside directors as an important vehicle by which the firm can gain access to external funding (Pfeffer & Salancik, 1978). Firms that wish to rely
on high levels of external funding for their activities are therefore likely to increase the representation of outside directors on their boards (Pfeffer, 1972).

The first argument above suggests that a higher representation of outside directors on a board will lead to higher debt intensity, while the second argument suggests that firms that want to increase their borrowing will choose outside directors for their boards, and therefore, offers a reversed causality. Both arguments suggest a positive relationship between firm’s debt intensity and the percentage of outside directors on its board, leading to the following hypothesis.

**Hypothesis 4:** There is a positive relationship between the fraction of independent directors on a firm’s boards and that firm’s debt intensity.

### 2.4.5 CEOs’ total compensation

Although it is often argued that a high level of CEOs’ total compensation enables firms to attract and retain high quality CEOs (Gomez-Mejia & Welbourne, 1988), the high level of compensation awarded to the CEOs of publicly traded corporations is often criticized (Loewenstein, 1994). In the decade of the 1980s, for example, the total compensation to the CEOs of the 365 largest corporations in the US grew 212%, whereas returns to the shareholders grew by only 78% (Byren, 1991). Because CEOs prefer the highest compensation level possible, a central monitoring function of a firm’s board is determining
an appropriate compensation for its CEO (Kesner, 1988). Because, the CEO determines the compensation of inside directors, but not that of outside directors', outside directors are more likely to mitigate the CEO’s compensation level.

Hypothesis 5: There is a negative relationship between the fraction of independent directors on a firm’s board and the level of its CEO’s total compensation.

2.4.6 Intensity of CEO’s incentive pay

Including performance-contingent pay in a CEO’s compensation package aligns his or her goals to those of shareholders (e.g. Jensen & Murphy, 1990). Contingent pay, however, may reduce a CEO’s willingness to implement risky strategies (Milgrom & Roberts, 1992). The results of studies that have examined whether tying managers’ compensation to firm performance that aims to maximize shareholders’ wealth are equivocal. Some studies have shown a positive relationship (e.g. Coughlan & Schmidt, 1985; Murphy, 1985), whereas others found little or no relationship (e.g. Kerr & Bettis, 1987). There is a growing consensus among researchers from different disciplines, however, that increasing the use of incentives in a manager’s compensation package increases the firm’s control over top managers (Zajac & Westphal, 1994). The business community also shares this view. For example, institutional investors use their power to increase the proportion of long-term incentives in CEOs’ compensation (David, Kochhar, & Levitas, 1998). For managers, however, non-contingent compensation is often preferred because it ensures a stable income (Tosi & Gomez-Mejia,
Consistent with agency theory's rationale, then, outside directors' independence from the CEOs enables them to increase the intensity of performance-contingent pay in CEOs' compensation.

Baysinger and Hoskisson (1990) argue that a board dominated by outside directors can be expected to reward the CEO on the basis of firm performance. They argue that inside directors' superior information enables them to evaluate the quality of a CEO's strategic decisions ex ante, whereas boards dominated by outside directors tend to reward the CEO on the basis of firm performance ex post. Both arguments, then, suggest the following hypothesis:

**Hypothesis 6:** There is a positive relationship between the fraction of independent directors on a firm's board and the level of its CEO's incentive pay.

### 2.4.7 CEO turnover

High CEO turnover is often a symptom of firms' distress (Wagner, Pfeffer & O'Reilly, 1984). Indeed, abnormal stock returns around the time of the resignation announcement date indicate that removing bad management increases firm value (Weisbach, 1988). Whereas shareholders have an interest in replacing a failing CEO, the CEO is likely to exercise whatever power he or she possesses to avoid dismissal (Brady & Helmich, 1984). Being fired
from a failing firm damages the CEO's reputation, and reduces his or her chances of being employed by other firms (Gilson, 1989; 1990). Hence, an independent board will likely be better able to dismiss a CEO than a board dominated by inside directors (Mizruchi, 1983; Fredrickson, Hambrick & Baumrin, 1988). The preceding discussion leads to the following hypothesis:

_Hypothesis 7: There is a positive relationship between the ratio of independent directors on a firm's board and the CEO turnover._

The next section describes the methods used to test these hypotheses.

### 2.5 METHOD

#### 2.5.1 Sample

I obtained the data to test the hypotheses developed in the previous section from previously published empirical studies that reported a relationship between any of the seven strategic decisions under consideration and board composition. However, these relationships were not necessarily the focus of the empirical studies I used. Any study that reported a relevant correlation of the variables was included in my meta-analyses. To identify relevant studies, we conducted computer-aided searches of the following databases: ABI/Inform, Social
Science Index, and JSTOR. Using the Web of Science. I also searched the reference lists of the studies that we identified earlier, as well as the studies that cited those identified earlier. Several iterations of this process took place until no further studies were identified.

We obtained 38 studies with 69 samples (N = 30,650). These studies are presented in Appendix 1 to Appendix 7. Several studies include multiple samples that stem from multiple indicators of both strategic decisions and different measures of board independence. We analyzed these samples separately. I divided my sample into seven subgroups according to the seven strategic decisions of interest. The number of studies, sample size and the number of samples included in each sub-group are presented in Table 1 below.

