École des Hautes Études Commerciales
Affiliated with the
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THE INTERDEPENDENCE BETWEEN

PERFORMANCE MEASUREMENT SYSTEMS,

GOVERNANCE STRUCTURE AND FIRM PERFORMANCE

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ABSTRACT

This thesis examines the association between the choice of using financial and non-financial measures of performance in executive bonus plan, and the firm's observed governance structure. The governance mechanisms examined are managerial ownership, board composition, debt financing, relative importance of the CEO's performance-contingent compensation, and presence of large shareholders. Using governance information from Canadian public companies in two very distinct economic sectors, I also investigate and control for the effect of market-based mechanisms such as product market, market for corporate control, and managerial labor market on the firms' internal governance configurations. To my knowledge, this study is the first to document empirical evidence that the mix of financial and non-financial performance measures in CEO bonus contracts is jointly determined with managerial ownership, board composition, and firm performance. Ceteris paribus, I find that firms with independent boards and greater managerial ownership tend to rely more on non-financial measures of performance to monitor and reward managers. Overall, the evidence supports several of the study's main hypotheses that non-financial information enhances the board's proprietary information concerning the CEO's current strategic activity that is not fully reflected in financial and stock-price information.

RÉSUMÉ

Cette étude examine l'interdépendance entre, d'une part, le choix des mesures financières et non financières de performance dans le contrat de rémunération des cadres dirigeants et, d'autre part, la structure de régie d'entreprise. Les mécanismes de régie d'entreprise analysés comprennent le pourcentage de propriété détenu par les dirigeants, la composition du conseil d'administration, le financement par la dette, l'importance relative de la rémunération conditionnée par l'atteinte d'un niveau établi de performance et la présence d'actionnaires importants. En se basant sur un échantillon de sociétés ouvertes canadiennes provenant de secteurs économiques très différents, cette recherche analyse également l'effet des mécanismes de marché (comme par exemple le marché des produits, le marché des prises de contrôle et le marché de travail des cadres dirigeants) sur la configuration interne de régie d'entreprise. A ma connaissance, cette recherche est la première à documenter que la combinaison de mesures financières et non financières d'évaluation de la performance dans les contrats de rémunération des cadres dirigeants est conjointement déterminée par le pourcentage de propriété détenu par les dirigeants, la composition du conseil d'administration ainsi que la performance de l'entreprise. Les résultats empiriques montrent que les entreprises caractérisées par un conseil d'administration sur lequel siègent majoritairement des administrateurs indépendants et dont les dirigeants détiennent un pourcentage élevé de propriété ont tendance à s'appuyer davantage sur des mesures non financières pour le contrôle et la rémunération des dirigeants. Dans l'ensemble, les résultats obtenus soutiennent l'hypothèse principale de cette recherche selon laquelle l'information non financière fournit à certains conseils d'administration une information utile relative aux activités stratégiques des gestionnaires au-delà de l'information financière ou boursière.

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CHAPTER 1

INTRODUCTION

There is considerable evidence that non-financial information improves the decision-making ability of managers (Abernethy and Lillis, 1995; Perera et al., 1997; Davila, 2000) and the monitoring activities of investors (Amir and Lev, 1996; Core et al., 1999; Hertenstein and Platt, 1998). However, few studies have addressed the specific role of non-financial information within internal governance mechanisms and how it interacts with other governance mechanisms. This study extends the literature examining the association between the choice of using financial and non-financial measures of performance in CEO bonus contracts and the firms' observed corporate governance structures. Since alternative mechanisms exist and each mechanism bears monitoring benefits and costs, this study takes the perspective that the use of one mechanism is jointly determined along with the other mechanisms in the governance structure. In addition to the choice of performance measures in CEO bonus contracts, the internal governance mechanisms investigated are managerial ownership, composition of the board of directors, use of debt financing, and the relative importance of performance-contingent compensation.

Considerable attention has been devoted in the accounting literature to the impact of governance structure on firm valuation (Hawkins, 1997; Barkema and Gomez-Mejia, 1998; Byrd et al., 1998; Gedajlovic and Shapiro, 1998; Core et al., 1999). Investors

associate governance conditions, such as the composition of board of directors, executives' compensation plans, and performance measures, with the firm's optimal use of resources and lower agency costs that lead to better performance and higher stock prices. Investors also perceive effective governance as a means of reducing investment risk because they believe it may decrease the likelihood of unfortunate events befalling the company (Lambert et al., 1993; Buchholtz et al., 1998; Conyon and Peck, 1998).

Management accounting research also maintains that the nature of performance measures in the design of managerial performance evaluation systems is a critical determinant of an effective governance structure (Banker and Datar, 1989; Curtis, 1994; Bushman et al., 1995; Ittner et al., 1997; Krolick, 1998; Dye, 1999). Overall, the evidence suggests that traditional accounting measures such as earnings per share and return on investment are short-term oriented, too aggregate, and concentrate little on the factors that increase firm value. Moreover, financial measures have been criticized for not fully reflecting managerial effort on strategic issues and for being influenced by external reporting rules.

Along this line, non-financial performance information such as customer satisfaction and productivity rates is assumed to provide more accurate knowledge about which factors drive firm value. The studies by Coates et al. (1995); Harrison et al. (1997); and Hertenstein and Platt (1998) suggest that non-financial measures of performance provide relevant information that facilitate investor monitoring and enable directors to enhance shareholder value through policing and advising managerial decisions. Similarly,

Bushman et al. (1995, 2000); Hemmer (1996); and Ittner et al. (1997) note that non-financial information improves incentive contracting with multi-task managers. The greater the precision or sensitivity of the contracting information, the smaller the risk-based compensating differential that must be paid to the corporate manager, which reduces managerial compensation costs. However, because the principal's access to non-financial performance measures may reduce the agent's ability to exploit private information, integrating non-financial performance measures into the contracting information may not be in the managers' best interests (Hemmer, 1996; Bushman et al., 2000). Building on this literature, I argue that integrating non-financial measures into CEO bonus contracts improves corporate governance by facilitating the collection of relevant information on the part of investors and independent directors, who can then more closely monitor the firm's strategic activities.

This study extends the prior literature in several ways. The focus of inquiry is whether the use of each governance mechanism complements or substitutes for the monitoring function of the others. I therefore employ a simultaneous equation approach to reflect the argument that the extent of each mechanism's use is jointly determined with the other mechanisms in the firm's governance structure.

This study uses governance information from Canadian public companies in two very distinct economy sectors to address some methodological limitations identified in two influential studies in this area: Agrawal and Knoeber (1996) and Ittner et al. (1997). A two-industry sample is used to directly investigate and control for the effect of market-

based mechanisms such as the product market, market for corporate control, and managerial labor market on the internal governance configuration of the firms. Also, I determine the monitoring role of large shareholder ownership more precisely by examining family and institutional ownership.

In contrast to most of the prior research in corporate governance that has focused on single relationships between governance mechanisms and firm financial performance, I investigate the joint effect of internal and external governance mechanisms, including the performance measurement system, on firm performance. This approach attempts to provide a more complete picture of the interdependence among governance mechanisms and shed some light on the presence of industry patterns in corporate governance configuration.

The empirical results confirm a number of the hypotheses. To my knowledge, this study is the first to document empirical evidence that the mix of financial and non-financial performance measures in CEO bonus contracts is jointly determined with managerial ownership, board composition, and firm contemporaneous performance. The estimate of the coefficients in the simultaneous model indicates that, ceteris paribus, an increase in the level of unrelated directors tends to reduce by the same proportion the firm emphasis on financial measures of performance in CEO bonus contracts, and the firm use of managerial ownership. This provides evidence that independent, outside directors tend to rely more on richer signals of managerial performance to monitor and reward managers holding lower fractions of the firm's equity.

The results support the study's main argument that non-financial information enhances the board's proprietary information concerning the CEO's current product development activity that is not fully reflected in financial and stock-price information. After controlling for other governance factors, the results indicate that knowledge-based companies tend to reduce their emphasis on financial performance measures in CEO bonus contracts by 30%, on average, compared to capital-based companies. Along this line, this study also provides evidence that a firm's emphasis on traditional financial performance measures in CEO bonus contracts is inversely proportional to its R&D investment. The results indicate that for every 1% increase in the ratio of R&D expenses to total assets, the firm's emphasis on financial performance measures decreases by 1%. This provides strong evidence that firms do de-emphasize traditional performance measures when these measures become less representative of managerial performance.

Consistent with prior studies by Agrawal and Knoeber (1996) and Barnhart and Rosenstein (1998), I found a negative and reciprocal association between managerial ownership and the proportion of unrelated directors on the board. The results of this study indicate that for every 1% increase in the proportion of managerial ownership, the proportion of unrelated directors decreases by 0.4%; and for every 1% increase in the proportion of unrelated directors, the proportion of managerial ownership tends to decrease by 1.6%. These results suggest that managerial ownership and board composition are alternate mechanisms, and that strong boards tend to reduce the proportion of managerial ownership to avoid managerial entrenchment.

The thesis proceeds as follows. Section 2 reviews the related literature focusing on how performance measures and other governance mechanisms may be used to align managers' decisions with the interests of shareholders, mitigate agency conflicts, and thereby improve the firm's performance. In Section 3, I present the research hypotheses and the empirical model used to investigate the interdependence between the mix of performance measures in CEO bonus contracts, governance structure, and firm performance. Section 4 presents the data and research methods used in this empirical investigation. In Section 5, I discuss the empirical findings. Section 6 presents the conclusion.

CHAPTER 2

LITERATURE REVIEW

2.1   INTRODUCTION

A review of the relevant literature on performance measurement about the use of financial and non-financial information and corporate governance mechanisms has revealed indirect but important evidence about the governance conditions that may influence the focus of a firm's performance measurement system. The literature suggests that performance measurement systems tend to be affected by governance conditions such as the presence of large shareholders (Tosi and Gomez-Mejia, 1989; David et al., 1998), the proportion of outside directors on the board (Lambert et al., 1993; Conyon and Peck, 1998), managerial ownership (Ittner et al, 1997), CEO influence on the board (Buchholtz et al., 1998), the use of debt financing (Begley and Feltham, 1999), and the relative importance of performance-contingent compensation (Bushman et al., 1995; 1996).

Based on the literature reviewed, Figure 1 below illustrates the research framework of the thesis, which integrates internal and external governance mechanisms, firm performance, and other factors identified as potential determinants of the mix of financial and non-financial performance measures in CEO bonus contracts.

Figure 1
Research Framework
Governance Structure, Performance Measures in CEO Bonus
Contracts and Firm Performance
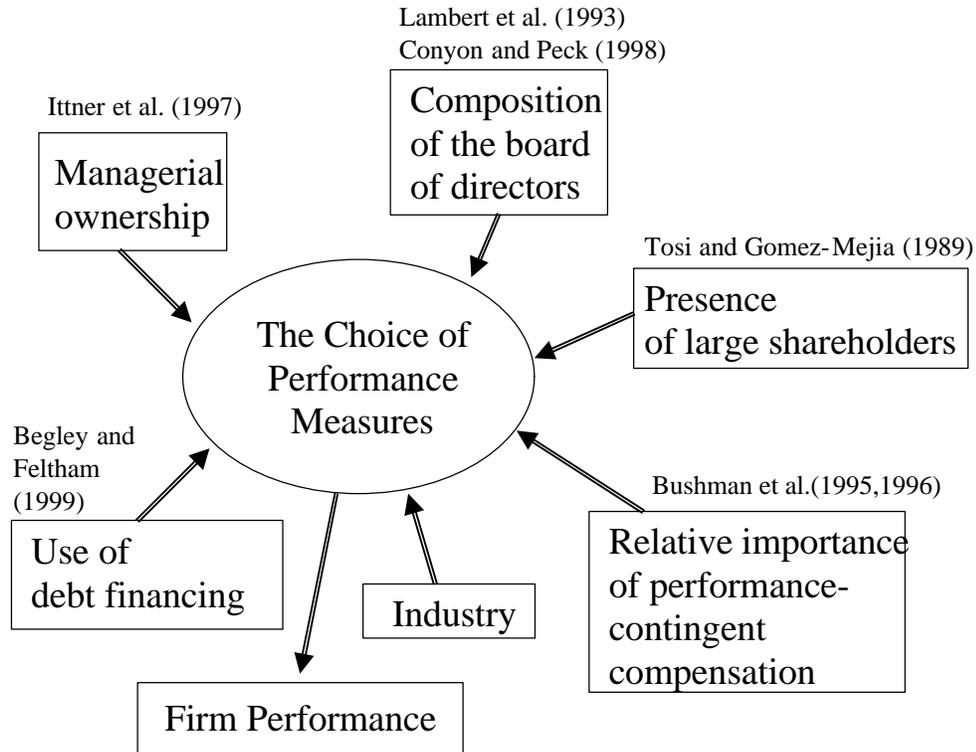
The remainder of this chapter is organized as follows: Section 2.2 includes a review of the literature on performance measurement systems, with a focus on the governance properties of integrating financial and non-financial performance information in CEO bonus contracts. The internal and external governance mechanisms used by public firms to enhance their monitoring of managers' decision-making processes are described in Sections 2.3 and 2.4, respectively. Section 2.5 reviews the related literature on the relationship between governance structure and firm performance. Finally, Section 2.6 outlines other factors identified in the literature as potential determinants of the firm's choices among performance measures and internal governance mechanisms.

2.2   PERFORMANCE MEASUREMENT SYSTEMS

Performance measurement and incentive compensation are considered two primary and interrelated systems of control within a business organization. While the performance measurement system measures performance in areas where the agent has decision rights, the compensation system rewards (and punishes) the agent's performance in those areas (Bushman et al., 1995; Ittner and Larcker, 1995; Hemmer, 1996; Perera et al., 1997; Zimmerman, 1997). The performance measurement system provides essential information to improve the understanding of managers' decisions on firm value, and thereby serves a key governance role in developing strategies, evaluating the achievement of organizational objectives, and compensating managers. Current studies also suggest that the link between performance measurement and executive reward is a key element of management control systems because it creates incentives for managers to take the long-term perspective, reduces information asymmetry, and aligns managers' decisions with the interests of shareholders (Fornell et al., 1996; Hertenstein and Platt, 1998; Ittner and Larcker, 1998).

These systems, devised to evaluate and reward performance, generally use a combination of financial and non-financial measures of performance. Financial measures are collected and audited by the firm's accountants, whereas non-financial measures are more likely to be self-reported. However, while financial measures are usually more objective and less subject to managerial discretion, non-financial measures usually relate to key strategic factors. Therefore, the trade-off between information costs, effort-averse behavior, and myopic decisions suggests that the choice of performance measures is one of

the most critical issues in the design of management control systems (Banker and Datar, 1989; Feltham and Xie, 1994; Zimmerman, 1997; Barkema and Gomes-Mejia, 1998; Krolick, 1998; Core et al., 1999; Davila, 2000).

Along this line, this study's focus on the mix of financial and non-financial performance measures reflects the debate of whether only traditional financial performance measures remain appropriate for monitoring the actions of multi-tasking managers and firm value (Fisher, 1992; Bushman et al., 1995; Kaplan and Norton, 1996; Atkinson et al., 1997; Harrison et al., 1997; Dye, 1999). The following sections examine the literature on the benefits of integrating financial and non-financial information into performance measurement systems.

2.2.1 Integrating financial and non-financial performance measures

Prior research has suggests that traditional accounting earnings and stock-price-based performance measures[1] are short-term oriented, too aggregate, and focus too little on factors that increase the value of the firm (McKinnon and Bruns, 1992; Curtis, 1994; Amir and Lev, 1996; Dye, 1999). For example, while accounting returns may represent a reasonable measure of a CEO's current management or stewardship of assets in place, they often do not reflect the benefits of the CEO's current strategic planning, growth opportunities identified, business initiatives, or investments in the discovery and development of new products and technologies with deferred returns. On the other hand,

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[1] Traditional accounting earnings measures of performance include earnings per share, pre-tax profit, return on assets, return on equity, and return on sales, while traditional stock price measures include total

stock price itself may not fully reflect, or may inadequately reflect, valuable contracting information, because managers may have better information than investors about how their activities and efforts are being directed in order to increase the firm's value in the long run. Along this line, integrating non-financial performance measures into performance measurement systems is intended to provide value-relevant information for monitoring managerial decisions in public firms.

This emphasis on non-financial information motivated several streams of accounting research to examine the monitoring benefits of non-financial performance measures. Management research, for example, has emphasized the use and performance consequences of non-financial measures in organizations using advanced manufacturing practices (Fisher, 1992; Abernethy and Lillis, 1995; Perera et al., 1997; Hertenstein and Platt, 1998). The results suggest that the operational performance of flexible manufacturing plants improves after the adoption of management control systems with greater reliance on non-financial information.

Market-based research suggests that non-financial measures tend to be leading indicators that provide relevant, forward-looking information not contained in traditional accounting information. The use of non-financial, forward-looking information is assumed to help managers be proactive and take advantage of opportunities for firm value creation. Overall, market-based research confirms the value relevance of non-financial information through positive relationships between non-financial measures and the firm's future

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stockholder returns and stock performance versus peer group.

accounting or stock price performance (Amir and Lev, 1996; Ittner and Larcker, 1998; Banker et al., 1996).

Compensation research has examined the use of non-financial measures in executive incentive plans. The evidence suggests that both financial and non-financial performance tend to improve following the introduction of an incentive plan integrating non-financial measures. The strength of this relationship, however, seems to be conditional on the firm's strategy, industry, level of regulation, and noise in traditional financial measures (Lambert et al., 1993; Bushman et al., 1995; Ittner et al, 1997, Hemmer, 1996).

Analytical research on performance measurement systems using multiple signals in agency settings suggests that financial measures alone may not provide the most efficient means to motivate multi-task managers to act in the best interest of the firm's owners (Feltham and Xie, 1994; Hemmer, 1996; Harrison et al., 1997). Hemmer (1996), in particular, suggests that the inclusion of any non-financial performance measure that provides incremental information on managerial actions may tend to improve incentive contracting with managers, thereby enhancing the effectiveness of the performance measurement system.

The above insights, taken from research on the monitoring attributes of non-financial information, provide the basis for this thesis. The focus of inquiry is whether a mix of financial and non-financial measures of performance in CEO bonus contracts tends to be jointly determined with other internal and external governance mechanisms. In essence, this study argues that observing non-financial measures may enhance the firm's governance structure by providing relevant information for determining which actions and decisions are to be taken by top managers. For example, I would expect that the choice of performance measures in CEO bonus contracts, in firms whose boards of directors are more independent from management, tends to focus more on non-financial measures to facilitate the board's assessment of operational information about the firm's specific activities and competitive environment. In contrast, it is also expected that firms using higher levels of managerial ownership to align managers' decisions with the interests of shareholders may compensate this "costly"[2] mechanism with less focus on non-financial measures.

In line with this discussion, the following sections provide a review of the literature on corporate governance based on principal-agent theory related to the use of internal and external governance mechanisms for monitoring the managerial decision-making process.

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[2] The term "costly" is used throughout this document to express the idea that greater use of each mechanism yields benefits by improving managerial incentives but also entails important direct and indirect costs. The studies by Gagnon and St-Pierre (1995) and Knoeber (1985) offer more details on opportunity and out-of-pockets costs in the use of governance mechanisms.

2.3   INTERNAL GOVERNANCE MECHANISMS

The well-documented assumptions of agency theory suggest that where the interests of shareholders and managers are not convergent, agency costs[3] arise. Appropriate corporate governance structures help to alleviate such agency costs, thereby improving firm performance (Fama and Jensen, 1983; Williamson, 1996). The literature identifies several governance mechanisms that strengthen shareholder vigilance in their task of making top management teams act in the best interests of the company (Demsetz and Lehn, 1985; Barnhart and Rosenstein, 1998; Byrd et al., 1998; Gedajlovic and Shapiro, 1998). Based on these studies, governance mechanisms can be divided into two categories − internal and external. The potential effect of these mechanisms on the choice of mix of performance measures in CEO bonus contracts can also be derived from these studies.

The group of internal governance mechanisms refers to the controls that rely on internal parts of the firm to provide incentives and to limit managerial discretion. The following paragraphs review the monitoring functions of internal governance mechanisms such as managerial ownership, composition of board of directors, performance contingent-compensation, and use of debt financing.

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[3] Economists call conflicts arising from such principal-agent relationships agency problems, and call the value lost agency costs (Williamson, 1975, 1996; Jensen and Meckling, 1976; Fama, 1980; Jensen, 1986).

2.3.1   Managerial ownership

Governance theorists suggest that agency costs increase within a firm whenever managers have incentives to pursue their own interests at shareholders' expense. Agency costs arise from differences between agent's and principal's risk tolerances, working horizons, and desired levels of reward, generating a decline in firm value. (Fama, 1980; Williamson, 1996; Zimmerman, 1997). In this respect, empirical research on managerial discretion shows that as managers have a smaller stake in the firm, their tendency to act in their own interest increases (Morck, Shleifer, and Vishny, 1988; Stulz, 1988; McConnell and Servaes, 1990; Barnhart and Rosenstein, 1998). The suggested reason is that when managers perceive their right to the firm's residual income as low, they tend to appropriate income from other corporate sources in the form of extra benefits. Consistent with the literature, this thesis takes the perspective that a firm's level of managerial ownership tends to affect the nature of performance measures in the CEO's annual bonus contract. Both mechanisms provide incentives for managers to pursue shareholders' priorities in the firm value creation process, implying that a substitution effect may exist between managerial ownership and the use of non-financial measures in CEO bonus contracts. For example, firms making greater use of managerial ownership to align managers' decisions with the objectives of shareholders may perceive it less necessary to integrate non-financial performance measures in CEO bonus contracts.

2.3.2 Composition of the board of directors

The distribution of power among corporate managers, shareholders and directors is set when shareholders nominate a board of directors to represent and protect their interests and to ensure that executives fulfill their responsibilities to the firm (Buchholtz et al., 1998; Conyon and Peck, 1998). Hence, the effectiveness of the board in monitoring the decisions of managers is often associated with its composition.

Board composition refers to the distribution of members according to their primary allegiance, which may be either to the shareholders (outside) or to the managers (inside). In this respect, an important assumption in governance literature is that an inside director, who may be one of the top executives or an important stakeholder, may not defend the same value-creation strategy as an outside, unrelated director. Outside, unrelated directors are viewed as professional referees who unbiasedly assess managerial performance, determine their remuneration, and replace them if necessary. Thus, the effectiveness of boards in monitoring the actions of managers is assumed to be a positive function of its proportion of outside, unrelated directors (Gagnon and St-Pierre, 1995; Agrawal and Knoeber, 1996; Core et al., 1999).

The impact of the proportion of outside directors on the effectiveness of board vigilance, however, is not that simple. Conyon and Peck (1998), for example, challenge this assumption and argue that the low financial stakes and equity holdings of outsiders may adversely affect their vigilance and independence. The independence of outside directors may also be compromised if the firm's CEO appoints them, or if they were

former members of the company's management team. Although these arguments cast doubt on the monitoring capabilities of outside directors, the predominant argument in the governance literature is that the presence of a low proportion of outside directors tends to lead to poor monitoring capabilities. "Insider-dominated boards" is assumed to mean problematic self-monitoring, and particularly weak monitoring of a fellow CEO.

The performance measurement system is also one of the mechanisms used to enhance the monitoring function of boards. This suggests that the choice of performance measures in CEO bonus contracts, determined by the compensation committee and issued by the board of directors, tends to be driven by the objective of facilitating the collection and processing of operating performance information by shareholders and vigilant directors. As such, greater emphasis on non-financial performance measures may be expected among firms whose boards are more independent from management.

2.3.3   Performance-contingent compensation

Performance-contingent compensation has also been proposed as a mechanism to achieve an alignment of interests between managers and shareholders. Agency theory predicts that conflict of interest and information asymmetry between shareholders and managers tends to be substantially reduced to the extent that executive compensation plans[4] are more tightly related to firm performance. Accordingly, empirical evidence suggests that the importance of performance-contingent contracts increases in firms where

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[4] Compensation plans negotiated with CEOs of public firms typically consist of a base salary component and a performance-contingent component. The payoffs of the performance-contingent component often

managers make a lot of decisions that cannot easily be monitored by the board of directors or investors (Barkema and Gomez-Mejia, 1998; Byrd et al., 1998). The related literature also suggests, however, that performance-contingent compensation can equally be interpreted as a sign of CEO entrenchment, because it may allow managers to obtain rewards the value of which exceeds the value of the services they provide (Core et al., 1999). Building on this literature and the suggested limitations of accounting data and stock prices for measuring current aspects of executive performance,[5] I argue that firms might shift towards the use of more "costly" performance measures when CEO performance-contingent compensation becomes relatively more important. Hence, this thesis proposes that the firm's use of, and relative importance given to performance-contingent compensation tends to be associated with the use of non-financial measures.

2.3.4   Reliance on debt financing

The use of debt financing is viewed as an internal corporate governance mechanism because it may be voluntarily used to transfer to the participants of the capital market (debtholders) the functions of monitoring and evaluating managerial performance (Jensen, 1986; Agrawal and Knoeber, 1996; Begley and Feltham, 1999).[6] In this respect, the literature provides three directions regarding the monitoring function of debt financing.

depend on an intricate portfolio of performance measures, which is the focus of this present study.
[5] See discussion in Section 2.2.

[6] The company's target ratio of dividends to earnings operates as a control instrument just like debt financing. The higher the payout ratio, the smaller the amount of free cash flow. However, a dividend imposes much less severe constraints because its payment is not mandatory. In addition, Zeckhauser and Pound (1990) document that within an industry, there is no significant difference in dividend payout ratios between firms with and without large shareholders. More importantly, their study also suggests that controlling for firm industry, the effect of dividend policy on other governance mechanisms may be indirectly controlled. A similar approach is therefore adopted in this investigation and the focus is placed

The first aspect is that increasing debt means a large part of the firm's cash flow is being returned to debtholders, and cash is therefore removed from managerial control. The larger the debt, the smaller the discretionary power of managers. Secondly, given the size of a firm, debt financing decreases the firm's need for new shares emission and allows voting rights to be more concentrated in the hands of the remaining shareholders. Thirdly, a relative high debt-to-assets ratio may be used to make the firm less attractive as a takeover target, substituting for the use of other takeover defense mechanisms (Knoeber, 1985; Agrawal and Knoeber, 1996; Byrd and Stammerjohan, 1997; Begley and Feltham, 1999). Consistent with the literature, this thesis takes the perspective that high-leveraged firms can be expected to de-emphasize the use of non-financial measures in CEO bonus contracts in favor of a greater use of short-run financial measures of performance in their incentive contracts with managers. This may occur either because the monitoring aspects of debt financing substitute for the use of "costly" measures of performance, or because high levels of debt financing tend to create incentives for directors and managers to focus on the firm's likelihood of financial distress.[7]

In summary, the internal governance mechanisms, defined as managerial ownership, board composition, performance-contingent compensation, and debt financing, appear to be important incentives for managerial performance, and for ensuring effective corporate governance. Since the extent of use of each of the mechanisms generates different information needs, they may tend to affect the role of performance measurement

on the disciplinary function of debt financing rather than the firm's dividend target ratio.
[7] A similar argument is used in the studies by Ittner et al (1997) and Begley and Feltham (1999).

systems, and hence the nature of performance measures used to monitor and reward managerial efforts. The discussion now turns to other mechanisms external to the firm that may also play an important role in the governance structure for monitoring and disciplining the actions of managers.

2.4   EXTERNAL GOVERNANCE MECHANISMS

As external conditions, the disciplinary role of external governance mechanisms is not internally determined, but is assumed to be a function of company's exposure to the pressure of market-based circumstances. Along the lines of Agrawal and Knoeber (1996), this thesis focuses on the main external mechanisms considered in the governance literature: presence of large shareholders in the ownership structure, market for corporate control, managerial labor market, and product market.

2.4.1   Large shareholders

The relationship between firm profitability and ownership structure emerges from the issue of the separation of ownership from control (Williamson, 1975, 1986, 1996; Jensen and Meckling, 1976). The literature suggests that the more concentrated the firm ownership structure, the greater the degree to which agency costs and the economic benefits of monitoring can be accrued to the same shareholder. According to this monitoring perspective, large shareholders tend to engage in more complex and "costly" monitoring activities, which benefit all shareholders because of the enhanced governance structure and increased firm value. Empirical evidence of this relationship is provided in

Amihud and Lev (1981); Demsetz and Lehn (1985); Zeckhauser and Pound (1990); Agrawal and Knoeber (1996); Barnhart and Rosenstein (1998); Bushee (1998, 1999); and Gedajlovic and Shapiro (1998). Overall, these studies suggest that the presence of large shareholders in the ownership structure may lead firms to use more complex control systems, and may be an important determinant of managers' information preferences. Consistent with this argument, the presence of large shareholders may be expected to be associated with more complex performance measurement systems, and hence with the firms' use of richer signals of managerial performance in CEO incentive contracts.[8]

2.4.2 Market for corporate control

The financial gains made by shareholders of takeover targets and the abnormally high turnover of executives following takeovers has been well documented in the literature (Knoeber, 1985; Lambert and Larcker, 1985; Davis, 1991; Mahoney and Mahoney, 1993). Overall, the evidence supports the role of takeover threats as an effective mechanism for displacing self-serving and sometimes inefficient managers. Moreover, the literature suggests that a firm's exposure to the market for corporate control is an important determinant of its internal governance structure for preventing a takeover. Inferring from the literature, this thesis takes the perspective that the market for corporate control may also have an impact on a firm's performance measurement system. For example, in order to

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[8] Institutional investors have also emerged as an important group of shareholders with an active governance role and the potential to limit managerial discretionary power. The literature suggests that, unlike individual investors, institutions invest "other people's money" and have legal fiduciary obligations to take proactive monitoring actions. These actions may consist of influencing executive compensation packages (David et al., 1998; Core et al.; 1999), percentage of inside ownership (Barnhart and Rosenstein; 1998), and board structure (Gagnon and St-Pierre, 1995). Since the incentive and influence to engage in

prevent a takeover, targeted firms may shift towards the use of short-run financial performance measures in CEO bonus contracts to enhance economic performance and equity costs, rendering the firm less attractive for takeovers.

2.4.3 Managerial labor market

Fama (1980) investigates the governance properties of the managerial labor market and provides evidence that managerial behavior is shaped by both the discipline and the opportunities for human capital provided by the labor market. Recent research also suggests that managerial human capital is tightly linked to firm performance. The higher the job competition among managers within[9] and/or outside the firm, the higher the managers' knowledge and responsive efforts to improve the firm's performance (Mahoney and Mahoney, 1993; Brett and Stroh, 1997; Ocasio, 1999).[10] The evidence leads to the argument that the external managerial labor market may enhance the firm's governance structure by increasing the possibility that managers' discretionary behavior is identified and that managers are replaced. Along this line, it may be expected that the performance measurement system of a firm exposed to the disciplinary forces of the competitive

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monitoring activities remains a function of equity stake, this study focuses on the presence of large shareholders who may be individual and/or institutional investors.

[9] The disciplinary role of the internal managerial labor market is explained by internal competition among managers for the top places in the firm. The idea is that internal competition exerts a mutual monitoring function by the fact that each manager has a stake in the performance of the managers above and below him and, as a consequence, undertakes some amount of monitoring on managerial discretion in both directions.

[10] Brett and Stroh (1997), for example, document that experienced managers who receive an external labor market offer tend to perceive their employment as short-term, with consequent higher pressure to perform. This occurs because if they are hired from an external labor market, the employer is likely to hire others from that same market.

external managerial labor market de-emphasizes the use of "costly" monitoring activities, such as the use of non-financial measures in CEO bonus contracts.

2.4.4   Product market

The monitoring function of the product market relies on the degree of competitive pressures facing a company's output, which is related to its industry and level of product diversification. Publicly-traded firms may face a product market concentration where the competition is relatively low, or a highly competitive market where a large number of companies compete under the same market conditions (Fama, 1980; Williamson, 1996). Along this line, accounting research provides empirical evidence that the discretionary behavior of managers is also disciplined by the pressure of other firms competing in the same product market (Haye, 1997; Nickell et al., 1997; and Collin, 1998). These studies suggest that high product-market competition forces the evolution of internal devices for efficiently monitoring the performance of a firm's entire team as well as its individual members. Product market competition leads managers to align their decisions with the owners' interests in an attempt to avoid bad performance, along with the loss of their jobs and reputations. Similarly, this thesis proposes that product market may also influence the firms' choices among internal governance mechanisms and the mix of financial and non-financial performance measures in CEO bonus contracts. It is expected, for example, that firms exposed to high product market competition may rely more heavily on non-financial information such as customer satisfaction to monitor customers' preference shifts to substitute or rival products.

In summary, internal and external governance mechanisms, along with the performance measurement system, are in place to provide incentives for managerial performance and to assure more effective monitoring by investors. In the next section, I review the literature on the relationship between control and firm performance.

2.5   FIRM PERFORMANCE

Evidence on the relationship between governance structure and firm performance is found throughout the agency literature in both financial and management accounting research.[11] The literature suggests that in situations where the interests of shareholders and managers are not perfectly aligned, agency costs and control mechanisms may have an important role in explaining firm performance. Essentially, more effective monitoring of the firm owners on managerial performance tends to enhance firm wealth gain (Barkema and Gomez-Mejia, 1998; Barnhart and Rosenstein, 1998; Byrd et al., 1998; Waterhouse and Svendsen, 1998). Even though most of this evidence has focused on the sensitivity of firm performance to different governance configurations, related research also provides evidence on the impact of the firms' performance on governance structures. The studies by Agrawal and Knoeber (1996) and Barnhart and Rosenstein (1998), for example, document that the firms' choices among internal governance mechanisms tend to be jointly determined along with firm performance. The evidence suggests, for example, that better firm performance may lead to higher managerial ownership, fewer outside directors on the

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[11] In financial accounting, the literature includes Demsetz and Lehn (1985); Morck, Shleifer, and Vishny (1988); Agrawal and Knoeber (1996); and Core et al. (1999). Examples from the management accounting literature include Ittner et al. (1997); Perera et al. (1997); and Gedajlovic and Shapiro (1998).

board, less reliance on debt financing, and fewer takeover attempts. This supports the argument that internal governance mechanisms are alternative ways to monitor and foster the actions of managers, suggesting that it is more likely that the extent of use of each mechanism increases only until the marginal benefits of control equal or offset its marginal costs. Consistent with this argument, this thesis takes the perspective that each mechanism may be used to substitute for or complement[12] the monitoring function of another mechanism, providing a comparable level of monitoring for managerial decisions and an improvement in firm performance. Hence, similar to the studies by Agrawal and Knoeber (1996) and Barnhart and Rosenstein (1998), this thesis jointly examines the firms' usage of internal mechanisms and their associations with firm performance.