2.5.2 Meta-analytic Procedure

We conducted the meta-analyses for this research according to guidelines recommended by Hunter & Schmidt (1990), and used the software “Comprehensive Meta Analysis” to analyze the data (Borenstein & Rothstein, 2000). Meta-analysis is a statistical method for aggregating results across individual studies. To obtain the observed correlation-weighted mean and to calculate the observed standard deviation, each correlation that is obtained from individual studies is weighted by the sample size used in the original study. The total variability across the individual correlations may stem from true variation in the population, as well as from statistical artifacts such as sampling error, reliability and range restriction (Hunter & Schmidt, 1990). Lacking data regarding potential artifacts, I corrected for sampling-error, and used a conservative reliability estimate of 0.8 (e.g. Dalton, Daily, Johnson & Ellstrand,
An indicator for a significant relationship is when zero is not included within the 95 percent confidence interval (e.g. Dalton et al., 1999).

2.6 RESULTS

The results of the meta-analysis of board independence and each of the seven strategic decisions are presented in Table 2.1 below.

**TABLE 2.1: The Relationship Between Board Independence and Firms' Strategic Decisions**

<table>
<thead>
<tr>
<th>Strategic Decision</th>
<th>Sample Size</th>
<th>No. of studies</th>
<th>No. of samples</th>
<th>Obs. r</th>
<th>Corr. r</th>
<th>Obs. Std.</th>
<th>Corr. Std.</th>
<th>90% credibility interval</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrelated Diversif.</td>
<td>3,830</td>
<td>12</td>
<td>13</td>
<td>.03</td>
<td>.04</td>
<td>.12</td>
<td>.11</td>
<td>-.11; .18</td>
<td>.00; .06</td>
</tr>
<tr>
<td>Takeover defenses</td>
<td>7,185</td>
<td>4</td>
<td>4</td>
<td>.08</td>
<td>.08</td>
<td>.10</td>
<td>.10</td>
<td>-.05; .22</td>
<td>.05; .10</td>
</tr>
<tr>
<td>R&amp;D intensity</td>
<td>1,179</td>
<td>6</td>
<td>6</td>
<td>-.13</td>
<td>-.15</td>
<td>.11</td>
<td>.10</td>
<td>-.27; -.02</td>
<td>-.19; -.08</td>
</tr>
<tr>
<td>Debt intensity</td>
<td>4,894</td>
<td>11</td>
<td>14</td>
<td>.12</td>
<td>.14</td>
<td>.09</td>
<td>.08</td>
<td>-.04; .24</td>
<td>.01; .15</td>
</tr>
<tr>
<td>CEO total Compens.</td>
<td>1,348</td>
<td>7</td>
<td>7</td>
<td>.04</td>
<td>.05</td>
<td>.09</td>
<td>.06</td>
<td>-.04; .13</td>
<td>-.01; .09</td>
</tr>
<tr>
<td>Incentive intensity</td>
<td>3,526</td>
<td>6</td>
<td>6</td>
<td>-.06</td>
<td>-.07</td>
<td>.1</td>
<td>.1</td>
<td>-.20; .07</td>
<td>-.09; -.03</td>
</tr>
<tr>
<td>CEO Turnover</td>
<td>8,688</td>
<td>16</td>
<td>19</td>
<td>.11</td>
<td>.13</td>
<td>.09</td>
<td>.08</td>
<td>.02; .23</td>
<td>.09; .13</td>
</tr>
</tbody>
</table>
The results for board independence and the level of firms' unrelated diversification, based on 13 samples obtained from 12 studies (N=3,830), indicate support for a systematic relationship. The corrected mean correlation estimate is a modest .04, and zero is just on the lower bound of the 95 percent confidence interval, indicating that the population value of the relationship under consideration is only marginally different from zero. Thus, although not strong, we obtained some support for Hypothesis 1b. A systematic and stronger positive correlation was found between board independence and the adoption of takeover defenses. The corrected mean correlation estimate is .08, and the 95 percent confidence interval does not include zero, a result that is inconsistent with Hypothesis 2. This result is based on four samples from four studies (N= 7,185). Contrary to the prediction of Hypothesis 3a -- that there is a positive relationship between board independence and a firm's R&D intensity – the results here indicate a systematic negative relationship between these two variables. Thus, the results provide support to the alternative hypothesis -- Hypothesis 3b. The corrected mean correlation estimate is -.15, and the 95 percent confidence interval does not include zero. This result is based on six samples from six studies (N=1,179). The results for the relationship between board independence and a firm's debt intensity provide support to Hypothesis 4, which predicted a positive correlation between these two variables. The corrected mean correlation estimate is .14, and the 95 percent confidence interval does not include zero. The analysis is based on 14 samples from 11 studies (N= 4,894). Hypothesis 5 predicted a negative relationship between board independence and the level of a CEO's total compensation. The results, based on seven samples from seven studies (N= 1,348), do not support this hypothesis. The corrected mean correlation estimate is .05. The 95 percent
confidence interval, however, includes zero; therefore, there is no indication that my estimate shows the true relationship between the two variables. Hypothesis 6 predicted a positive relationship between board independence and the level of intensity of a CEO's incentive pay. Contrary to this prediction, the results indicate a systematic negative relationship between these two variables. The corrected mean correlation estimate is -.07, and the 95 percent confidence interval does not include zero. This result is based on six samples from six studies (N=3,526). Finally, a systematic positive correlation was found between board independence and the rate of CEO turnover. The corrected mean correlation estimate is .13, and the 95 percent confidence interval does not include zero. This result is based on 19 samples of 16 different studies (N= 8,688).