2.6   OTHER FACTORS

In the literature reviewed above, other factors were identified as potential determinants of a firm's choice among performance measures and internal governance mechanisms. For example, aggregate financial measures of performance appear to be more suitable for transferring information across management levels in large, decentralized firms (Ittner et al., 1997). Firms employing a *prospector* strategy − a high level of diversification and greater noise on accounting information − tend to use more non-financial measures to monitor managerial decisions (Perera et al., 1997; Ittner and Larcker, 1998). Cross-traded firms are exposed to more mandatory regulations and are likely to present more vigilant and independent boards of directors (Core et al., 1999). Managerial ownership tends to

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[12] The studies by Demsetz and Lehn (1985); Stulz (1988) and Barnhart and Rosenstein (1998) document that institutional ownership and board composition are substitutes for inside ownership, and that inside

increase with CEO tenure (Agrawal and Knoeber, 1996; Barnhart and Rosenstein, 1998), and the use of debt financing tends to be negatively associated with the firm's capacity to produce cash flow return (Begley and Feltham, 1999). Bloom and Milkovich (1998) and Byrd et al. (1998) suggest that when business risk is higher, greater use of performance-contingent compensation may become dysfunctional as far as directing managerial behavior. Hence, in order to control for their potential effect on the relationship of the firm's choices among financial and non-financial performance measures, governance mechanisms, and firm performance, these factors are also included in the research framework as control variables[13].

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ownership has a greater effect on board composition than vice-versa.

[13] The control variables, the expected associations with the dependent variables and their measurement are described in detail in Section 4.5.

2.7   SUMMARY

In summary, studies on performance measurement suggest that in certain settings, non-financial measures of performance tend to be more informative for the long-term desirability of managerial actions and firm value creation than traditional financial measures of performance. Previous studies, however, did not focus on the potentially complementary aspects among the firms' choices of performance measures in CEO incentive contracts, and the extent to which other control mechanisms were used as incentives and monitors of firm performance. Taking the perspective that alternative control mechanisms exist with different cost-benefit metrics, this thesis contributes to the previous literature by investigating whether the mix of financial and non-financial measures of performance in CEO bonus contracts tends to be jointly determined with other internal and external governance mechanisms. The following chapter presents the development of the research hypotheses and the empirical model used in this thesis to investigate the association between the mix of financial and non-financial performance measures for CEO bonus contracts, governance structure, and firm performance.

CHAPTER 3

RESEARCH HYPOTHESES AND EMPIRICAL MODEL

3.1   INTRODUCTION

This chapter introduces the research framework, develops the hypotheses, and presents an empirical model for investigating the proposed relationships between the choice of performance measures in CEO bonus contracts, governance mechanisms, and firm performance.

3.2   RESEARCH FRAMEWORK

3.2.1   Setting

As discussed in the previous chapter, the role of governance mechanisms is to provide incentives for aligning managerial decisions with shareholder value creation, thereby alleviating agency problems between managers and shareholders. Since alternative governance mechanisms exist, and since each mechanism bears monitoring benefits and costs, this thesis takes the perspective that the firm's use extent of a mechanism is jointly determined along with the other mechanisms in its governance system. For example, where one specific mechanism is used less, others may be used more, which may produce equally effective levels of managerial monitoring, and consequently, firm performance.[14]

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[14] This argument finds support in Agrawal and Knoeber (1996) and Barnhart and Rosenstein (1998).

Building on the literature reviewed in Section 2.2, this thesis relies on the argument that the nature of the performance measures used to reward top managers reflects its performance measurement system.[15] Since information acquisition and processing are "costly" managerial activities, managers tend to make trade-off when deciding what information to obtain, and are most likely to concentrate their efforts on, and acquire information about tasks directly linked to their own rewards. At the same time, this investigation assumes that the cost to shareholders and directors of collecting and processing audited, standardized signals from the accounting system are, in many cases, low relative to alternative performance measures such as non-financial information. In addition, managers may prefer to keep non-financial, less noisy performance information private for contracting purposes, because reducing the noisiness of contracting information may decrease the risk-based compensating differential that the principal needs to pay. Self-serving management of performance indicators is regarded as an unavoidable fact of organizational life and therefore, contracting on accurate, timely non-financial information will tend to be more "costly" to directors. Hence, the mix of financial and non-financial performance measures used in CEO bonus contracts can be viewed as one of the governance mechanisms that directors and shareholders use to reduce information asymmetry and better monitor managerial decisions. The following time-line summarizes the setting used in this thesis to jointly investigate the empirical relations between governance structure, choice of performance measures in CEO bonus contracts, and firm performance:

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[15] Ittner et al. (1997) and Dye (1999), for example.

Figure 2 – Time-line

t   t+1

|_____|

Firm contemporaneous   Firm future performance:
performance: Market to book ratio (P/B_t) Market to book ratio (P/B_{t+1})
External governance mechanisms
Internal governance mechanisms:
- The mix of financial and non-financial
  performance measures in CEO bonus contracts (MEAS);
- managerial ownership (MSHARE);
- board composition (OUT);
- reliance on debt financing (DEBT);
- target annual cash bonus (BONUS).

3.2.2 Variables

As mentioned at the outset of the previous section, this thesis focuses on the interaction between the mix of financial and non-financial performance measures in CEO bonus contracts (MEAS) and four internal governance mechanisms. The four internal governance mechanisms investigated are managerial ownership (MSHARE), board composition (OUT), the firm's reliance on debt financing (DEBT), and the relative importance of the bonus on total cash compensation (BONUS). The notion that these control mechanisms work to ensure that management teams act in the best interests of shareholders is examined through their joint relationship with firm performance, as measured by market to book ratio. Market to book ratio (P/B) is assumed to capture the consequences of managerial decision and governance structure quality, which are reflected in market price but not in traditional accounting numbers (Core et al., 1999). The monitoring function relying on forces outside the firm,[16] namely the market for corporate control, external managerial labor market, and product market, is assumed to be industry-

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[16] This issue is discussed in Section 2.2.

related mechanisms. Therefore, their effect on firm governance structure will be controlled

and examined with two industry-based samples of public companies (IND).[17] The presence

of large shareholders (BLOCK) in the firms' ownership structures is directly observed.

Figure 3 illustrates the main variables used in this empirical investigation and their

respective notations.

Figure 3
Research framework
Variables and their notations
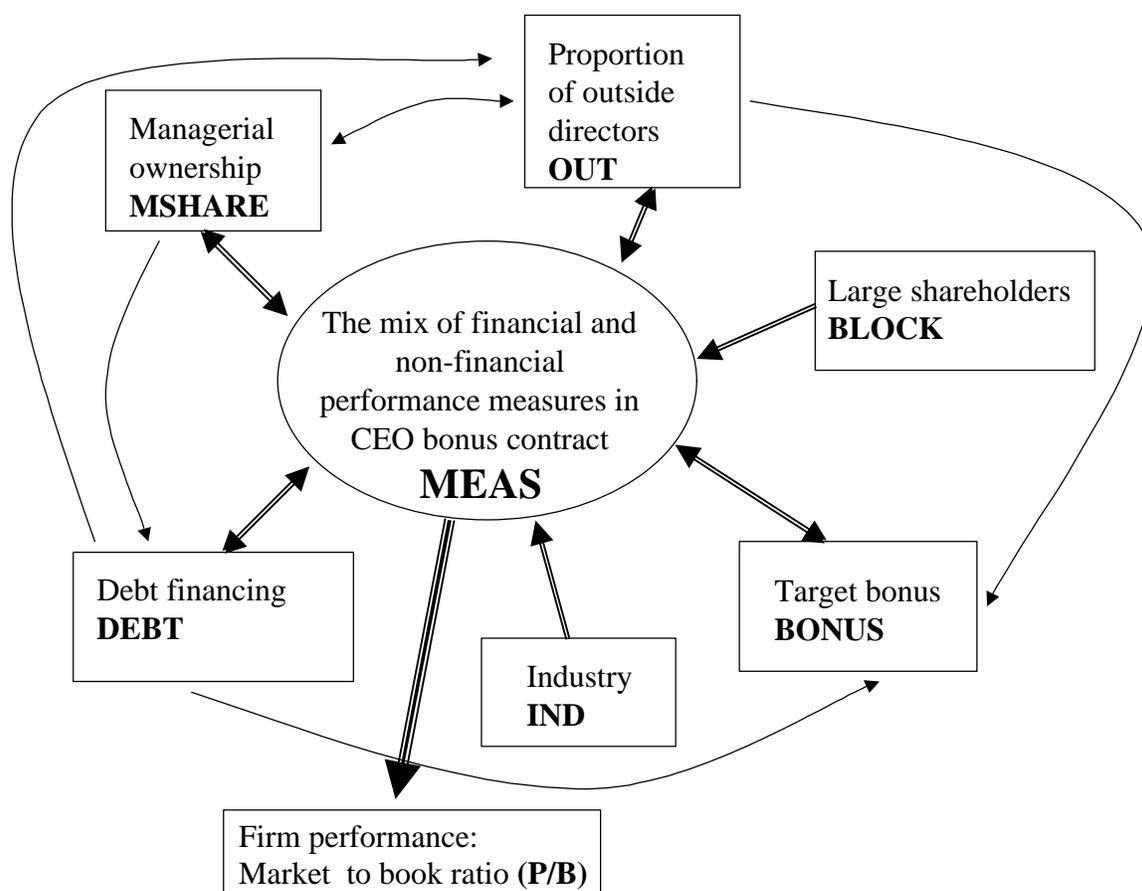
In Figure 3, straight arrows represent the main proposed associations examined by the thesis and illustrate the suggested associations among the mix of financial and non-financial performance measures in CEO bonus contracts and the use of other internal governance mechanisms. Corollary associations reflecting relationships among the other governance mechanisms included in the research framework are also investigated. These corollary associations are represented by curvy arrows. As outlined above, the thesis also investigates the joint effect of the mechanisms on firm future performance, represented in Figure 3 by the largest straight arrow. As in the studies by Agrawal and Knoeber (1996) and Barnhart and Rosenstein (1998), the research framework provides for an examination of all mechanisms jointly, including the mix of financial and non-financial measures of performance in CEO bonus contracts. As such, the two-headed arrows in Figure 3 illustrate the thesis argument that the use of the individual internal mechanisms may influence and be influenced by the extent of use of other internal mechanisms present in the governance structure.

Consistent with this approach, the following section develops this thesis research hypotheses to investigate the association between the mix of financial and non-financial performance measures in CEO bonus contracts, alternative governance mechanisms, and firm performance.

3.3   DEVELOPMENT OF HYPOTHESES

3.3.1   Impact of managerial ownership on firm's choice of performance measures

The related literature offers two competing explanations for the potential effect of managerial ownership on a firm's choice of performance measures. The managerial entrenchment perspective, for example, suggests that the separation of ownership and control allows entrenched managers a wide range of discretion, including the manipulation of the performance criteria used in their performance contingent compensation (Ittner et al., 1997; Demski, 1998). In this respect, non-financial measures such as internal customer satisfaction survey results or managerial estimates of their progress toward the completion of strategic milestones are potentially more prone to managerial manipulation and are rarely subject to public verification. Eccles and Mavrinac (1995), for example, found that many investors and market analysts believe that reported non-financial performance measures may be biased and that their computation may change over time, allowing the measures to be manipulated without sanction by outside auditors. This leads to the argument that, independent of the *informativeness* of performance measures, the use of non-financial information in bonus plans may allow powerful CEOs to increase compensation above the level justified by the firm's economic performance. These claims suggest that more focus on non-financial performance measures in the annual bonus contracts may be expected in firms where CEOs hold a greater fraction of the firm's outstanding shares.

Alternatively, non-financial performance measures and managerial ownership may also be viewed as equivalent, and could potentially substitute for monitoring mechanisms. For example, integrating non-financial measures into incentive systems may increase the efficiency of contracting with managers, given their informativeness about managerial efforts (Bushman et al., 1995, 1996; Hemmer, 1996), whereas managerial ownership of a firm's stock may also be used to improve the contract with managers by increasing the costs to managers of shirking or excessive asset use (Agrawal and Knoeber, 1996; Barnhart and Rosenstein, 1998; Core et al., 1999). Following this line of reasoning, one may also expect that firms making greater use of managerial ownership to align managers' decisions with the objectives of shareholders may perceive it to be less necessary to integrate "costly" non-financial performance measures in CEO bonus contracts.

The above competing possible explanations lead to the following research hypothesis (stated in an alternative form), which predicts no direction for the impact of managerial ownership on a firm's choice of performance measures:

> **Hypothesis 1:** *Ceteris paribus,* the mix of financial and non-financial performance measures in CEO bonus contract is associated with the firm's level of managerial ownership.

3.3.2 Impact of board composition on firm's choice of performance measures

The monitoring perspective suggests that firms with more vigilant boards of directors from outside the organization tend to demand complex information systems to reduce information asymmetry and more closely monitor the managerial decision-making processes (Hallock, 1997; Barnhart and Rosenstein, 1998; Core et al., 1999). Building on

this evidence, this study takes the perspective that the integration of non-financial measures into CEO bonus contracts is an effort to facilitate the collection of relevant operating information on the part of independent directors to monitor more closely and earlier the firm's strategic activities. In contrast, boards with a higher proportion of inside directors may decrease the demand for non-financial information on managerial performance. This may occur either because the insider-dominated board already has better knowledge of the firm's operational process, or because insider-dominated boards imply problematic self-monitoring, and particularly weak monitoring of fellow CEOs. Hence, boards of directors with a greater proportion of inside directors may tend to rely on more aggregate and traditional financial measures of performance to monitor the managers' decision-making processes. This leads to the following hypothesis:

> **Hypothesis 2:** *Ceteris paribus*, the mix of performance measures in a CEO bonus contract tends to focus more (less) on financial measures of performance in firms with a lower (higher) proportion of outside directors.

3.3.3 Impact of debt financing on firm's choice of performance measures

The studies by Ittner et al. (1997) and Begley and Feltham (1999) document that high debt level creates incentives for firms to minimize their likelihood of financial distress, and to therefore emphasize short-term financial measures in the compensation policy. The advocated reason is that in highly leveraged firms, shareholders and debtholders prioritize traditional financial measures of performance that tend to provide more informative signals on managerial actions that prevent firms financial distress. In addition, although non-financial measures may offer monitors and debtholders early warning signals of firm health, non-financial performance indicators are not easily observable by external parties. In line

with this evidence, this study takes the perspective that highly leveraged firms tend to de-emphasize the use of non-financial performance measures in CEO bonus contracts in favor of greater focus on financial and cash-flow measures of performance. This leads to the following hypothesis:

> **Hypothesis 3:** *Ceteris paribus*, the mix of performance measures in a CEO bonus contract tends to focus more (less) on financial measures of performance in firms with higher (lower) levels of debt financing.

3.3.4 Impact of the relative importance of CEO target bonus on firm's choice of performance measures

The *informativeness* principle of performance measurement (Holmstrom, 1979) maintains that for contracting purposes, a performance measure will only be included in a portfolio of performance measures if it provides incremental information content over and above the other available and less "costly" performance measures. Similarly, recent research suggests that the incremental information provided by the performance measures included in an incentive contract depends not only on the relative weight placed on these measures, but also on the targeted dollar amount of the portion of the agent's compensation that at-risk, based on these performance measures (Banker and Datar, 1989; Demsky, 1994; Bushman et al., 1995, 1996; Hemmer, 1996). For example, a higher weight on a non-financial performance measure, such as customer satisfaction, multiplied by a lower target bonus amount implies a lower risk-incentive to the agent regarding this measure. Thus, this performance measure is likely to provide less incremental information about the agent's effort. Building on this evidence, this thesis takes the perspective that the use of "costly" non-financial measures in the CEO annual cash bonus contract tends to be

associated with the relative importance of the target bonus compared to the CEO's overall cash compensation. This leads to the following hypothesis:

> **Hypothesis 4:** *Ceteris paribus*, the mix of performance measures in CEO bonus contracts tends to focus more (less) on financial measures of performance in firms using a low (high) level of target bonus.

3.3.5   Impact of managerial ownership on board composition

The studies by Barnhart and Rosenstein (1998) and Core et al. (1999) document that high levels of managerial ownership tend to increase the influence (or power) of the CEO over the board of directors. This entrenchment perspective leads to the argument that powerful CEOs may tend to lower the proportion of outside, unrelated directors in the attempt to render the board of directors unwilling to take adversarial positions against the CEO. This suggests a negative relationship between managerial ownership and the proportion of outside directors on the board, which leads to the following hypothesis:

> **Hypothesis 5:** *Ceteris paribus,* higher (lower) level of managerial ownership is associated with lower (higher) proportion of outside directors in the composition of the board.

3.3.6   Impact of debt financing on board composition

The study by Gagnon and St-Pierre (1995) suggests that a firm's use of debt financing induces a greater level of monitoring by lenders who want to ensure the repayment of their loans. Along the same lines, the study by Begley and Feltham (1999) documents that, given the importance of their investments, lenders might engage in closer monitoring of managerial performance through activities such as participation on the board of directors. Building on this evidence, it is expected that boards of directors of high

leveraged firms are more likely to include outside directors than boards of firms with lower levels of debt financing. This leads to the following hypothesis:

> **Hypothesis 6:** *Ceteris paribus*, the board tends to have a higher (lower) proportion of outside directors in firms using higher (lower) levels of debt financing.

3.3.7 Impact of managerial ownership on debt financing

The equity holder perspective suggests a negative impact of managerial ownership on a firm's use of debt financing (Jensen, 1986; Williamson, 1986; Gilson and Vetsuypens, 1993). Managers holding high levels of a firm's equity will be motivated to avoid ex-ante situations that can restrict the equity distribution, such as dividend payment and share repurchase, or that can negatively affect the expected value of their human capital.[18] As such, high levels of managerial ownership may be expected to be associated with greater restrictions on firms' additional borrowing. Alternatively, a reciprocal negative effect may also be expected because the use of debt financing means that a larger part of the firm's cash flow is being returned to debtholders and the discretionary power of managers may become smaller. The introduction of monitoring by lenders may lead the board of directors to use less managerial ownership to mitigate agency problems (Begley and Feltham, 1999). This leads to the following hypothesis:

> **Hypothesis 7:** *Ceteris paribus,* the level of debt financing tends to be lower (higher) in firms using higher (lower) levels of managerial ownership.

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[18] Gilson and Vetsuypens (1993), for example, provide evidence of the negative effect of financial distress on managers' wealth. The study examined firms that suffered financial distress and found that one-third of the CEOs were replaced and the other two-thirds experienced significant salary and bonus reductions.

3.3.8 Impact of managerial ownership on the relative importance of CEO target bonus

Research on compensation based on agency theory suggests that the larger the level of managerial ownership, the more power managers exert over the board of directors. The independence of directors may be compromised, for example, if the firm's CEO appoints them or if directors have lower equity holdings (Conyon and Peck, 1998; Magnan et al., 1999). As a result, the compensation committee of boards of directors may be ineffectual in awarding appropriate levels of risk-based compensation for powerful CEOs[19] because they may be unwilling to take adversarial positions against the CEO. This situation may allow risk- and effort-averse managers to manipulate their compensation contracts by reducing the relative importance of performance-contingent incentives (Lambert et al., 1993; Bloom and Milkovich, 1998; Core et al, 1999). This leads to the following hypothesis:

Hypothesis 8: *Ceteris paribus*, the target bonus tends to be lower (higher) in firms using higher (lower) levels of managerial ownership.

3.3.9 Impact of board composition on the relative importance of CEO's target bonus

The evidence on the impact of governance structure on the CEO's compensation suggests that the proportion of outside directors is positively associated with the use of performance-contingent compensation (Tosi and Gomez-Mejia, 1989; Bushman et al., 1995; Banker et al., 1996; Core et al., 1999). This leads to the argument that boards with a greater proportion of outside directors, with shareholders' interests as the basis of their

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[19] The CEO's ownership fraction can be viewed as another measure of the alignment of CEO preferences with equityholders, but it has also been used in the financial economics literature as a measure of CEO

decision-making process, may tend to emphasize to a greater extent the use of performance-contingent compensation, thereby using target bonuses with higher thresholds. This thesis takes the perspective that the percentage of ex-ante target bonus to base salary captures the relative importance of the risk-based incentives provided by a board's ability to reward CEOs, contingent on specific signals of managerial performance. This leads to the following hypothesis:

> **Hypothesis 9:** *Ceteris paribus*, the target bonus tends to be higher (lower) in firms with a higher (lower) proportion of outside directors on the board.

3.3.10 Impact of debt financing on the relative importance of CEO target bonus

The literature documents that high levels of debt financing tend to jeopardize the incentive power and monitoring function of short-term performance-contingent compensation (Tosi and Gomez-Mejia, 1989; Barkema and Gomez-Mejia, 1998; Bloom and Malkovich, 1998). The extensive use of debt-financing increases the likelihood of financial distress and factors outside the agent's control that can negatively influence the short-term outcome measures of managerial performance. The literature also suggests that, rather than aligning agents' actions more closely with the principals' objectives, combining greater use of debt financing with higher target bonus can negatively influence the behavior of agents. For example, high levels of debt financing can motivate managers to make income-increasing accounting policy choices to protect their jobs and compensation, or to avoid defaulting on the firm's debt covenants (Gilson and Vetsuypens, 1993). Drawing from this evidence, this thesis proposes that firms with a high

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power (Begley and Feltham, 1999).

reliance on debt financing tend to use lower target dollar amounts in their bonus contracts. This line of reasoning leads to the following hypothesis:

> **Hypothesis 10:** *Ceteris paribus*, target bonus tend to be higher (lower) in firms using lower (higher) levels of debt financing.

In addition to the relationships described in hypotheses H1 to H10, this thesis examines the relationships among the internal governance mechanisms and firm economic performance. Following a similar approach used in the studies by Agrawal and Knoeber (1996) and Barnhart and Rosenstein (1998), hypotheses H11 to H15 jointly examine whether the mix of financial and non-financial performance measures in the CEO annual bonus contract and the other four internal governance mechanisms investigated are associated with differences in firm performance, as measured by firm market to book ratio. Market to book ratio is assumed to capture the performance consequences of managerial decision and governance structure quality, which are reflected in market price but not in traditional accounting numbers.

3.3.11 Impact of firm's choice of performance measures in CEO bonus contract on firm market to book ratio

Traditional financial measures of performance[20] are often blamed for encouraging multi-task managers to focus on current operations and short-term results, which can discourage strategic initiatives and long-term investments in new products, processes, and markets with deferred and highly uncertainty returns (Holmstrom, 1979; Demski, 1994; Hemmer, 1996). Consistent with this argument, empirical research on the *informativeness*

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[20] See discussion in Chapter 2 Section 2.2.

properties of non-financial information provides evidence that non-financial measures such as customer satisfaction are value-relevant in the governance structure because they provide important information for monitoring managerial contribution to the firm's value creation (Bushman et al., 1996; Ittner et al., 1997). Agency analytical research also supports the view that incentive contracts that include performance measures capable of more precisely capturing desired dimensions of managerial efforts result in reallocations of such efforts, along with improvements in the measured dimensions (Feltham and Xie, 1994; Banker et al, 1996). Building on this evidence, this thesis takes the perspective that non-financial performance information in the bonus contract provides the board with relevant monitoring information about managerial effort and the firm's value creation process that is not reflected in traditional financial performance measures. Since market to book ratio captures the consequences of managerial decision-making which are reflected in market price but not in traditional accounting numbers, I expect a positive association between market to book values and the use of non-financial measures in CEO bonus contracts. This leads to the following hypothesis:

> **Hypothesis 11:** *Ceteris paribus,* market to book ratio is positively associated with the firm's emphasis on non-financial measures of performance in the CEO bonus contract.

3.3.12 Impact of managerial ownership on firm market to book ratio

The agency literature suggests that managerial ownership of a firm's stock helps to align the interests of managers with those of stockholders by increasing the costs to managers of shirking or excessive asset use. The idea is that managers who own a large fraction of the firms' shares bear the consequences of managerial actions that destroy firm

value, and profit from managerial actions that increase firm value. Hence, managers with a high ownership fraction are assumed to work harder, have longer investment horizons, and make better investment decisions relative to managers who have relatively little stock ownership (Morck et al., 1988; Williamson, 1996; Barnhart and Rosenstein, 1998). This leads to the following hypothesis:

> **Hypothesis 12:** *Ceteris paribus,* market to book ratio is positively associated with the firm's use of managerial ownership in its governance structure.

3.3.13 Impact of board composition on firm market to book ratio

The relation between board composition and firm performance has been examined in many prior empirical studies (Agrawal and Knoeber, 1996; Barnhart and Rosenstein, 1998; Buchholtz et al, 1998; Core et al, 1999). Overall, the evidence suggests that the monitoring effort of a board of directors is positively associated with its proportion of independent and unrelated directors. An independent board of directors tends to require more information on management actions to more closely monitor managers' decisions and anticipate rises in firm value. This leads to the following hypothesis:

> **Hypothesis 13:** *Ceteris paribus*, market to book ratio is positively associated with the proportion of outside directors on the board of directors.

3.3.14 Impact of debt financing on firm market to book ratio

The studies by Williamson (1986), Byrd et al.(1998) and Begley and Feltham (1999) suggest that greater reliance on debt financing imposes more financial risk on the firm and may align the firm's decision-making process more with the interest of debtholders than with the interest of equity holders. As a result, managers of heavily debt-

financed firms may be induced to renounce high returns from risky investment projects in order to reduce the organization's risk exposure, and may consequently experience lower financial performance. This leads to the following hypothesis:

> **Hypothesis 14:** *Ceteris paribus*, market to book ratio is negatively associated with the use of debt financing.

3.3.15 Impact of the relative importance of CEO target bonus on firm market to book ratio

Agency-based compensation research supports the notion that performance-contingent compensation aligns the actions of risk- and effort-averse agents with the desired organizational outcomes. The rationale is that the stronger the link between executive compensation and firm performance, the greater the incentive for managers to exert productive effort in line with the principals' objectives (Bloom and Milkovich, 1998; Byrd et al, 1998; Feltham and Xie, 1994; Banker et al, 1996). Building on this literature, this thesis takes the perspective that the relative importance of the targeted dollar amount of total annual bonus is positively associated with firm performance, as measured by market to book ratio. This leads to the following hypothesis:

> **Hypothesis 15:** *Ceteris paribus*, market to book ratio is positively associated with the relative importance of the CEO target bonus.

Figure 4 recalls the proposed research framework illustrated in Figure 3, and includes all the research hypotheses described above. Panel A illustrates the main hypotheses regarding the predicted associations among the mix of financial and non-financial performance measures in CEO bonus contract and the other internal governance mechanisms. Panel B illustrates the corollary hypotheses reflecting the predicted

associations across the other governance mechanisms, and Panel C presents the hypotheses relating governance mechanisms and firm performance. In the following section, I describe the regression model used in this thesis to investigate the proposed hypotheses.

Figure 4
Research framework with the testable Hypotheses
Panel A – The main hypotheses
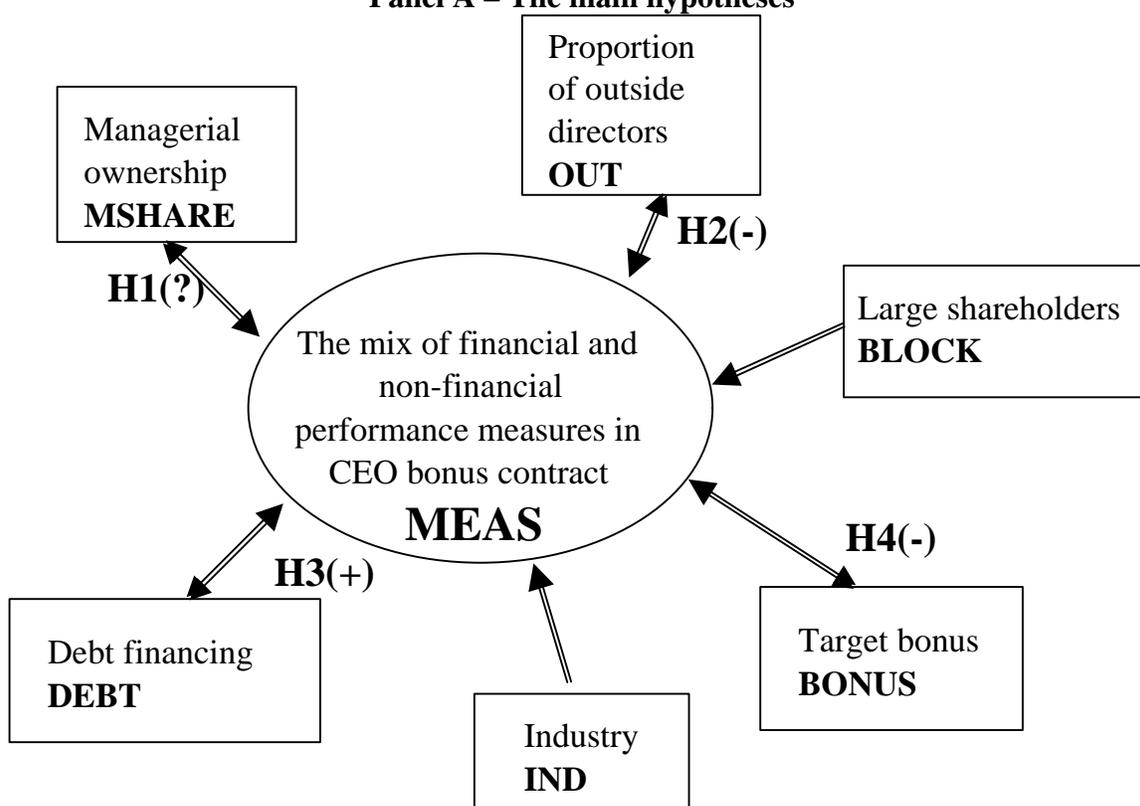
Figure 4 (cont'd)
Panel B – The corollary hypotheses
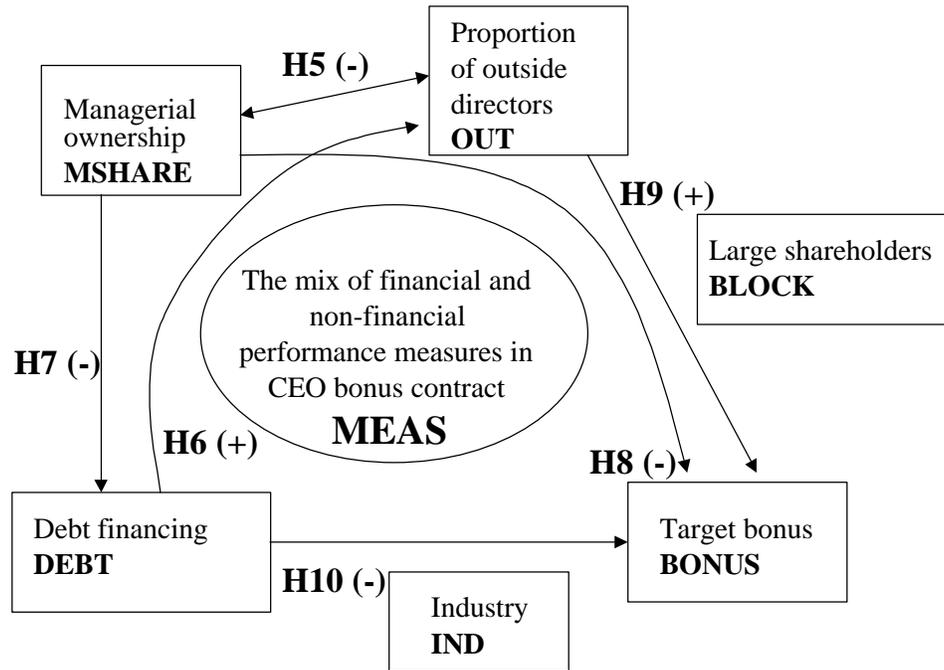
Panel C – The hypotheses relating governance mechanisms and firm performance
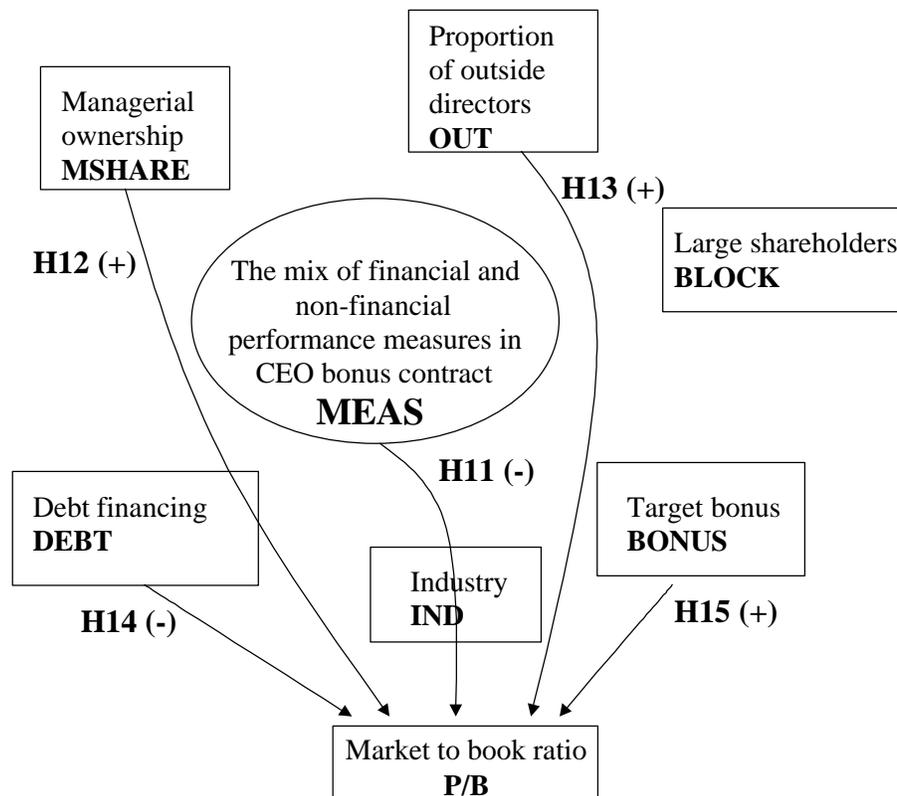
3.4   REGRESSION MODELS

In order to test the hypothesized associations among the mix of financial and non-financial performance measures in the CEO bonus contracts, governance structures and performance enhancements arising from their use, I estimate the following six regression models:

$$MEAS_{it} = a_{10} + b_{11}MSHARE_{it} + b_{12}OUT_{it} + b_{13}DEBT_{it} + b_{14}BONUS_{it} +$$
$$b_{15}IND_i + b_{16}BLOCK_{it} + b_{17}DESC_{it} + b_{18}NOISE_{it} + b_{19}STRAT_{it} + e_1 \quad (1)$$

$$MSHARE_{it} = a_{20} + b_{21}MEAS_{it} + b_{22}OUT_{it} + b_{23}DEBT_{it} + b_{24}BONUS_{it} +$$
$$b_{25}IND_i + b_{26}BLOCK_{it} + b_{27}SIZE_{it} + b_{28}TENURE_{it} + e_2 \quad (2)$$

$$OUT_{it} = a_{30} + b_{31}MEAS_{it} + b_{32}MSHARE_{it} + b_{33}DEBT_{it} + b_{34}BONUS_{it} +$$
$$b_{35}IND_i + b_{36}BLOCK_{it} + b_{37}SIZE_{it} + b_{38}CROSS_{it} + e_3 \quad (3)$$

$$DEBT_{it} = a_{40} + b_{41}MEAS_{it} + b_{42}MSHARE_{it} + b_{43}OUT_{it} + b_{44}BONUS_{it} +$$
$$b_{45}IND_i + b_{46}BLOCK_{it} + b_{47}SIZE_{it} + b_{48}CASH_{it} + e_4 \quad (4)$$

$$BONUS_{it} = a_{50} + b_{51}MEAS_{it} + b_{52}MSHARE_{it} + b_{53}OUT_{it} + b_{54}DEBT_{it} +$$
$$b_{55}IND_i + b_{56}BLOCK_{it} + b_{57}SIZE_{it} + b_{58}RISK_{it} + e_5 \quad (5)$$

$$P/B_{it+1} = a_{60} + b_{61}MEAS_{it} + b_{62}MSHARE_{it} + b_{63}OUT_{it} + b_{64}DEBT_{it} + b_{65}BONUS_{it}$$
$$+ b_{66}IND_i + b_{67}BLOCK_{it} + b_{68}SIZE_{it} + b_{69}STRAT_{it} + e_6 \quad (6)$$