2.7 SUMMARY AND DISCUSSION

This study provides a comprehensive analysis of the true relationships in the population between board composition and several strategic decisions available to firms in which a potential conflict of interest between managers and shareholders exists. The examination of these instances provides insights into the relationship between board composition and effective board monitoring (Kosnik, 1987; 1990; Mallette & Fowler, 1992; Sundaramurthy, 1996). The results provide evidence for the presence of systematic relationships between board composition and a firm's strategic decisions. The results revealed a positive
relationship between board composition and the following strategies: unrelated
diversification, takeover defenses, debt intensity, and CEO turnover, and a negative
relationship between board composition and the following strategies: R&D intensity and the
level of intensity of a CEO’s incentive pay. No systematic relationship was found between
board composition and a CEO’s total compensation.

This study’s contribution lies not only in estimating the true relationship between board
composition and the extent to which a specific strategy was adopted, but also in evaluating
the extent to which the predictions of a theoretical framework are consistent with the
estimates of the systematic relationships across several strategies. This wide outlook sheds
new light on an extensively studied area in corporate governance research.

Overall, the results of this study provide little support to agency theory’s predictions. The
positive relationship between board composition and both the level of a firm’s unrelated
diversification and takeover defenses contradicts the argument that a higher proportion of
outside directors will influence CEOs to adopt riskier strategies, as preferred by shareholders.
Also, whereas the same rationale predicts a positive relationship between board composition
and a firm’s R&D intensity, we have found a systematic negative relationship, which
contradicts this prediction.

The negative relationship between board composition and the intensity of a CEO’s incentive
pay is another result that is inconsistent with agency theory’s prediction. Managers often
prefer non-contingent compensation because it ensures a stable income (Tosi & Gomez-
Mejia, 1994), yet the use of incentives in managers’ compensation increases the firm’s control over top managers (Zajac & Westphal, 1994). Therefore, a higher proportion of outside directors is expected to enforce performance contingent pay to CEOs.

Finally, the positive relationship between board composition and both the rate of CEO turnover and a firm’s leverage are consistent with agency theory’s predictions. Whereas shareholders have an interest in replacing a failing CEO, the CEO is likely to exercise whatever power he or she possesses to avoid dismissal (Brady & Helmich, 1984). Thus, a positive relationship between board composition and CEO turnover can be indicative of a board’s monitoring effectiveness. In the same manner, a positive relationship with debt intensity can be indicative of monitoring effectiveness because managers’ use of external funds is lower than the optimal level predicted by pure economic criteria (Donaldson, 1961, 1969).

The positive relationship found between board composition and debt intensity is also consistent with the argument within the resource dependence literature that outside directors provide firms with better access to lenders (Pfeffer & Salancik, 1978). Firms that need high levels of external funding for their activities are, therefore, likely to increase the representation of outside directors on their boards (Pfeffer, 1972). It is worth mentioning that meta-analysis can establish the best estimate for true population relationships between two variables, yet it cannot isolate the cause of this relationship (Dalton et al., 1999). Therefore, when using meta-analysis it is not possible to determine whether a demonstrated relationship,
which is consistent with certain theoretical perspectives, is a function of one particular theoretical perspective or another.

My findings across strategies support Baysinger and Hoskisson's (1990) propositions, yet they challenge an important assumption on which their propositions rest. In the present study, outside-dominated boards were found to be positively associated with the level of a firm's diversification and negatively associated with a firm's R&D intensity, as proposed by Baysinger and Hoskisson (1990). However, these propositions explicitly assume that because outside directors lack the required information to monitor strategic decisions, when the choice of evaluation method is in their hands, "top management is likely to be rewarded on the basis of objective financial performance criteria" (p.79). Because the results here indicate a negative relationship between the degree of representation on a board of outside directors and the intensity of a CEO's performance-contingent pay, this result challenges the assumption on which Baysinger and Hoskisson (1990) based their propositions.

2.7.1 Limitations

Publication bias, which stems from the tendency to publish only significant findings, presents the greatest methodological threat to the validity of a meta-analysis. Indeed, it was found that effect sizes in published studies are higher than in non-published studies (Smith, 1980). Although all 69 samples of my study stem from published research work, only 26 samples focused on the relationships under consideration in this study. The rest were derived from
control variables to which the publication bias does not pose a threat. The publication bias in
the present study is therefore not expected to be significant.

2.7.2 Future Research

Whereas a recent meta-analysis on board composition and firm performance concluded that
further research in this area is not expected to be fruitful (Dalton et al., 1998), my findings
suggest that research on board composition and strategic decisions offers interesting avenues
for future research. First, longitudinal studies are required in order to shed light on the
direction of causality in the systematic nonzero relationships that were estimated. For
example, the finding regarding the debt intensity was consistent with two theoretical
frameworks: agency theory and resource dependence. Future research may provide further
understanding of whether board composition affects a firm’s debt intensity or vice versa.
Second, the magnitude of the credibility intervals suggests the presence of factors that
moderate the relationships that were estimated (see Koslowsky & Sagie 1993). Although a
lack of available data prevented us from investigating potential moderators, we encourage
future research to unveil these factors. An example of a possible moderator is directors’
compensation scheme, which has shifted in recent years towards performance-based
compensation. Finally, these findings emphasize the need to develop a conceptual framework
that could enhance our understanding of the relationship between board composition and
firms’ strategic decisions.
2.7.3 Implication for Practice

The results of the meta-analysis conducted in this study have implications for practice. The findings do not lend support to the widespread belief within the business community that a more independent board is a better guardian of shareholders' interests. Hence, policy makers, regulators and institutional investors should reconsider their demand to increase the percentage of independent directors on the boards of publicly traded corporations. Outside directors' goals may diverge from those of shareholders, in which case effective monitoring of outside directors can only be achieved through incentives that align directors' goals with those of shareholders. However, such incentives could be given, alternatively, to inside directors. Given that inside directors usually have better access to the needed information to fulfill their monitoring role than do outside directors, the efficacy of increasing the percentage of outside directors is questionable.
2.8 REFERENCES