Where:

MEAS$_{it}$ = firm i's ratio of the number of financial performance measures to the total number of financial and non-financial performance measures included in the CEO bonus contract in year t,

MSHARE$_{it}$ = firm i's level of managerial ownership in year t,

OUT$_{it}$ = firm i's percentage of outside directors on the board in year t,

DEBT$_{it}$ = firm i's reliance on debt financing in year t,

BONUS$_{it}$ = firm i's percentage of the CEO's ex-ante target bonus for year t,

P/B$_{it+1}$ = firm i's financial performance in year t+1,

IND$_i$ = dummy variable with value of 1 when "i" is a knowledge-based and 0 when it is a capital-based firm,

BLOCK$_{it}$ = percentage of outstanding shares held by the largest shareholder of firm i in year t,

SIZE$_{it}$ = size of firm i in year t,

NOISE$_{it}$ = firm i's noise on accounting performance measures in year t,

DESC$_{it}$ = firm i's level of decentralization in year t,

STRAT$_{it}$ = firm i's strategy in year t,

CROSS$_{it}$ = dummy variable with value of 1 when i is a cross-traded firm in year t and 0 otherwise,

RISK$_{it}$ = firm i's risk in year t,

TENURE$_{it}$ = tenure of firm i's actual CEO in year t, and

CASH$_{it}$ = firm i's operating cash flow return in year t,

Equation (1) tests hypotheses H1 to H4, examining the joint effects of the internal governance mechanisms investigated on firms' choice of financial and non-financial measures in CEO bonus contract. Equation (2) and (3) jointly test the reciprocal associations between managerial ownership and board composition as predicted in hypothesis H5. The effect of debt financing on board composition, predicted in hypothesis H6, is tested in Equation (3). The association between debt financing and managerial ownership predicted in hypothesis H7 is tested in Equation (4). Equation (5) tests hypotheses H8, H9 and H10 by examining the effects of managerial ownership, board composition and debt financing on target bonus. Finally, Equation (6) tests hypotheses H11 to H15 by jointly examining the predicted associations between the internal

governance mechanisms investigated and firm performance, as measured by market to book ratio.

3.4.1   Simultaneous approach

Consistent with the discussion in the previous section, this thesis takes the perspective that the choice of performance measures in CEO bonus contracts and the other four internal governance mechanisms investigated are jointly determined. This implies that not only is the extent of use of the internal governance mechanism investigated determined by the use of the other internal mechanisms, but that these other mechanisms are, in turn, determined by the mechanism investigated. In short, this thesis takes the perspective that there is a two-way, simultaneous relationship between the extent of use of the internal mechanisms investigated.

The implications of this simultaneity, or interdependence, for the empirical analysis is that the use of a single equation approach estimated by ordinary least square (OLS) to investigate their relationship might lead to spurious conclusions. One of the crucial assumptions of the OLS method is that the explanatory variables are either non-stochastic, or if stochastic, are distributed independently of the stochastic disturbance term. Neither of these conditions is met if the dependent and independent variables investigated are jointly determined, as proposed in this thesis. Therefore, the least-squares estimators will be not only biased but also inconsistent, which means that as the sample size increases indefinitely, the estimators of the OLS regression do not converge to their true value.

In order to reflect the interdependence among the mechanisms investigated and correctly estimate their association, the firm's mix of financial and non-financial measures in the CEO bonus contract (MEAS), managerial ownership (MSHARE), outside directors (OUT), reliance on debt financing (DEBT), and target bonus (BONUS) are treated as *endogenous* variables and estimated by simultaneous-equation models.[21] In such models, there are several equations, one for each of the dependent or *endogenous* variable. Unlike single-equation estimation, simultaneous-equation models estimate the parameters of a single equation taking into account information provided by the other equations in the system. The interdependence among the internal mechanisms investigated is, therefore, reflected by the simultaneous estimation of a system of five equations using three stage least square (3SLS), where the equation for each internal governance mechanism explained includes the other four internal mechanisms investigated as independent variables. As a result, the hypotheses H1 to H10 presented in the preceding section are also examined through a five simultaneous-equation model, which includes the first five equations presented in Section 3.4. This system of five equations is identified,[22] and the five *endogenous* variables, MEAS, MSHARE, OUT, DEBT, and BONUS, can be expressed as a function of the *exogenous* (or control) variables only.

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[21] Previous empirical work addressing this issue includes Agrawal and Knoeber (1996) and Barnhart and Rosenstein (1998).

[22] The analysis of model identification conditions is described in Appendix A.

3.5   SUMMARY

This chapter presented the hypotheses positing the interdependence among the mix of financial and non-financial performance measures in the CEO bonus contract, governance structure, and firm performance. The proposed associations are mainly supported by the argument that integrating non-financial measures into the CEO's incentive contract improves corporate governance by facilitating the collection of relevant information on the part of investors and independent directors to more closely monitor the activities that create firm value. In the following chapter, I describe the data and research methods used to empirically investigate the hypotheses of this thesis.

CHAPTER 4

DATA AND METHODOLOGY

4.1   INTRODUCTION

This chapter describes the methodology used to empirically investigate the proposed hypotheses for the associations among the mix of financial and non-financial performance measures, other alternative governance mechanisms, and firm performance. In Section 4.2, I present the sampling strategy and demographic data on the two-industry-sample of Canadian public firms. Comparisons between target and final sample, two tests for potential sample selection bias, and demographic data on the final sample are presented in Section 4.3. Finally, Sections 4.4 and 4.5 describe the measurement of the main and control variables used in the empirical analysis.

4.2   SAMPLING STRATEGY

4.2.1   Target sample

In order to test the research hypotheses developed in Section 3, I limit the analysis to a two-industry sample of Canadian publicly-traded companies. The motivation to use a sample of Canadian publicly-traded companies in this thesis is driven by the evidence that Canadian[23] firms have a higher number of significant shareholders than do public firms in the U.S..[24] The amount of managerial ownership, for example, is almost twice as great in

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[23] For Canadian evidence see, for example, Gillies and Morra (1997), Gedajlovic and Shapiro (1998), Klassen and Mawani (2000), and Craighead et al. (2000).

[24] For U.S. evidence see, for example, Barnhart and Rosenstein (1998), Begley and Feltham (1999), and Core et al. (1999).

Canada as in the U.S., and the institutional ownership of shares in Canada is about two-thirds of what it is in the U.S.. In contrast, CEO duality[25] is present in only 33% of Canadian firms compared to 60% in the U.S.. These distinctions suggest that, relative to the U.S., shareholders of Canadian companies may have greater influence on corporate governance structures. Therefore, relative to the U.S., the use of Canadian data may provide new evidence regarding the associations among the governance mechanisms and between governance mechanisms and firm performance.

The purpose is also to focus the analysis on Canadian public companies from two very distinct economic sectors, thereby better investigating and controlling for the effects of market-related mechanisms[26] on the firm's internal governance configuration. The contextual differences between these two sample sub-groups, which I identify as "knowledge" and "capital-based" companies, can be described as follows.

Knowledge-based companies

The first group, called knowledge-based, consists of Canadian public companies in the biotechnology and pharmaceutical two-digit standard industrial classification, SIC Codes 43 and 52 respectively.[27] This group represents companies dealing with new technologies and intensive product development, which creates high levels of uncertainty

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[25] The governance literature uses the expression CEO duality labels the situation where the chairman of the board and the CEO are the same person.

[26] As outlined previously, these market-related governance mechanisms are assumed to be industry-related mechanisms and are identified in the related literature as the market for corporate control (Mahoney and Mahoney, 1993), the managerial labor market (Fama, 1980), and the product market (Collin, 1998).

[27] The Standard Industrial Classification (SIC) is used to classify companies by type of economic activity in which they are primarily engaged. The source for this classification is the StockGuide files.

as to the extent of the future value of the technology, and therefore, to the firm's future value.[28] The growth of firms in biotechnology and pharmaceutical sectors stems in large part from high levels of long-term investments in training and research, which require large amounts of R&D funding. As such, a crucial characteristic of companies in this sector is their huge spread between market value and physical assets, suggesting that the intangible assets do play an important evaluating role. (*Industry Canada Strategis*). Furthermore, because of the continuous development carried out by these companies, the management decision process tends to be less centralized and based on indicators other than accounting measures of past activities (Milton, 1997; Zhen, Baruch and Narin, 1999).

Capital- based companies

The sub-sample of capital-based companies is composed of publicly-traded companies under three two-digit standard industrial classifications − Pulp & Paper (SIC 26), Steel Producers (SIC 60 and 61), and Publishing (SIC 83). In contrast to the knowledge-based group, the production process of companies in the capital-based sub-sample has remained essentially the same since the beginning of this century. Pulp & Paper, Steel Producers, and Publishing are industries with a stable technology where the most recent innovations have been focused on production scale for purposes of cost reduction (*Strategis Canada*). Furthermore, these industries tend to be characterized by long-established companies with high levels of capital invested in tangible assets, large

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[28] According to Ernest & Young (*Canadian Biotechnology'98*), the Canadian biotechnology industry is characterized by a mixture of firms dedicated to biotechnology and of firms using it as a tool to develop more traditional products and services. This same report documents that in the summer of 1998, the Canadian biotechnology industry was composed of 282 firms, 25% of which were publicly traded. About

numbers of employees, a centralized decision process, relatively lower levels of R&D expenditures, and product innovation as a secondary priority.

Consistent with the two-digit SIC classification described above and the availability of the company's Management Proxy Circular in the SEDAR files, the target sample of knowledge- and capital-based Canadian publicly-traded companies consists of the following:

Table 1 - Composition of the target sample by industry

Description	SIC Codes	Number of companies by	
		SIC Codes	Sub-group
Biotechnology	(43)	58	
Pharmaceuticals	(52)	19	
Knowledge-based Sub-sample			77
Pulp & Paper	(26)	37	
Steel Producers	(60 and 61)	11	
Publishing	(83)	13	
Capital-based Sub-sample			61
Total			138

Financial and governance information for the financial years ending in 1997 and 1998 was collected for the target sample of 138 Canadian public companies. The database was developed using two data sources. The StockGuide files were the source for the financial statements and the SEDAR files were the source for the ProxyBase information about the companies' governance structures. The 1997 and 1998 financial years were selected because of the availability of proxy statements at the time I started building the database for this thesis. For example, the company's 1999 Management Proxy Circular provided data on the CEO's compensation and performance measurement criteria used in

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46% of the companies are in the health care sector and agriculture ranks second at 22%. Small,

the financial year ending in 1998.

In Table 2, I present the general characteristics of this target sample of 138 knowledge- and capital-based Canadian publicly-traded companies. This data is based on their financial statements for the 1997 financial year. As expected, companies across the capital-based sub-sample have larger revenues, total assets and number of employees. This result confirms our previous classification of knowledge- and capital-based companies as two distinct sub-groups.

Table 2 – Target sample characteristics (year = 1997)

Panel A: Number of employees

Companies	N	Mean	St.Dev.	Minimum	Maximum
Knowledge	77	572.1	1,451.5	5	8,500
Capital	61	4,728.1	8,021.9	5	39,000
Total Sample	138	2,409.1	5,800.3	5	39,000

Panel B: Total Revenue ($thousands)

	N	Mean	St.Dev.	Minimum	Maximum
Knowledge	77	271.4	787.4	0.0	3,905.9
Capital	61	1,227.3	1,747.9	3.5	8,425.2
Total Sample	138	693.9	1,381.7	0.0	8,425.2

Panel C: Total Assets ($thousands)

	N	Mean	St.Dev.	Minimum	Maximum
Knowledge	77	336.6	1,001.4	0.2	6,333.7
Capital	61	1,570.2	2,811.9	4.9	19,073.0
Total Sample	138	881.9	2,097.0	0.2	19,073.0

Source: StockGuide database

In order to provide further evidence about the statistical differences in this dichotomy classification between knowledge- and capital-based companies, I conducted comparison tests between the two target sub-samples. The tests of differences of means and variance between the target sub-samples are presented in Panels A and B of Table 3.

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entrepreneurial companies represent 72% of the total industry and R&D expenditures total 585 million.

The results provide statistically significant evidence on the contextual differences between the two target sub-groups. The hypotheses of equal means and variance were rejected for all three criteria: number of employees, total revenue, and total assets. Hence, the results confirm the sample dichotomy classification and lead to the conclusion that these two sub-groups of companies differ significantly.[29]

Table 3 – Comparison between sub-samples of target sample
Panel A - Difference of means between knowledge- (N_1=77) and capital-based sub-samples (N_2=61).

Variables N_1=77/N_2=61	F-test Equality of means	Results (F_c=1.79 Prob.=5%)
Employees	19.882	H_0 of Equality is rejected
Total Revenue	63.171	H_0 of Equality is rejected
Total Assets	12.793	H_0 of Equality is rejected

Panel B - Difference of variances between knowledge (N_1=77) and capital-based sub-samples (N_2=61).

Variables N_1=77/N_2=61	Bartlett's Homogeneity of Variance test	Results (X^2 = 3.841 Prob.= 5%)
Employees	152.95	Unequal variance accepted
Total Revenue	9.95	Unequal variance accepted
Total Assets	65.41	Unequal variance accepted

4.2.2 Final sample

After limiting the sample to companies where (1) the CEO's compensation package included an annual bonus plan, and (2) ProxyBase information about the bonus plan allowed the identification of objective financial and non-financial performance criteria, the final sample size is reduced to 97 companies in the knowledge- (N_1= 48) and capital-based (N_2=49) industries.

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[29] For purposes of validating the classification of Pulp & Paper, Steel Producers and Publishing as a homogeneous capital-based sub-group, and Biotechnology and Pharmaceuticals as a homogeneous knowledge-based sub-group, the same tests of differences reported on Table 3 were performed within the industries composing each target sub-group. Although not reported here, the evidence indicates that each target sub-group is statistically internally homogeneous.

Panel A of Table 4 summarizes the composition of the final sample used for subsequent empirical tests of the hypotheses. Panels B and C present the characteristics of each final sub-sample, and Panel D the characteristics of the final pooled sample. This data is based on the financial statements at the end of 1997, as disclosed in the StockGuide files. As expected, companies across the capital-based sub-sample have larger revenue, total assets, and number of employees. Also, the results confirm, for the final sample, the dichotomy classification between knowledge- and capital-based companies as two significantly different sub-groups.

Table 4 – Final sample characteristics

Panel A - Composition of final sample by industry

Description	SIC Codes	Number of companies by	
		SIC Codes	Sub-group
Biotechnology	(43)	37	
Pharmaceuticals	(52)	11	
Total final knowledge-based sub-sample			48
Pulp & Paper	(26)	35	
Steel Producers	(60 and 61)	8	
Publishing	(83)	6	
Total final capital-based sub-sample			49
Total number of companies in the final sample			97

Panel B - Characteristics of the sub-sample of knowledge-based companies

Variable	N	Mean	St.Dev.	Minimum	Maximum
N. Employees	48	790.8	1,708.8	5.0	8,500.0
Total Revenue ($thous.)	48	335.4	822.3	0.0	3,532.0
Total Assets ($thous.)	48	513.7	1,354.0	4.8	6,333.7

Panel C - Characteristics of the sub-sample of capital-based companies

Variable	N	Mean	St.Dev.	Minimum	Maximum
N. Employees	49	4,912.2	7,228.2	5.0	39,000.0
Total Revenue	49	1,308.2	1,576.0	12.7	8,261.6
Total Assets	49	1,951.0	3,102.9	39.9	19,050.0

Panel D - Characteristics of the pooled sample

Variable	N	Mean	St.Dev.	Minimum	Maximum
N. Employees	97	2,872.7	5,643.0	5.0	39,000.0
Total Revenue ($thous.)	97	826.8	1,346.1	0.0	8,261.6
Total Assets ($thous.)	97	1,239.8	2,496.7	4.8	19,050.0

4.3   TESTS FOR POTENTIAL SAMPLE BIAS

The fact that the two necessary conditions of data availability described in Section 4.2.2 lead to the exclusion of 41 companies[30] from our target sample might raise the question that a potential sample-bias may affect the proposed investigation. In order to address this issue, I conducted two different tests to investigate the external validity of the final sample of 97 companies. First, I compared within each sub-sample the means and variances of companies included in the final sample with the 41 companies excluded from the final sample. Secondly, I conducted a probability test on the criteria limiting our final sample. These tests are described in Appendix B.

The evidence provided by the test of differences (Appendix B, Section B1) and the probability test (Appendix B, Section B2) leads to the conclusion that the exclusion of 41 companies from our target sample, because either (1) a bonus plan was not present in CEO's compensation package or (2) objective performance criteria were not disclosed in the proxy statements, is not likely to affect the external validity of the empirical analysis of the final sample. Therefore, the remainder of this investigation uses the final sample of 97 Canadian public companies.

In the following section, I describe the measurement of the variables used in this investigation as well as the hypothesized relationship among the variables.

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[30] Consistent with the two limiting criteria, 12 and 29 companies were dropped from the target capital- and knowledge-based sub-groups, respectively. More precisely, in the capital-based (knowledge-based) sub-group, 4 (17) companies were dropped because CEO compensation plan does not include cash bonus,

4.4   MEASUREMENT OF MAIN VARIABLES

4.4.1   Choice of financial and non-financial performance measures
in CEO bonus contract (MEAS)

The performance measures used in the CEO bonus contract were obtained from the firm's 1998 ProxyBase.[31] Similar to the U.S. study by Ittner et al. (1997), this information was found in the "Human Resources and Compensation Committee Report on Executive Compensation." However, unlike the U.S. disclosure, specific weights for each performance criterion used in the bonus contract are not available for most Canadian firms. In this thesis, therefore, when a criterion's weight is not specified, a weight is arbitrarily determined according to the proportion of non-financial and financial metrics to the total number of metrics disclosed in the discussion of the CEO's annual bonus contract. Similar to the studies by Cowen (1987), Gray et al. (1995), and Neu et al. (1998), this approach is assumed to provide a measure of the emphasis placed on financial and non-financial performance measures.[32] Consistent with the studies by Ittner et al. (1997) and Morissette (1998), Table 5 documents the list of financial and non-financial performance measures used as a reference for the analysis and classification of the sampled firms' ProxyBased information on the performance criteria included in CEO bonus plans. For subsequent empirical analysis, the variable MEAS denotes the proportion of total performance measures that consist of financial performance criteria. As such, values for this variable range from 1.0 (one) for firms using only financial measures to 0 (zero) for firms using only non-financial performance measures in CEO their bonus contracts. The

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and other 8 (12) companies because the bonus contract does not disclose objective performance criteria.
[31] This expression will be used in the remainder of this document to indicate information available in the firm's Management Proxy Circular.

mix of financial and non-financial performance measures used in CEO bonus contract for

the sampled firms that did not disclose specific weights in the discussion of the criteria

used to grant the cash bonus is computed using the following formula:

$$\text{Percentage (\%) of financial measures used} = \frac{\text{Number of Financial measures}}{\text{Number Financial} + \text{Number Non-financial}}$$

Table 5 - Performance measures found in ProxyBase information

F – financial measures	NF – non-financial measures
Operating income or income before tax	Customer satisfaction
Cash flow	Employee satisfaction and safety
Stock price return	Acquisitions and alliances
Net income	Product or service quality
Earnings-per-share	Efficiency or productivity
Sales	Employee safety
Economic value added	Market share
Return on invested capital	Non-financial strategic objectives
Return on assets	Process improvements and re-engineering
Return on equity	New product development
Return on sales	Innovation
Cost reduction	Employee development and training
	Workforce diversity
	Individual performance measures

4.4.2   Managerial ownership (MSHARE)

The fraction of equity held by managers, or managerial ownership (MSHARE),

was measured by the ratio of the number of shares held by corporate managers to the

firm's total amount of outstanding shares, as disclosed in the firm's 1998 ProxyBase

information. A similar measure of managerial ownership is used in the governance

literature by Byrd and Stammerjohan (1997); Barnhart and Rosenstein (1998); Bloom and

Milkovich (1998); David et all. (1998); and Core et al. (1999).

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[32] To illustrate this approach, Appendix D presents some ProxyBase data for this variable.

4.4.3 Board vigilance (OUT)

The corporate governance guidelines of the Toronto Stock Exchange (TSE - 1994) have motivated the measure used to proxy for boards' efforts in monitoring managerial decisions. Guideline N.3, for example, suggests that every corporation's board of directors be constituted with a majority of individuals who qualify as "unrelated" directors. An unrelated director is a director who is independent of management and free of any interest, business, or other relationship that could, or could reasonably be perceived to materially interfere with the director's ability to monitor management. Similar to other studies on corporate governance (e.g., Lambert et al., 1993; Gagnon and St-Pierre, 1995; Agrawal and Knoeber, 1996; Barnhart and Rosenstein, 1998; Core et al., 1999), this thesis uses the proportion of unrelated directors as a proxy for board monitoring.

4.4.4 Use of debt financing (DEBT)

Like Agrawal and Knoeber (1996) and Begley and Feltham (1999), this study measures the firm's reliance on DEBT financing by the ratio of firm book value of liabilities to total assets. This ratio is measured as follows:

$$DEBT \ = \ \frac{LTD + STD \ - CASH}{V} ,$$

Where;   *LTD* =   *Book value of long-term debt,*
                    STD   =   *Book value of short-term debt,*
                    CASH =   *Cash and marketable securities,*
                    V   =   *Equity + LTD + STD*

4.4.5   Target bonus (BONUS)

The percentage of the ex-ante threshold for the cash bonus CEOs can potentially earn at the end of the financial year is used to proxy for the relative importance of performance-contingent rewards in CEOs compensation packages. The cash bonus target is established ex-ante by the board of directors' compensation committee, and it is disclosed in the firm's Management Proxy Circular. For example, a *year-t* bonus target of 100% (1.0), which is determined early in *year-t*, means that if the performance targets of the bonus contract are achieved in *year-t* the CEO can potentially earn a cash bonus in the same amount of his salary at the end of *year-t*. As such, the target bonus captures the importance of cash incentive at risk relative to CEO overall total cash compensation. For firms that did not disclose the 1998 target bonus (N=21), the ratio of total bonus payout to total salary in the preceding financial year (1997) is used as a proxy for the relative importance of the CEO target bonus for the 1998 financial year.[33]

4.4.6   Large shareholder (BLOCK)

This variable represents the presence of blockholders in the firms' ownership structure, and their efforts to monitor managerial decisions. This variable was measured by the proportion of outstanding shares held by the largest shareholder at the beginning of the

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[33] I should note that, although strong contingent incentives can be provided by an executive's holdings of stock and stock option grants, these incentives are not the focus of this thesis, and are omitted from this investigation. This thesis focuses on the incentives provided by the board's ability to reward CEOs based on financial and non-financial signals of managerial performance. In this respect, *ex-ant*e cash bonus target, rather than stock option grants, is the mechanism that may be used by boards to collect agent's private information and reduce information asymmetry. This thesis takes the perspective that stock options granting is an incentive by which the board delegates the tasks of monitoring and rewarding top managers to capital markets as a by-product of the extensive use of equity-based pay instruments. Also, the omission of stock option is a methodology that parallels the empirical studies of Bushman, Indjejikian, and Smith

1998 fiscal year. This data was obtained from the firms' 1998 Management Proxy Circulars. To be classified as a large shareholder, the individual or institution needed to beneficially own or exercise control over more than 10% of the company's outstanding shares. If no large shareholder was indicated in the ProxyBase information, the ownership structure was considered diffuse and 0% was noted for this variable. A similar measure was used in the studies by Jensen and Meckling (1976); Gedajlovic and Shapiro (1998); and Core et al. (1999).

4.4.7   Industry (IND)

Consistent with the industry-based sample selection described in Section 4.2, the firms' industry memberships were coded by an indicator variable with a value of 1 for a knowledge-based company, and 0 for a capital-based company. Also, the inclusion of this indicator variable in all six equations allowed investigation into whether an industry pattern might exist through the choice of performance measures and internal governance mechanisms investigated. This thesis takes the perspective that this industry indicator variable surrogates for the impact of external (or market-related) governance mechanisms, such as the market for corporate control, the managerial labor market, and the product market, on the firm's internal governance configuration.

4.4.8   Firm performance (P/B)

Market-to-book ratios are often used to capture the spirit of Myer's (1977) characterization of a firm's actual performance and growth opportunities relative to assets

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(1996), Ittner, Larcker, and Rajan (1997), and Krolick (1998).

in place. In the context of managerial performance evaluation, the typical intuition for this ratio is that it captures the consequences of managerial actions and decisions that are reflected in market price, but not reflected in accounting numbers. Greater monitoring of managerial decisions is expected to be associated with greater market-to-book ratios.[34] I measure the firm's ratio of the market value of common stock to book value of stockholders' equity with data collected from Stockguide files for financial years ending in 1997 and 1998, noted as P/B_t and P/B_{t+1}, respectively. The firm's 1997 financial year was the firm's last financial statement preceding its 1998 Management Proxy Circular[35]. Thus, related to the information collected to capture the governance configuration of the firms, P/B_t is considered a proxy for firm contemporaneous performance, and P/B_{t+1} a proxy for firm future performance.

4.5   MEASUREMENT OF CONTROL VARIABLES

This section presents the control variables considered in the six regression models presented in Section 3.4. Table 6 below describes them and the way they are measured, with appropriate reference to related studies that used a similar proxy. Following Table 6, I describe the motivation for each variable and its hypothesized effect on the dependent variables. This section ends with Table 7, which summarizes the predicted signs between the dependent and independent variables included in the regression models.

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[34] Similar proxies were used in the studies by Agrawal and Knoeber (1996),Barnhart and Rosenstein (1998) and Core et al. (1999)

[35] The firm's disclosure of both reports occurs around 3 months after the end of its financial year.

Table 6
Control variables

Variable	*Notation*	*Proxy*	*Reference*
1. Firm size	SIZE	Logarithm of book value of assets.	Barnhart and Rosenstein (1998) Bloom and Milkovich (1998) Gadhoum (1998) Gedajlovic and Shapiro (1998)
2. Strategy	STRAT	Ratio of R&D expenses to total book value of assets.	Zeckhauser and Pound (1990); Bushee (1998, 1999)
3. Noise on accounting information	NOISE	Standard deviation of firm's accounting earnings.	Demsetz and Lehn (1985) Bloom and Milkovich (1998) Core et al.(1999)
4. Decentral-ization	DESC	Firm's number of branches (business units) as disclosed in the CanCorp data base	Ittner et al. (1997)
5.Tenure of CEO	TENURE	The number of years as CEO in the present organization.	Barnhart and Rosenstein (1998)
6. Cross-traded firms	CROSS	Dummy variable with value 1 for Canadian companies also listed in US stock exchange like NYSE, NASDAQ and AMEX, and 0 otherwise.	Core et al. (1999)
7. Operating cash flow return	CASH	The ratio of operating cash flow to firm book value.	Agrawal and Knoeber (1996)
8. Risk	RISK	Firm's Beta calculated over a period of twelve months prior to the end of 1997 financial year.	Bloom and Milkovich (1998) Byrd et al. (1998)

4.5.1   Size of firm (SIZE)

The size of the firm is included to account for potential economies of scale and monitoring complexity required in larger firms. The motivation is that the larger the organization, the greater its potential growth opportunities and agency costs, and the more complex its governance conditions (Barnhart and Rosenstein, 1998; Gedajlovic and Shapiro, 1998). Thus, firm size is expected to be positively associated with the independence of the board of directors (OUT), emphasis on performance-contingent compensation (BONUS), and firm performance. In contrast, it is expected that firm size would be negatively associated with managerial ownership (MSHARE) and reliance on debt financing (DEBT). Following the evidence provided by Ittner et al. (1997), I do not expect that size would significantly influence the mix of financial and non-financial measures in CEO bonus contract (MEAS).

4.5.2   Strategy (STRAT)

The management literature suggests that competitive strategy can be broadly conceptualized as a continuum between two different strategic orientations (Miles and Snow, 1978; Porter, 1985). At one extreme, organizations are characterized as *prospectors,* or firms that exhibit a *differentiation* strategy. This group includes firms attempting to continuously identify new product/service market opportunities, quickly adapt themselves to changes in the external environment, and follow a "first-to-market" strategy. At the other extreme, organizations are characterized as *defenders,* or firms that exhibit a cost leader strategy. These firms attempt to provide a stable set of products and services to a well-defined portion of the total market while emphasizing improvements in

current operating efficiencies in order to lower costs. Consistent with this literature, a firm's ratio of research and development (R&D) expenses to total book value of assets is assumed to identify *defender* and *prospector* firms (Zeckhauser and Pound, 1990; Bushee, 1998, 1999).

This thesis takes the perspective that the impact of managerial actions in *prospector* firms may take substantial time to be revealed in financial results, which renders short-run financial performance measures relatively less informative about managerial effort (Govindarajan and Gupta, 1985; Curtis, 1994; Abernethy and Lillis, 1995; Ittner et al., 1997; Morissette, 1998). Thus, I expect *prospector (defender)* firms to be negatively (positively) associated with the emphasis on financial performance measures in the CEO bonus contract (MEAS). *Prospectors* are also committed to the development of new products and diversification, which may lead to greater firm value creation. As a result, I expect a positive (negative) association between *prospectors (defenders)* and firm market to book ratio.

4.5.3 Noise on accounting information (NOISE)

Firms transacting in markets characterized by stable prices, stable technology, stable market shares, and so forth are firms where managerial effort can be easily monitored through efficiency-based (financial) measures of performance. In contrast, a situation of less predictable environments, innovation-oriented strategy, and competitive markets renders managerial effort more complex and costly to monitor, leading firms to focus performance evaluations on non-financial measures (Abernethy and Lillis, 1995; Ittner et al., 1997; Perera et al., 1997; Ittner and Larcker, 1998). Consistent with this

literature, I expect greater noise on accounting information (NOISE) to be associated with a lower use of financial measures of performance in CEO bonus contracts (MEAS).

4.5.4 Decentralization (DESC)

The studies by Abernethy and Lillis (1995); Ittner et al. (1997); and Morissette (1998) suggest that as the level of firm decentralization increases, the monitoring activities tend to rely on several hierarchy levels, greater emphasis on aggregate performance information, and more formal communication mechanisms. Thus, a positive association between the firm's level of decentralization (DESC) and its emphasis on financial measures of performance in the CEO bonus contract is expected.

4.5.5 CEO tenure (TENURE)

The studies by Ittner et al. (1997); Barnhart and Rosenstein (1998); and Core et al. (1999) suggest that as tenure of CEOs increases, they are able to accumulate power from a variety of sources. For example, one important source of power is their level of managerial ownership. This evidence leads to the argument that as the number of years as CEO increases, the greater tends to be his or her fraction of the firm's stock. Thus, a positive association between MSHARE and TENURE is expected.

4.5.6 Cross-traded firms (CROSS)

Corporate governance guidelines worldwide have been following the influence of regulations and disclosure formats imposed by US standards. The efforts of boards of directors to monitor the actions of managers may therefore tend to be positively associated with firm exposure to the more stringent regulations of the U.S. capital market regarding

board composition (e.g., the 1996 Blue Ribbon Commission Guidelines of the National Association of Corporate Directors – NACD/US). In line with the studies by Agrawal and Knoeber (1996) and Core et al. (1999), I expect that Canadian public-firms with stock traded on NYSE, AMEX and/or NASDAQ are likely to have a greater proportion of outside, unrelated directors (OUT) on the board.

4.5.7   Cash flow return (CASH)

Consistent with the evidence provided by Agrawal and Knoeber (1996) and Begley and Feltham (1999), I expect that the firms' reliance on debt financing (DEBT) to be negatively affected by their capacity to produce cash flow return (CASH). The premise is that the availability of internal funds provides an alternative source of capital, leading public firms to make less use of debt financing to leverage its activities.

4.5.8   Risk (RISK)

The studies by Bloom and Milkovich (1998) and Byrd et al. (1998), suggest that a firm's risk on its own tends to increase an agent's overall risk exposure by jeopardizing both the entire employment relationship and the agent's income stream. These authors also argue that when business risk is higher, greater use of performance-contingent compensation may become dysfunctional for directing managerial behavior, because it decreases employment security and imposes even more risk on the agent. Following this line of reasoning, I expect that the firm's risk will be negatively associated with the use of performance-contingent compensation, as measured by the target bonus.

This section ends with Table 7, which summarizes the above discussion. This table documents the predicted signs of the associations among all dependent and independent variables included in the proposed empirical models.

Table 7
Predicted signs of the relationships among dependent and independent variables

	MEAS Eq.1	MSHARE Eq.2	OUT Eq.3	DEBT Eq.4	BONUS Eq.5	PERF Eq.6
MEAS		?	(-)	+	(-)	(-)
MSHARE	?		(-)	(-)	(-)	+
OUT	(-)	(-)		+	+	+
DEBT	+	(-)	+		(-)	(-)
BONUS	(-)	(-)	+	(-)		+
IND	(-)	?	?	(-)	(-)	+
BLOCK	(-)	?	+	(-)	+	+
SIZE		(-)	+	(-)	+	+
DESC	+					
NOISE	(-)					
STRAT	(-)					+
TENURE		+				
CROSS			+			
CASH				(-)		
RISK					(-)	

4.6 SUMMARY

This chapter presented the research framework and measurement instruments used in the empirical investigation. The measurement instrument for each variable is supported by related literature. The quantitative and qualitative information collected by these instruments is used in the following chapter to revise the empirical models, empirically test the hypotheses and develop further theoretical generalizations. In the following chapter, I discuss the results of the quantitative analyses conducted on the information collected.

CHAPTER 5

EMPIRICAL ANALYSIS AND DISCUSSION

5.1   INTRODUCTION

This section presents the empirical results of the tests of the hypotheses developed in Chapter 3. Section 5.2 presents the descriptive statistics of the variables. Section 5.3 reports the results of the univariate analyses among the main variables, as well as among the main and the control variables. The OLS and simultaneous regression analyses are developed in Section 5.4 and 5.5, respectively. Section 5.6 presents the regression estimates on firm future performance. Finally, Section 5.7 reports a summary of the results.