2.9 APPENDIX

2.9.1 Studies Relied on for Unrelated Diversification

Baysinger et al., 1991
Beekun et al., 1998
Hermalin & Weisbach, 1988
Hill & Snell, 1988
Hoskisson et al., 1994
Johnson et al., 1993
Judge & Zeithaml, 1992
Pearce & Zahra, 1992
Sanders & Carpenter, 1998
Sheppard, 1994
Zajac & Westphal, 1994
Zajac & Westphal, 1996

2.9.2 Studies Relied on for Takeover Defenses

Buchholtz & Ribbens, 1994
Coles & Hesterly, 2000
Davis, 1991
Mallette & Fowler, 1992

2.9.3 Studies Relied on for R&D Intensity

Barnhart & Rosenstein, 1998
Baysinger et al., 1991
Hill & Snell, 1988
Hoskisson et al., 1994
Sanders & Carpenter, 1998
Zahra, 1996

2.9.4 Studies Relied on for Debt Intensity

Barnhart & Rosenstein, 1998
Cochran et al., 1985
Daily & Dalton, 1994
Daily, 1995
Hoskisson et al., 1994
Mallette & Fowler, 1992
Pearce & Zahra, 1992
Pfeffer, 1972
Sheppard, 1994
Zahra, 1996
Zajac & Westphal, 1994
2.9.5 Studies Relied on for CEO Total Compensation

Boyd, 1994
Conyon & Peck, 1998
David et al., 1998
Fizel & Louie, 1990
Mangel & Singh, 1993
Sanders & Carpenter, 1998
Seward & Walsh, 1996

2.9.6 Studies Relied on for CEO Incentive Intensity

Beatty & Zajac, 1994
David et al., 1998
Sanders & Carpenter, 1998
Seward & Walsh, 1996
Westphal & Zajac, 1994
Zajac & Westphal, 1994

2.9.7 Studies Relied on for CEO Incentive Intensity

Alexander et al., 1993
Boeker, 1992
Daily, 1995
David et al., 1998
Denis & Sarin, 1999
Diacon & O'Sullivan, 1995
Fizel & Louie, 1990
Hermalin & Weisbach, 1988
Judge & Dobbins, 1995
Mallette & Fowler, 1992
Mangel & Singh, 1993
Molz, 1988
Ocasio, 1994
Sanders & Carpenter, 1998
Westphal & Zajac, 1994
Young et al., 2000
CHAPTER 3

DOES DIRECTORS’ COMPENSATION MATTER? THE INFLUENCE OF STOCK-BASED PAY ON FIRM R&D
3.1 ABSTRACT

In this paper, I examine the effects of outside directors' stock-based compensation on one indicator of board monitoring effectiveness: a firm's R&D intensity. The results of the study suggest that both the percentage of an outside director's compensation that is stock-based and the proportion of stock options within it are positively related to the level of the firm's R&D expenditures. Moreover, the study finds that stock-based compensation moderates the relationship between board composition and R&D intensity. These results highlight the need to reevaluate previous research findings that addressed the effects of board composition on both firm performance and firms' strategic decisions.

3.2 INTRODUCTION

There has been a trend in the last decade toward including stocks and stock options in outside directors' compensation. This trend is manifested not only in the greater percentage of corporations that now include stock-based compensation in directors' pay, but also in the rise in the relative weight of incentive pay as part of directors' overall compensation. Whereas in 1990 only 17 percent of firms included some form of stock-based pay in their directors'
compensation, by 1996 this figure reached nearly 80 percent, and recently some firms have begun to compensate their directors exclusively with stock-based compensation (Daily, Certo, & Dalton, 1999).

The community of institutional investors has been an active proponent of including stock-based compensation as a complementary measure to increasing the representation of outside directors on corporate boards. The main rationale is that stock-based compensation more closely aligns outside directors’ goals to those of shareholders, and provides incentives for vigilant board monitoring of management decisions (Carey, Elson & England, 1996). In contrast, Daily et al. (1999) warn that corporations that adopt stock-based compensation for outside directors enter a potential minefield. These authors suggest that to avoid potential criticism, firms should be cautious in adopting this practice, at least until there is sound evidence that this compensation scheme does in fact benefit stockholders. This debate reflects the fact that to date we simply do not know whether including stock-based compensation in outside directors’ pay improves boards’ monitoring performance.

This paper attempts to fill this important gap in our knowledge. First, I examine the relationship between the percentage of stock-based components in outside directors’ pay and one indicator of board monitoring effectiveness: a firm’s R&D expenditures. An examination of firms’ R&D expenditures provides a good indication of board monitoring effectiveness because investment in R&D represents a strategic decision in which managers and shareholders may have conflicting interests (Hansen & Hill, 1991). This approach is consistent with numerous studies that have evaluated the effectiveness of board monitoring.
by studying strategic decisions in which a potential conflict of goals exists between managers and shareholders (e.g., Kosnik, 1987; 1990; Mallette & Fowler, 1992; Sundaramurthy, 1996). Second, I examine whether stock-based compensation moderates the relationship between board composition and firm R&D expenditure.

3.3 R&D Expenditure

Investment in R&D not only increases a firm’s risk, but also involves a temporal trade-off in which, to some extent, the firm sacrifices short-term financial performance for long-term performance gains (Laverty, 1996). Over the long term, R&D investment can be expected to improve the performance of products and services, to facilitate learning, and to improve the capacity of firms to absorb needed knowledge from their environment for future innovation (Cohen & Levinthal, 1990). However, the payoffs of successful R&D investment are only appreciated in the long run, whereas in the short run such investment can adversely affect a firm’s financial performance (David, Hitt & Gimeno, 2001). In addition, R&D investments are inherently risky (Baysinger, Kosnik & Turk, 1991; Graves & Langowitz, 1993), with a high probability of failure (Finkelstein & Boyd, 1998).
Managers and shareholders have conflicting interests regarding R&D expenditures because they differ both in their temporal preferences, and in their attitudes toward risk (David et al., 2001). Shareholders usually favor investment in R&D because they are able to mitigate against the risk inherent in R&D decisions by holding shares of multiple firms (Hansen & Hill, 1991), and because R&D expenditures can increase firm value. In contrast, managers are often preoccupied with safety, which leads them to under-invest in long-term, risky projects (Hirshleifer & Thakor 1992). The increasing mobility of managers further motivates them to under-invest in R&D, because the long-term effects of this strategy might only manifest after they have already left the firm (Rumelt, 1987), whereas a short-term increase in financial performance is realized immediately, enabling managers to demonstrate superior ability to the job market (Campbell & Marino, 1994), and more rapidly enhance their reputations (Narayanan, 1985). Therefore, because managers may serve their own interests at the expense of shareholder wealth by skewing R&D expenditures lower, more vigilant board monitoring is expected to be manifested in higher R&D expenditures of firms (Kosnik, 1990).

3.4 THEORY AND HYPOTHESES

According to agency theory, a firm's board is considered an important mechanism for limiting managers' self-serving behavior in situations in which a firm's managers and its
owners have conflicting goals (Fama & Jensen, 1983). For this reason, board reformists demand the inclusion of outside directors on corporate boards to ensure their independence from top management (Davis, 1991, Mace, 1971). This demand is based on the belief that inside directors, by virtue of their employment with the firm, are beholden to a CEO for their career (Patton & Baker, 1987), and are therefore less likely to monitor the CEO’s actions effectively. In contrast, outside directors are expected to provide more vigilant monitoring in order to maintain their reputations and avoid liability lawsuits (Fama, 1980; Fama & Jensen, 1983). It has been found, however, that not all outside directors perform as effective stewards of shareholders’ interests as expected (e.g., Jensen & Murphy, 1990).

Researchers have suggested several reasons for this ineffective monitoring. First, challenging a CEO is often costly, whereas complying with a CEO may be important in being offered directorship positions (Davis, 1993; Davis & Thompson, 1994). Challenging management might also reduce the likelihood of outside directors being offered attractive consulting contracts by the CEO (Singh & Harianto, 1989). Second, directors’ exposure to lawsuits is substantially limited by insurance available to them and to officers of corporations (Brook & Rao, 1994; Core, 1997). Finally, because outside directors usually hold time-consuming positions with other firms, they often lack the time to effectively fulfill their monitoring role (Lorsch & Maclver, 1989). Outside directors, therefore, may have little incentive to fulfill their supervisory role beyond the minimum required level (Hambrick & Jackson, 2000).

Recognizing that outside directors are themselves self-serving agents (Davis & Thompson, 1994; Mallette & Fowler, 1992), and given the increasing demand of directors to have stock-
based compensation in their pay, the remainder of this section addresses the effectiveness of this practice. First, I address the main effect of both outside directors' stock pay, and their stock-option pay on firms' R&D expenditure. I then address the moderating effect of these compensation schemes on the relationship between board independence and R&D expenditure.

3.4.1 Stock-Based Compensation

Agency theory has been the predominant theory guiding compensation research in recent years (Bloom & Milkovich, 1998). Agency theory assumes that agents (in this case, directors) are self-serving individuals who are effort- and risk-averse (Jensen & Meckling, 1976; Levinthal, 1988). Given this expected self-serving behavior, there is a need to implement mechanisms to support the alignment of agents' goals with those of the principals (in this case, shareholders) in order to induce agents to act in the principals' best interests (Jensen & Murphy, 1990). Performance-based compensation has become institutionalized as a legitimate, widely accepted mechanism for motivating agents to fulfill their role (Zajac & Westphal, 1995). This notion is supported by much of the compensation research (e.g. Abowd, 1990). Equity-based compensation in particular, where an agent participates in the gains of the organization's performance, has been found to provide incentives to promote the firm's value (Kosnik & Bettenhausen, 1992; Shleifer & Vishny, 1997). For example, there is evidence that the greater the percentage of stock-based compensation in executive pay, the smaller the likelihood that executives will engage in activities that damage shareholders'
interests, such as paying greenmail, a payment made to a potential raider to get him or her to terminate a takeover attempt (Kosnik, 1987). Because outside directors are themselves self-serving agents (Davis & Thompson, 1994; Mallette & Fowler, 1992), this rationale suggests that including stock-based compensation in directors’ pay will help align their goals to those of shareholders, thus providing appropriate incentives for directors to monitor CEO actions more vigilantly (Carey et al., 1996). As discussed earlier, given that under-investment in R&D serves managers’ interests at the expense of shareholder wealth, effective board monitoring is expected to be manifested in higher R&D intensity. We thus have the following hypothesis:

**Hypothesis 1:** The percentage of stock-based compensation in a director’s pay is positively related to the firm’s R&D intensity.