5.2   DESCRIPTIVE STATISTICS

The descriptive statistics are presented in Tables 8 to 11. Proxies for debt financing (DEBT), market to book ratio (P/B_t and P/B_{t+1}), firm's strategy (STRAT), and operating cash flow return (CASH) are also presented as deviations from industry mean (i.e., $DEBT_i$ – $DEBT_{Industry}$ = DEBT-adj). This adjustment uses the firms' respective industry average value for that variable as a benchmark, with the objective of increasing the variables' variance and to capture the sample firms that under- or out-perform on these specific criteria. Tables 8 and 9 report the distributions of the variables for the knowledge-based and capital-based sub-samples, respectively. Table 10 presents the results of the comparisons of means and variances between these two final sub-samples, while Table 11

reports the summary statistics for the final pooled sample. Finally, Panels A and B of Table 12, report the correlation ranks for the variables. For instance, in Table 12 as well as in the further regression analysis, the results are presented as variables net of the industry mean for that variable.

Table 8 – Descriptive statistics of knowledge-based sub-sample

Panel A: Dependent variables

	N	Mean	St.Dev.	Median	Minimum	Maximum
MEAS	48	0.652	0.295	0.670	0.000	1.000
MSHARE	48	0.104	0.174	0.034	0.000	0.742
OUT	48	0.654	0.144	0.655	0.330	0.900
DEBT	48	0.061	0.447	0.101	-0.896	0.813
DEBT-adj	48	0.003	0.443	0.046	-0.945	0.764
BONUS	48	0.459	0.337	0.335	0.000	1.360
P/B$_t$	48	3.629	2.397	2.945	0.570	13.580
P/B$_t$ –adj	48	1.471	2.725	0.985	-2.450	11.950
P/B$_{t+1}$	48	3.708	3.599	2.545	0.600	18.400
P/B$_{t+1}$ –adj	48	-0.037	3.595	-1.070	-3.200	14.600

Panel B: Independent variables

	N	Mean	St.Dev.	Median	Minimum	Maximum
IND	48	1.000	0.000	1.000	1.000	1.000
BLOCK	48	0.247	0.228	0.152	0.000	0.866
SIZE	48	4.129	1.810	3.670	1.148	8.754
DESC	48	3.937	3.581	2.000	0.000	17.000
NOISE	48	36.260	31.679	27.730	4.660	148.730
STRAT	48	0.126	0.158	0.034	0.000	0.653
STRAT-adj	48	-0.010	0.157	-0.077	-0.139	0.514
TENURE	48	7.333	5.883	6.000	1.000	28.000
CROSS	48	0.125	0.334	0.000	0.000	1.000
CASH	48	0.097	0.155	0.045	-0.254	0.544
CASH-adj	48	0.018	0.156	-0.030	-0.326	0.472
RISK	48	0.758	0.459	0.064	-0.140	1.910

Dependent Variables: MEAS = emphasis on financial measures of performance; MSHARE = level of inside shareholding at the beginning of the 1998 financial year; OUT = percentage of outside directors; DEBT = debt to firm value ratio at the end of 1997; DEBT-adj = debt to firm value ratio in 1997 adjusted for industry mean; BONUS = target bonus as a percentage of salary in 1998; P/B$_t$= market to book ratio, measured at the end of 1997; P/B$_t$-adj = market to book value ratio in 1997 adjusted for industry mean; P/B$_{t+1}$ = market to book value ratio in 1998; P/B$_{t+1}$-adj = market to book value ratio in 1998 adjusted for industry mean.

Independent Variables: IND = dummy variable with value of 1 for a knowledge-based company and 0 for a capital-based company; BLOCK = percentage of outstanding shares held by the largest shareholder at the beginning of 1998; SIZE = natural log of firm's total value of assets at the end of 1997; DESC = number of branches; NOISE = standard deviation of firm's stock price over 12 months prior to January 1998; STRAT = ratio of R&D expenses to total book value of assets in 1997; STRAT$_{adj}$ = ratio of R&D expenses to total book value of assets in 1997 adjusted for industry mean; TENURE = number of years as CEO; CROSS = dummy variable with value 1 for Canadian companies also listed on US stock exchange; CASH = operating cash flow return on firm market value in 1997; CASH$_{adj}$ = operating cash flow in 1997 adjusted for industry mean; RISK = sensitivity of firm's stock market price to overall fluctuation in the TSE-300.

Table 9 – Descriptive statistics of capital-based sub-sample

Panel A: Dependent variables

	N	Mean	St.Dev.	Median	Minimum	Maximum
MEAS	49	0.771	0.236	0.750	0.330	1.000
MSHARE	49	0.195	0.276	0.015	0.000	1.000
OUT	49	0.596	0.209	0.600	0.000	0.920
DEBT	49	0.500	0.206	0.483	-0.038	0.981
DEBT-adj	49	0.015	0.206	-0.002	-0.523	0.496
BONUS	49	0.656	0.381	0.600	0.100	1.530
P/B_t	49	1.524	0.966	1.210	0.560	5.380
P/B_t –adj	49	-0.106	0.966	-0.420	-1.070	3.750
P/B_{t+1}	49	1.197	0.775	0.960	0.340	3.520
P/B_{t+1} –adj	49	-0.013	0.775	-0.250	-0.870	2.310

Panel B: Independent variables

	N	Mean	St.Dev.	Median	Minimum	Maximum
IND	49	0.000	0.000	0.000	0.000	0.000
BLOCK	49	0.389	0.261	0.272	0.000	0.830
SIZE	49	6.466	1.638	7.134	3.566	9.856
DESC	49	7.469	7.746	5.000	0.000	38.000
NOISE	49	21.619	32.282	9.590	2.410	144.120
STRAT	49	0.001	0.005	0.000	0.000	0.032
STRAT-adj	49	-0.005	0.005	-0.006	-0.006	0.026
TENURE	49	11.327	11.174	6.000	1.000	46.000
CROSS	49	0.163	0.373	0.000	0.000	1.000
CASH	49	0.409	0.380	0.321	0.032	2.274
CASH-adj	49	0.019	0.380	-0.068	-0.357	1.885
RISK	49	0.463	0.247	0.430	-0.010	1.150

Dependent Variables: MEAS = emphasis on financial measures of performance; MSHARE = level of inside shareholding at the beginning of the 1998 financial year; OUT = percentage of outside directors; DEBT = debt to firm value ratio at the end of 1997; DEBT-adj = debt to firm value ratio in 1997 adjusted for industry mean; BONUS = target bonus as a percentage of salary in 1998; P/B_t= market to book ratio, measured at the end of 1997; P/B_t-adj = market to book ratio in 1997 adjusted for industry mean; P/B_{t+1} = market to book value ratio in 1998; P/B_{t+1}-adj = market to book ratio in 1998 adjusted for industry mean.

Independent Variables: IND = dummy variable with value of 1 for a knowledge-based company and 0 for a capital-based company; BLOCK = percentage of outstanding shares held by the largest shareholder at the beginning of 1998; SIZE = natural log of firm's total value of assets at the end of 1997; DESC = number of branches; NOISE = standard deviation of firm's stock price over 12 months prior to January 1998; STRAT = ratio of R&D expenses to total book value of assets in 1997; $STRAT_{adj}$ = ratio of R&D expenses to total book value of assets in 1997 adjusted for industry mean; TENURE = number of years as CEO; CROSS = dummy variable with value 1 for Canadian companies also listed on US stock exchange; CASH = operating cash flow return on firm market value in 1997; $CASH_{adj}$ = operating cash flow in 1997 adjusted for industry mean; RISK = sensitivity of firm's stock market price to overall fluctuation in the TSE-300.

Table 10 - Test of differences in the model variables between knowledge- and capital-based sub-samples

Variable Name	Know Mean	St.Dev.	Cap Mean	St.Dev.	F-test Mean Diff.	Bartlett's Test Var. Diff.(χ^2)
MEAS	0.652	0.295	0.771	0.236	4.826***	2.387*
MSHARE	0.104	0.172	0.195	0.276	3.704***	10.010***
OUT	0.654	0.144	0.596	0.209	2.476***	6.339**
DEBT	0.061	0.447	0.500	0.206	38.739***	26.077***
DEBT – adj	0.003	0.444	0.015	0.206	0.028	25.552***
BONUS	0.459	0.337	0.656	0.381	7.237***	0.679
P/B_t	3.629	2.397	1.524	0.965	32.418***	34.635***
P/B_t – adj	1.471	2.725	-0.106	0.965	14.550***	43.729***
P/B_{t+1}	3.708	3.599	1.197	0.775	22.781***	84.048***
P/B_{t+1} – adj	-0.037	3.594	-0.013	0.775	0.002	83.934***
BLOCK	0.248	0.228	0.390	0.261	8.115***	0.842
DESC	3.937	3.581	7.469	7.746	8.249***	25.450***
NOISE	36.260	31.679	21.619	32.282	5.081***	0.017
STRAT	0.126	0.158	0.001	0.005	30.774***	269.920***
STRAT– adj	-0.010	0.157	-0.005	0.005	0.042	269.260***
TENURE	7.333	5.883	11.327	11.174	4.821***	18.069***
CASH	0.097	0.155	0.409	0.380	27.743***	33.344***
CASH – adj	0.018	0.157	0.020	0.380	0.000	32.710***
RISK	0.758	0.458	0.463	0.247	15.722***	16.843***

***,**,* Statistically significant at the 1%, 5%, and 10% levels, respectively.

Dependent Variables: MEAS = emphasis on financial measures of performance; MSHARE = level of insider shareholding at the beginning of the 1998 financial year; OUT = percentage of outside directors; DEBT = debt to firm value ratio at the end of 1997; DEBT-adj = debt to firm value ratio in 1997 adjusted for industry mean; BONUS = target bonus as a percentage of salary in 1998; P/B_t= market to book ratio, measured at the end of 1997; P/B_t-adj = market to book ratio in 1997 adjusted for industry mean; P/B_{t+1} = market to book ratio in 1998; P/B_{t+1}-adj = market to book ratio in 1998 adjusted for industry mean.

Independent Variables: IND = dummy variable with value of 1 for a knowledge-based company and 0 for a capital-based company; BLOCK = percentage of outstanding shares held by the largest shareholder at the beginning of 1998; SIZE = natural log of firm's total value of assets at the end of 1997; DESC = number of branches; NOISE = standard deviation of firm's stock price over 12 months prior to January 1998; STRAT = ratio of R&D expenses to total book value of assets in 1997; STRAT$_{adj}$ = ratio of R&D expenses to total book value of assets in 1997 adjusted for industry mean; TENURE = number of years as CEO; CROSS = dummy variable with value 1 for Canadian companies also listed on US stock exchange; CASH = operating cash flow return on firm market value in 1997; CASH$_{adj}$ = operating cash flow in 1997 adjusted for industry mean; RISK = sensitivity of firm's stock market price to overall fluctuation in the TSE-300.

Table 11 – Descriptive statistics of pooled sample

Panel A: Dependent variables

	N	Mean	St.Dev.	Median	Minimum	Maximum
MEAS	97	0.712	0.272	0.670	0.000	1.000
MSHARE	97	0.150	0.234	0.027	0.000	1.000
OUT	97	0.625	0.182	0.630	0.000	0.920
DEBT	97	0.283	0.410	0.388	-0.896	0.981
DEBT-adj	97	0.009	0.343	0.022	-0.945	0.764
BONUS	97	0.558	0.372	0.450	0.000	1.530
P/B_t	97	2.566	2.097	2.010	0.560	13.580
P/B_t – adj	97	0.674	2.175	0.100	-2.450	11.950
P/B_{t+1}	97	2.440	2.870	1.420	0.340	18.400
P/B_{t+1} – adj	97	-0.025	2.574	-0.460	-3.200	14.600

Panel B - Independent variables

	N	Mean	St.Dev.	Median	Minimum	Maximum
IND	97	0.495	0.503	0.000	0.000	1.000
BLOCK	97	0.319	0.254	0.230	0.000	0.830
SIZE	97	5.309	2.080	4.898	1.148	9.856
DESC	97	5.722	6.279	4.000	0.000	38.000
NOISE	97	28.864	32.658	15.730	2.410	148.730
STRAT	97	0.063	0.128	0.000	0.000	0.653
STRAT-adj	97	-0.007	0.110	-0.006	-0.139	0.514
TENURE	97	9.350	9.132	6.000	1.000	46.000
CROSS	97	0.144	0.353	0.000	0.000	1.000
CASH	97	0.254	0.329	0.200	-0.254	2.274
CASH-adj	97	0.019	0.290	-0.042	-0.357	1.885
RISK	97	0.609	0.394	0.540	-0.140	1.910

Dependent Variables: MEAS = emphasis on financial measures of performance; MSHARE = level of insider shareholding at the beginning of 1998 financial year; OUT = percentage of outside directors; DEBT = debt to firm value ratio at the end of 1997; DEBT-adj = debt to firm value ratio in 1997 adjusted for industry mean; BONUS = target bonus as a percentage of salary in 1998; P/B_t= market to book ratio, measured at the end of 1997; P/B_t-adj = market to book ratio in 1997 adjusted for industry mean; P/B_{t+1} = market to book ratio in 1998; P/B_{t+1}-adj = market to book ratio in 1998 adjusted for industry mean.

Independent Variables: IND = dummy variable with value of 1 for a knowledge-based company and 0 for a capital-based company; BLOCK = percentage of outstanding shares held by the largest shareholder at the beginning of 1998; SIZE = natural log of firm's total value of assets at the end of 1997; DESC = number of branches; NOISE = standard deviation of firm's stock price over 12 months prior to January 1998; STRAT = ratio of R&D expenses to total book value of assets in 1997; $STRAT_{adj}$ = ratio of R&D expenses to total book value of assets in 1997 adjusted for industry mean; TENURE = number of years as CEO; CROSS = dummy variable with value 1 for Canadian companies also listed on US stock exchange; CASH = operating cash flow return on firm market value in 1997; $CASH_{adj}$ = operating cash flow in 1997 adjusted for industry mean; RISK = sensitivity of firm's stock market price to overall fluctuation in the TSE-300.

Table 12 - Pearson correlation coefficients

Panel A: Among the dependent variables

		MSHARE		OUT		DEBT-adj		BONUS		P/B$_t$-adj		P/B$_{t+1}$-adj
MEAS	(+)	0.181*	(-)	-0.023	(+)	0.196**	(-)	0.223**	(-)	0.045	(-)	-0.049
MSHARE			(-)	-0.296***	(-)	0.139	(-)	0.051	(+)	-0.057	(+)	-0.010
OUT					(+)	-0.108	(+)	-0.044	(+)	-0.051	(+)	-0.147
DEBT-adj							(-)	0.112	(-)	-0.118	(-)	-0.205**
BONUS									(+)	-0.148	(+)	-0.093
P/B$_t$-adj											(+)	0.674***

Panel B: Among dependent and independent variables

	MEAS	MSHARE	BOARD	OUT	DEBT-adj	BONUS	P/B$_t$-adj	P/B$_{t+1}$-adj
IND	-0.219***	-0.194**	0.139	0.159	-0.017	-0.266***	0.364***	-0.005
BLOCK	0.208**	0.416***	-0.286***	-0.338***	0.080	0.144	-0.166*	-0.032
SIZE	0.095	-0.009	-0.191*	0.116	0.168*	0.457***	-0.303***	-0.101
DESC	-0.016	-0.044	-0.210**	-0.001	0.127	0.372***	-0.177*	-0.074
NOISE	-0.208**	0.087	0.247***	-0.036	-0.141	-0.370***	0.187*	0.015
STRAT-adj	-0.264***	-0.086	0.058	0.072	-0.507***	-0.240***	0.217***	0.417***
TENURE	0.029	0.429***	-0.284***	-0.218**	0.179**	0.201***	-0.251***	-0.110
CROSS	-0.018	-0.123	-0.067	0.160	0.142	0.106	-0.020	0.074
CASH-adj	0.031	0.092	-0.161	-0.104	0.399***	0.083	-0.123	-0.098
RISK	-0.231***	-0.265***	0.142	0.322***	-0.427***	-0.279***	0.324***	0.150

***, **, * Statistically significant at the 1%, 5%, and 10% levels (two-tail), respectively.

Dependent Variables: MEAS = emphasis on financial measures of performance; MSHARE = level of managerial ownership at the beginning of the 1998 financial year; BOARD = compliance with TSE guidelines of board vigilance; BSIZE = size of the board of directors; OUT = percentage of outside directors; DEBT = debt to firm value ratio at the end of 1997; DEBT-adj = debt to firm value ratio in 1997 adjusted for industry mean; BONUS = target bonus as a percentage of salary in 1998; P/B$_t$= market to book ratio, measured at the end of 1997; P/B$_t$-adj = market to book ratio in 1997 adjusted for industry mean; P/B$_{t+1}$ = market to book ratio in 1998; P/B$_{t+1}$-adj = market to book ratio in 1998 adjusted for industry mean. **Control Variables**: IND = dummy variable with value of 1 for a knowledge-based company and 0 for a capital-based company; BLOCK = percentage of outstanding shares held by the largest shareholder at the beginning of 1998; SIZE = natural log of firm's total value of assets at the end of 1997; DESC = number of branches; NOISE = standard deviation of firm's stock price over 12 months prior to January 1998; STRAT$_{adj}$ = ratio of R&D expenses to total book value of assets in 1997 adjusted for industry mean; TENURE = number of years as CEO; CROSS = dummy variable with value 1 for Canadian companies also listed on US stock exchange; CASH$_{adj}$= operating cash flow in

1997 adjusted for industry mean; RISK = sensitivity of firm's stock market price to overall fluctuation in the TSE-300.

The main dependent variable in this investigation, MEAS, denotes the firms' relative emphasis on financial performance measures in the CEO annual bonus contracts. This variable has a skewed distribution with a mean (median) of 71% (67%). Across our sample of 97 companies, two companies in the knowledge subgroup have zero weight on financial measures of performance, which means that these companies measure CEO performance using exclusively non-financial criteria. The characteristics of this variable are consistent with previous work done on the choice of performance measures in CEO bonus contracts. Ittner et al. (1997), for example, measured the focus on non-financial measures across a sample of 317 U.S. public companies and found that the mean (median) weight placed on non-financial performance is 13.4% (21.68%). This allows us to infer that in Ittner et al's (1997) sample, the average weight placed on financial measures corresponds to 86%,[36] which is similar to the mean of this sample of Canadian publicly-traded companies.