### 3.4.2 Stock Options

There are important differences in the risk characteristics of stock pay and stock-option pay (Marcus, 1981; Tufano, 1996). Stock pay ties the agent’s wealth to shareholders’ wealth, regardless of whether firm value rises or drops. In contrast, payment in the form of stock options, which are granted with low market value, tie the agent’s wealth to that of shareholders’ more closely when the value of the firm rises than when the firm’s market value drops. Moreover, the value of stock options increases when the volatility of a firm’s value increases (Black & Scholes, 1973). Therefore, whereas risky strategies may result in a
loss of wealth for an agent who is compensated in stock shares, the same strategies can mainly benefit an agent who is compensated in stock options.

The difference in risk characteristics between compensation in stocks and compensation in stock options results in distinctly different effects on agents' behavior (Sanders, 2001). Decision makers exhibit risk aversion when they have something to lose, and risk loving when there is nothing to lose (Kahneman & Tversky, 1979). Therefore, substantial stock ownership often increases, rather than decreases, managers' risk aversion and their willingness to adopt risky strategies, which shareholders often favor (Sanders, 2001). In contrast, stock options mitigate the effects of managers' risk aversion because they give managers incentives to adopt risky projects (Hemmer, Kim & Verrecchia, 1999; Hirshleifer & Suh, 1992). Given the inherent risk in R&D investment, and the effect that stock option pay can have on agents' (directors') willingness to adopt risky strategies, the following hypothesis is derived:

\[ \text{Hypothesis 2: The higher the percentage of stock options in director's stock-based compensation, the higher will be the firm's R&D intensity.} \]

3.4.3 Board Composition

A widely held belief among researchers and practitioners is that a high representation of outside directors on a firm's board increases its monitoring effectiveness (e.g., Zahra &
Pearce, 1989). This belief is consistent with the agency theory rationale that when directors are dependent on a CEO they are less likely to objectively monitor his or her actions (Johnson, Daily & Ellstrand, 1996; Pearce & Zahra, 1992). Outside directors are believed to be more independent than inside directors (Beatty & Zajac, 1994; Pearce & Zahra, 1992), who may be beholden to a CEO for their career (Patton & Baker, 1987). Moreover, as managers, inside directors are likely to have interests that are more closely aligned with those of the CEO than with those of shareholders (Johnson, et al., 1996). Thus, agency theory predicts a positive relationship between outside directors’ representation on a board and R&D intensity.

Highlighting the benefits associated with a high representation of inside directors, Baysinger & Hoskisson (1990) propose the reverse relationship. They argue that the superior information available to inside directors enables them to evaluate and reward the CEO on the quality of his or her strategic decisions, whereas boards dominated by outside directors tend to reward the CEO only on the basis of the firm’s financial performance. Tying CEO rewards to financial performance may result in "skewing the direction of managerial effort away from the optimally, risky strategies that many shareholders prefer" (p.80).

Earlier empirical studies have found a negative relationship between outside directors’ representation on a firm’s board and that firm’s R&D expenditures (e.g., Baysinger, et al., 1991; Hill & Snell, 1988). It is important to note, however, that these studies were conducted at a time when compensating outside directors with stock-based pay was not common
practice. Consequently, these earlier results may suggest that a high representation of outside directors is not, by itself, sufficient to ensure effective board monitoring.

Consistent with agency theory, the present study argues that assuring a high representation of outside directors and providing them with appropriate incentives are complementary measures in enhancing the monitoring performance of boards. Outside directors, whose goals often conflict with those of shareholders, are unlikely to be willing to accept the various costs associated with challenging the CEO's decisions unless appropriate incentives are in place. As well, even if outside directors are motivated to protect shareholders' interests through appropriate incentives, because board decisions are group based, a higher representation of outside directors increases a board's ability to influence board decisions (Lipton & Lorsch, 1992). Based on this logic and the previous discussion of compensation schemes, the following two hypotheses are derived:

*Hypothesis 3: The interaction between the percentage of outside directors on boards and the percentage of stock-based compensation in a directors' pay is positively related to a firm's R&D intensity.*

*Hypothesis 4: The interaction between the percentage of outside directors on boards and the percentage of stock options in a director's stock-based compensation is positively related to the firm's R&D intensity.*
3.5 METHODS

3.5.1 Sample

Data from three archival data sources was combined for this study. Directors’ compensation data was taken from Standard & Poor’s ExecuComp database. The data comprised information on directors’ compensation for the S&P 1500 firms between 1997 and 2000. Accounting and financial data was drawn from Standard & Poor’s Research Insight. Data on institutional investors’ ownership, and on board composition was drawn from the Investor Responsibility Research Center, Corporate Governance Service. To allow for entry and exit in my sample, any firm that was included in the S&P 1500 for at least one year between 1997-2000, and on which the relevant data could be obtained, was included in the initial sample. For the current analysis, I used initial imbalanced panel data of 2,316 firms’ years, which, after the loss of observations caused by lagging the independent variables, resulted in a sample of 1,578 firm-years.

3.5.2 Variables

The dependent variable used was R&D intensity. R&D intensity was a firm’s reported annual R&D expenditure per employee. This measure has been used in several previous studies (e.g. Graves, 1988; Hill & Snell, 1988), and has been found to be less sensitive to spurious effects.

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9 To mitigate concerns about sample bias, I conducted the analyses also on the non-lagged independent variables, that is with the full sample, and similar results were obtained.
such as business cycles and accounting manipulation than R&D expenditures per sale (Baysinger, et al., 1991). The independent variables of interest were stock-based intensity, and stock-option intensity. Stock-based intensity is the sum of the value of stock and stock options that were granted to an outside director during a firm’s fiscal year, divided by the sum of an outside director’s annual cash retainer, annual cash meeting fees, and stock-based intensity. The value of the stock granted was calculated by multiplying the number of shares granted to an outside director during a firm’s fiscal year by the closing price of the company’s stock in that fiscal year. The value of the stock options granted was calculated by multiplying the number of stock options granted to an outside director during a firm’s fiscal year by the average value of a firm’s stock options\textsuperscript{10} that were granted to the company’s executives during that fiscal year. Stock-option intensity was the value of stock options that were granted to an outside director during a firm’s fiscal year divided by the stock-based intensity.

The estimation included several control variables in the model to account for other factors that might affect R&D intensity. These variables included outside directors (the percentage of non-employee directors on a firm’s board); firm size (the logarithm of total sales), which has been shown to be related to both R&D intensity (Baysinger, et al., 1991) and directors’ compensation (Boyd, 1996); institutional investors’ holdings (the percentage of firms’ outstanding common shares owned by institutional investors); and directors’ and executives’ holdings (the percentage of a firm’s outstanding common shares owned by the firm’s

\textsuperscript{10} Using the S&P Modified Black-Scholes Method
directors and executives). Previous studies have suggested that directors’ and executives’ equity holdings assist in aligning their goals to those of shareholders (Hambrick & Jackson, 2000; Zahra, 1996), and therefore may affect R&D intensity. Systematic risk (the firm’s Beta obtained from the CAPM model) was also controlled for. According to the CAPM model, a firm’s systematic risk is the amount of price variation that can be explained by the overall market variation. Because the agent has less control over the firm performance when systematic risk is high, in these cases higher incentive pay can negatively influence the behavior of agents, rather than align their goals to shareholders’ interests (Bloom & Milkovich, 1998). Two measures of firm performance are also included: return on assets (ROA) and return on equity (ROE). High levels of firm performance have been shown to be related to R&D intensity (Chaney & Devinney). Firm leverage (the ratio of total debt to total equity). Because firm leverage affects the ability of firms to obtain long-term debt (Baysinger & Hoskisson, 1989), it is expected to affect its R&D intensity. Firm liquidity (the ratio of total current assets to current liabilities) was also included, as firm leverage accounts for short-term resources available to the firm (Hansen & Hill, 1991) and is therefore expected to affect R&D intensity.
Table 3.1 presents the descriptive statistics including means, standard deviations, and correlations of the variables used in this study. Table 3.2 presents the results of the panel data analysis of five models, in which all of the independent variables are in t-1. To control for possible unobserved industry effects, I have grouped the firms by their industries at the four-digit SIC level, and run the regressions as a fixed-effect model (see Greene, 1993). A year trend variable was incorporated into the models to account for differences across time. Model 1 reports the results for the control variables. Notably, the coefficient for outside directors' representation is positive and significant (p = 0.049). This result is not consistent with the results of earlier studies, which report a negative relationship between non-employee directors' representation and a firm's R&D intensity (e.g. Baysinger et al., 1991; Hill & Snell, 1988).

Overall, the results provide strong support for three out of the four hypotheses of this study, whereas the fourth hypothesis is only weakly supported. In Model 2, stock-based intensity is introduced in addition to the control variables. The positive and significant (P < 0.000) coefficient for stock-based intensity supports hypothesis 1 that stock-based intensity is positively related to a firm’s R&D intensity. Hypothesis 2 predicts that the higher the percentage of stock-option intensity, the higher a firm’s R&D intensity will be. Model 3, includes stock-option intensity in addition to the variables that were included in model 2. The

\[ \text{Controlling for industry, also helps addressing concerns about reverse causality -- that high-risk high-return industries tend to compensate directors with stock-based compensation.} \]

\[ \text{Similar results were obtained when year dummies replaced the year trend.} \]
coefficient for stock option intensity is positive and significant (P<0.015), and, therefore, supports hypothesis 2.

### TABLE 3.1: Descriptive statistics and Correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>s.d.</th>
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<th>3</th>
<th>4</th>
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<th>9</th>
<th>10</th>
<th>11</th>
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<td>Year</td>
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<td>ROE</td>
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<td>.05</td>
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<td>.224</td>
<td>.246</td>
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(Std. Err in parenthesis)

† P<.10
* P<.05
** P<.01
*** P<.001
Hypothesis 3 predicts that the interaction between outside directors and the intensity of stock-based compensation is positively related to a firm’s R&D intensity. In Model 4, I included this interaction in addition to the variables that were included in Model 3. The positive and significant coefficient for the interaction (P < 0.000) supports hypothesis 3. In order to understand the implications of this significant interaction, I followed the standard methodology for interpreting moderators (Cohen & Cohen, 1983). Accordingly, I computed the high and low values of the variables included in the interaction by adding and subtracting, respectively, the variables’ standard deviations to the variables’ means. These values are then substituted into the estimated regression model, while fixing the other variables at their mean values.

Figure 1 presents a plot of the interaction between the percentage of outside directors and stock-based intensity in predicting a firm’s R&D intensity. It reveals that when stock-based intensity is high, there is a positive relationship between the percentage of outside directors and R&D intensity. However, when stock-based intensity is low, there is a negative relationship between these variables. The negative relationship when stock-based intensity is low is consistent with the findings of earlier studies, which, as mentioned earlier, were conducted before compensating directors with stock-based compensation became common practice. Another interesting result highlighted by this plot is that when the representation of outside directors is low, the level of stock-based compensation will only have a small effect on R&D intensity. However, when representation of outside directors is high, the intensity of stock-based compensation will have a significant impact.
By setting to zero the partial derivative of R&D intensity with respect to outside directors, I estimated that the threshold for stock-based intensity at which the slope of the relationship between outside directors and R&D intensity shifts from a negative slope to a positive one. I obtained a 67% threshold, which indicates that only when stock-based intensity is considerable, will a higher representation of outside directors on the board be positively related to firm R&D intensity.
Hypothesis 4 predicts that the interaction term between outside directors and stock option intensity will be positively related to a firm's R&D intensity. This interaction term was added in Model 5, in addition to the variables included in Model 3. The coefficient for this interaction is positive but only marginally significant (P<0.081), providing only weak support for the hypothesis 4.\textsuperscript{13}

3.7 DISCUSSION

This study is an important step towards understanding the influence of directors' compensation schemes on boards' monitoring effectiveness. The results strongly suggest that directors' stock-based compensation positively affects one indicator of board monitoring effectiveness: R&D intensity. Given the strong recent trend towards including stock-based compensation in outside directors' pay, and subsequent warnings by researchers that such compensation schemes should be handled cautiously until there is strong evidence of the benefits to shareholders (Daily, et al., 1999), this study's results are of major importance for both corporate governance research and for practice.

\textsuperscript{13} In the model with non-lagged independent variables I obtained a significant result (p<0.033)
The value of this study can be delineated along three important lines. First, this study sheds light on the direct effect of including stock-based compensation in outside directors’ pay on firms’ R&D intensity. Second, this study reveals the moderating effect of this compensation scheme on the relationship between a board’s composition and a firm’s R&D intensity. Finally, this study addresses the differential effects of stock pay and stock-option pay for outside directors on a firm’s willingness to adopt a risky strategy such as R&D.

The positive relationship found between the proportion of stock-based compensation and firms’ R&D intensity suggests that, in line with agency theory, stock-based compensation provides incentive for outside directors to more vigilantly monitor the actions of CEOs. This evidence provides important input to the debate regarding the effectiveness of giving outside directors stock-based compensation. In particular, the results strongly imply that including stock-based pay in directors’ compensation will result in better protection of shareholders’ interests.

This study provides empirical support for the argument developed in this paper that stock-based compensation and board independence are complementary measures for enhancing a board’s monitoring performance. The positive and significant relationship found between the interaction of outside directors’ representation and the intensity of stock-based compensation with R&D intensity suggests that boards can become effective guardians of shareholders’ interests when outside directors are both properly motivated and given sufficient representation.
Furthermore, this interaction suggests a new explanation based on agency theory for the negative relationship found in earlier studies between the proportion of outside directors and a firm's R&D intensity (e.g. Baysinger et al., 1991; Hill & Snell, 1988). This study has shown that the relationship between outside directors' representation on a firm's board and that firm's R&D intensity is moderated by stock-based intensity. When stock-based intensity is low, the relationship between outside directors and R&D intensity is negative; however, when the stock-based intensity is high, this relationship becomes positive. Including stock-based compensation in directors' pay, however, is a relatively new trend, whereas the empirical evidence indicating a negative relationship between the proportion of outside directors on boards and firms' R&D is based on data collected before stock-based compensation became a common practice. Therefore, the negative relationship reported in previous studies is consistent with the results of this study.

It should be emphasized that the explanation provided here for the negative relationship between outside directors' composition and R&D expenditures differs from that previously offered. Baysinger and Hoskisson (1990) proposed that because outside directors lack firm-specific knowledge, they tend to evaluate and reward CEOs on the basis of firm financial performance rather than on the quality of strategic decisions. They suggested that this might skew the CEOs' effort away from risky strategies that many shareholders prefer. The results of the present study suggest an alternative explanation – that a negative relationship between outside directors' representation on a firm's board and that firm's R&D intensity exists when outside directors do not receive appropriate incentive pay.
The results of this study also provide valuable evidence regarding the effects of including stock options in directors' compensation. The positive and significant relationship between stock-option intensity and a firm's R&D intensity suggests that the inclusion of stock options in outside directors' compensation affects firms' adoption of risky strategies, such as R&D. It is also worth noting that stock-option intensity has additional effects on R&D intensity, beyond those of stock-based intensity. This finding is consistent with previous research on executive compensation, which has found that the different risk characteristics of stock pay and stock-options pay result in different behavior by managers (e.g., Bloom & Milkovich, 1998).

It is worth emphasizing, however, that a higher weight of stock options in directors' compensation does not necessarily imply that directors' goals will be better aligned with those of shareholders. Because stock-option pay gives agents an incentive to adopt rather than avoid risky projects (Hemmer, et al., 1999; Hirshleifer & Suh, 1992), including a high percentage of stock options in outside directors' compensation may shift outside directors' risk preferences from risk aversion to risk seeking. Under such conditions, risk-seeking outside directors might encourage managers to adopt risky strategies, beyond the risk level preferred by shareholders. Therefore, although the results suggest that stock-option compensation enhances R&D intensity, it is beyond the scope of this study to conclude whether the R&D level attained is optimal for shareholders. That is, it may be true that substantial use of stock options could lead to excessive investments in R&D.
This research provides an important step in untangling the relationships between board incentive pay, board composition, and R&D intensity. Future research should examine whether the relationships found in this study apply to other strategic decisions, such as firm diversification and anti-takeover amendments, in which potential conflicts of interests exist between managers and shareholders. This study also highlights the need for reevaluating previous findings of studies that addressed the effects of board composition on both firm performance and firm strategic decisions. It is possible that, as in the case of R&D, the effects of board composition become visible only when contingent pay, such as stock-based compensation, is also in place.
3.8 REFERENCES


COMPREHENSIVE REFERENCES


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