Consistent with prior studies, the distribution of stock ownership by officers (MSHARE) is skewed with a mean (median) managerial ownership of approximately 15% (3%) of the firms' outstanding equities. Compared to the U.S. sample, this Canadian sample shows a higher level of managerial ownership. Barnhart and Rosenstein (1998), Begley and Feltham (1999) and Core et al. (1999), for example, found managerial ownership with a skewed distribution and a mean (median) managerial ownership of

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[36] Ittner et al.'s (1997) sample of 317 companies comprises firms from 48 different two-digit industrial classifications. In addition, only 36% of their sample (114 companies) presented both financial and non-financial performance measures. In contrast, our sample consists of only 5 two-digit standard industrial classification (SIC) codes grouped into two dichotomy sub-samples with more than 60% (63 companies) presenting financial and non-financial performance measures in their bonus plans.

6.44% (9.69%), 2.2% (0.1%) and 1.53% (0.08%), respectively. Relative to the U.S., Canadian public companies seem to have different governance configurations, which is one of the motivations for this empirical investigation.

The proxy for board independence, denoted OUT, is the percentage of outside and unrelated directors on the board. This variable is normally distributed with a mean (median) of 62% (63%) for the pooled sample. This level of outsiders on the board is consistent with prior studies based on U.S. and Canadian samples. In the U.S., Barnhart and Rosenstein (1998) and Core et al. (1999) found 60.1% and 64% of outside directors, respectively. Magnan et al. (1999) found an average of 66% outsiders in a sample comprising 139 of the 150 largest firms listed on the Toronto Stock Exchange.

The DEBT and DEBT–adj. variables in the pooled sample have skewed distributions with a mean (median) of approximately 28%(38%) and 1%(2.2%), respectively. The presence of negative minimum values for DEBT is due to the fact that its proxy[37] is computed with net "cash and equivalents" available at the end of the period. As expected, knowledge-based companies have significantly less DEBT financing compared to capital-based companies. However, further data analysis suggests important differences in the source and use of debt financing between these two sub-samples. For example, when isolated, debt to total equity ratio is significantly greater in the capital-based sub-sample − mean (standard-deviation) of 0.376 (0.227) − than in the knowledge sub-sample

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[37] This proxy is similar to the proxy used in Agrawal and Knoeber (1996).

− mean (standard-deviation) of 0.177 (0.218). However, cash to total assets ratio[38] is significantly lower in the capital-based sub-sample, 0.039 (0.064), than in the knowledge-based sub-sample, 0.260 (0.305). This evidence suggests that capital-based companies tend to access private sources (e.g., banks, insurance companies, and pension funds) of financing, while knowledge-based companies appear to access more equity financing for operational capital. In contrast, knowledge-based companies appear to use relatively more equity financing for operational capital and investments on R&D, which is consistent with Kochhar and Hitt's (1998) suggestion that equity financing is more suitable for firms with a greater proportion of intangible assets.

The BONUS variable represents the maximum potential CEO bonus for 1998 financial year as a percentage of the CEO's salary for the same year. This variable has a normal distribution with a mean (median) value of 55% (45%) in the pooled sample. Values for this variable are consistent with prior work based on U.S. and Canadian data. In the study of Ittner et al. (1997), for example, the average target bonus represents 52% of the CEO's total cash compensation. The Canadian study by Craighead et al. (2000) documents that the CEOs' average annual bonus payout represented 59% of the annual cash compensation for the period 1994-1996 for the largest 100 Canadian firms traded on the Toronto Stock Exchange.

Consistent with prior studies, I found the distributions of P/B_t, P/B_t-adj, P/B_{t+1}, and P/B_{t+1}-adj, right-skewed with a mean (median) of 2.56 (2.01), 0.67 (0.10), 2.44 (1.42),

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[38] Computed by the formula: (Total value of cash and equivalents)/(Total value of assets).

and –0.02 (-0.46), respectively. Market to book ratio is lower in 1998 (t+1) than in 1997 (t) in the pooled sample. In addition, the decrease in the level of firm performance is more significant for companies in the capital-based sub-sample. A possible explanation is the average negative return for companies in the Pulp & Paper industry due to recession prices for pulp and paper in 1998.[39] In the U.S. samples, the study by Ittner et al. (1997) reports market to book ratios with a mean (median) of 2.37 (1.68).

Consistent with prior work, I found the BLOCK variable to be normally distributed with a mean (median) of approximately 32% (23%). As expected, the level of blockholders as well as the presence of family-owners is larger in this Canadian sample of public companies than that documented in U.S. studies (e.g., Bushee, 1998). In this study, forty-two companies have families as large shareholders, eight companies do not have a large shareholder, and forty-seven companies have an institution as a large shareholder. This is consistent with the study by Gillies and Morra (1997) documenting that Canadian firms, regardless of size, have a higher number of significant shareholders than U.S. public firms.

The SIZE variable is normally distributed with a mean (median) of 5.31 (4.89). As expected, this variable is larger for the capital-based sub-sample than for the knowledge-based sub-sample. Consistent with prior work, I found the DESC, NOISE, STRAT-adj, TENURE, and RISK variables right-skewed (e.g., Ittner et al., 1997). As expected, DESC and TENURE are significantly larger in the capital-based than in the knowledge-based sub-sample. This reflects the fact that the former group tends to be characterized by long-

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[39] Source: Financial Post Industry Analysis Reports (Canada), May 7, 2000.

established companies with high levels of capital invested in tangible assets. In addition, the level of NOISE in accounting information and the systematic RISK is higher across the knowledge-based sub-sample. This is consistent with this young industry imposing higher levels of uncertainty, thereby rendering accounting measures of past activities less useful for valuation purposes (Milton, 1997). STRAT and STRAT-adj variables are both significantly different between the two sub-samples. Similar to Ittner et al. (1997), this sample dichotomizes between *prospectors* (knowledge-based group) and *defenders* (capital-based group). Finally, CASH and CASH-adj variables measure the company's capacity for generating operational cash flow. Both variables have a skewed distribution with a mean (median) of 25% (20%) and 1.9% (29%), respectively. These means and medians are statistically significantly different for the two sub-samples. The data documents that operating cash flow return is lower and, in some cases, negative in the knowledge-based sub-sample. This evidence confirms the prediction that knowledge-based companies usually sustain significant cash outflows because of large ongoing amounts of R&D funding.

5.3   UNIVARIATE ANALYSES

Panel A of Table 12 reports the correlation ranks among the main variables investigated. The predicted directions (signs) are reported in parentheses at the left of each correlation coefficient. Panel B of Table 12 reports the correlation ranks among the main and other explanatory variables included in the regression models used in this study.

The firm's emphasis on financial performance measures in the CEO bonus contract (MEAS) is positively correlated with managerial ownership (MSHARE) and firm reliance on debt financing (DEBT). Regarding H1, the univariate result suggests that as firms use higher levels of managerial ownership to control for agency problems, they tend to increase reliance on financial and market-based performance measures to monitor managers. The univariate result also supports H3, suggesting that higher levels of debt financing leads firms to focus on traditional financial performance measures.

The univariate results support H5. Managerial ownership (MSHARE) is negatively associated with the percentage of outside directors on the board (OUT). This negative association is consistent with Lambert et al. (1993) and Core et al. (1999), which suggest that managerial ownership may also capture the level of entrenchment by managers, who tend to limit the number of outside and unrelated directors on the board to keep their power.

The predicted negative association between firms' emphasis on financial measures of performance and the proportion of unrelated directors on the board (H2) is not supported by the univariate analysis. Regarding the relationship between firms' emphasis on financial measures of performance and target bonus (H4), Panel A of Table 12 reports a positive correlation rank. Contrary to expectation, this positive association indicates that as firms use higher target bonus, they tend to focus on more aggregate financial measures of the firm's performance. This evidence suggests that the contracting value of financial

performance measures tends to increase when the target bonus is relatively high.

Simple correlation analysis, however, does not control for the effects of other variables influencing the mix of financial and non-financial measures of performance in CEO bonus contracts and the use of the internal governance mechanisms investigated. I proceed to investigate the hypothesized associations using regression analyses to control for the effects of other explanatory variables. Before performing the regression analyses, however, I conduct some diagnostic tests to improve model specification and better interpret further OLS estimates. The diagnostic tests are described in the following section.

5.3.1 Diagnostic tests

Test for heteroscedasticity

The *Breusch-Pagan* (B-P-G) and *Goldfeld-Quandt* (G-Q)[40] statistics test the null hypothesis of equal error variance in the sample *(Homoscedasticity)*. The alternative hypothesis is that the error variance in the first partition of the sample is larger than the second partition *(Heteroscedasticity)*, which makes for a different error variance between two subsets of observations. In the presence of heteorscedasticity, the OLS estimates without correction for different error variance are not efficient. Two characteristics of the sample make this issue particularly important. First, no restrictions for firm size were included when building this sample of Canadian publicly-traded companies. Secondly, as documented in Table 10, the knowledge- and capital-based sub-samples are significantly

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[40] The G-Q test is a satisfactory test when we can unambiguously split the sample into two parts, one part with high error variance and the other part with low error variance. This procedure is more difficult when there is more than one independent variable because an error variance may be related to more than one

different in terms of total assets, which is the proxy for firm size. As such, to perform the B-P-G and G-Q tests the sample data was sorted by the SIZE criteria for all variables in the six empirical models. Also, the SIZE variable was included as an independent variable in all six regressions and a decrescent order was applied. The decrescent order serves to test the hypothesis that the error term for larger firms may present larger variance than the error term for smaller firms.

Test for structural change

The purpose of the Chow test is to test the hypothesis that coefficients are the same for two subsets of the same sample. In this case, the sample is ordered by size, and the cut-off I used to analyze the results is the median of the sample. If the Chow test statistic is less than the critical value from an F distribution, there is no evidence that the estimated coefficients may change between the two subsets (larger and smaller companies) of observations.

Table 13 reports the results of the diagnostic tests. The B-P-G and G-Q tests confirm the presence of heroscedasticity at 5% and 10% significance levels for all regression models except the OUT model. As such, for all models except OUT, we used White's (1980) heteroscedastic-consistent covariance matrix to correct for the OLS estimates for an unknown form of hetroscedasticity. As expected, the Chow test provides evidence that the OLS-estimated coefficients for the models explaining internal governance mechanisms are not likely to change between larger and smaller companies. Since this thesis takes the perspective that market-related mechanisms tend to affect firms'

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independent variable. For this reason, we also performed the B-P-G test.

internal governance configurations, I expect the internal governance mechanisms investigated would be more sensitive to the firms' industry variance than to size variance. Also, the Chow test confirms the size effect on firm future performance as proxied by firm market to book ratio.

Table 13 - Diagnostic test for OLS models

TESTS		MEAS	MSHARE	OUT	DEBT-adj	BONUS	P/B_{t+1}-adj
B-P-G	Chi-S.	10.351*	32.899**	9.978	19.028**	24.699**	16.624*
CHOW	F-test[41]	1.361	1.558	0.779	1.159	1.323	3.315*
G-Q	F-test	4.469*	1.889*	0.998	0.256[42]	2.271*	5.275*

**, * Statistically significant at 5% and 10% levels (two–tail), respectively.

In the following sections, I proceed with the discussion of the regression analyses.

5.4 REGRESSION ANALYSES

This section presents the empirical results of the regression analyses. The discussion considers each hypothesis, taking into account all the different regressions (Tables 14 to 18) performed to investigate the proposed association in that hypothesis. In the following paragraphs, I begin by describing the steps and regressions performed to test the hypotheses of this thesis.

I first examine the associations among the mix of financial and non-financial measures of performance in CEO bonus contracts and the internal governance mechanisms, estimating equations (1) to (5) by ordinary least square (OLS). The results

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[41] The values reported for the CHOW and G-Q test correspond to a balanced split of the sample (half/half), which means N1=49 and N2=48.

[42] G-Q tests the null hypothesis of equal variance against the alternative hypothesis of larger variance in the first subset of the sample. However, when G-Q<1 and the p-value is less than 0.05, there is evidence for larger variance in the second subset of the sample. As expected, DEBT shows large variance in small

are reported in Table 14.

Table 14 -   OLS regression results for governance mechanisms

Dependent Variable / Independent Variables	Predicted sign	MEAS	Predicted sign	MSHARE	Predicted sign	OUT	Predicted sign	DEBT-adj	Predicted sign	BONUS
MEAS			?	0.079	-	0.102*	+	0.263**	-	0.244*
MSHARE	?	0.096			-	-0.104	-	0.122	-	-0.019
OUT	-	0.207*	-	-0.085			+	-0.214	+	-0.137
DEBT-adj	+	0.060	-	0.031	+	-0.084*			-	-0.111
BONUS	-	0.092	-	0.050	+	-0.053	-	-0.013		
P/B_t-adj	-	0.032***	+	0.009	+	-0.013*	-	-0.017	+	-0.000
IND	-	-0.149**	?	-0.034	?	0.109**	-	0.133**	-	0.108
BLOCK	-	0.165*	?	0.314**	+	-0.184**	-	-0.040	+	0.004
SIZE			-	-0.008	+	0.027**	-	0.030**	+	0.089*
DESC	+	0.009***								
NOISE	-	-0.001								
STRAT-adj	-	-0.638***								
TENURE			+	0.010**						
CROSS					+	0.016				
CASH-adj							-	0.384*		
RISK									-	-0.201*
Intercept		0.596*		0.031		0.463**		-0.263		0.066
R^2 – Adj		0.17		0.29		0.16		0.15		0.21

***, **, * Statistically significant at 1%, 5%, and 10% levels (two –tail), respectively.

MEAS = emphasis on financial measures of performance; MSHARE = level of managerial ownership at the beginning of the 1998 financial year; OUT = percentage of outside directors; DEBT-adj = debt to firm value ratio in 1997 adjusted for industry mean; BONUS = target bonus as a percentage of salary in 1998; P/B_t= market to book ratio, measured at the end of 1997; P/B_t-adj = market to book ratio in 1997 adjusted for industry mean; P/B_{t+1} = market to book ratio in 1998; P/B_{t+1}-adj = market to book ratio in 1998 adjusted for industry mean; IND = dummy variable with value of 1 for a knowledge-based company and 0 for a capital-based company; BLOCK = percentage of outstanding shares held by the largest shareholder at the beginning of 1998; SIZE = natural log of firm's total value of assets at the end of 1997; DESC = number of branches; NOISE = standard deviation of firm's stock price over 12 months prior to January 1998; $STRAT_{adj}$ = ratio of R&D expenses to total book value of assets in 1997 adjusted for industry mean; TENURE = number of years as CEO; CROSS = dummy variable with value 1 for Canadian companies also listed on US stock exchange; $CASH_{adj}$ = operating cash flow return on firm market value in 1997 adjusted for industry mean; RISK = sensitivity of firm's stock market price to overall fluctuation in the TSE-300.

Secondly, to examine the impact of external governance mechanisms on the firm's internal governance configuration, I re-estimate (1) to (5) by OLS using independent variables that interact with the variables used as proxies for the external governance mechanisms − IND and BLOCK. These results are reported in Tables 15 and 16.

Table 15 presents the estimated OLS coefficients, where the group of independent variables includes the other four internal governance mechanisms plus the same set of governance mechanisms interacting with the industry dummy variable (IND). For example, the variable $MSHARE_{know}$ = (MSHARE*IND). As such, β_{MSHARE} captures the specific effect of managerial ownership for the capital-based sub-sample, and (β_{MSHARE} + $\beta_{MSHAREknow}$) captures the specific effect of managerial ownership for the knowledge-based sub-sample. The objective is to investigate the industry effects of external governance mechanisms on the use of the internal governance mechanisms investigated. The dummy variable IND distinguishes the sample in two very distinct economic sectors and is assumed to capture the effect of market-based governance mechanisms such as managerial job market, product market, and market for corporate control.

Table 15 - **OLS regression results for governance mechanisms with industry dummy interactions**

	MEAS	MSHARE	OUT	DEBT-adj	BONUS
MEAS		0.129	0.065	-0.117	0.118
MEAS$_{knw}$		0.094	0.005	0.673**	0.335
MSHARE	0.105		-0.207*	0.030	-0.016
MSHARE$_{knw}$	0.461*		-0.064	0.044	-0.550
OUT	0.087	-0.343*		-0.137	-0.131
OUT$_{knw}$	0.134	0.007		-0.239	0.100
DEBT-adj	-0.171	0.054	-0.150		-0.230
DEBT$_{knw}$-adj	0.372**	-0.043	0.107		0.279
BONUS	0.047	-0.008	-0.039	-0.062	
BONUS$_{knw}$	0.238**	-0.132	0.032	0.149	
P/Bt-adj	-0.019	0.068**	0.016	0.064**	0.114
P/Bt$_{knw}$-adj	0.061	-0.087**	-0.031	-0.109***	-0.152**
Intercept	0.668***	0.311*	0.616***	0.230*	0.661***
IND	-0.414**	-0.040	0.046	-0.323	-0.363
R^2 –Adj	0.18	0.10	0.03	0.10	0.10

***, **, * Statistically significant at 1%, 5% and 10% levels (two –tail), respectively.

IND = industry dummy variable, which takes 1 for knowledge-based companies and 0 for capital-based companies. MEAS = firm's emphasis on financial performance measures in CEO bonus contract. MEAS$_{knw}$ = MEAS interacting with the IND. MSHARE = managerial ownership. MSHARE$_{knw}$ = MSHARE interacting with IND. OUT = percentage of outside and unrelated directors on the board. OUT$_{knw}$ = OUT interacting with the IND. DEBT-adj = debt to firm book value ratio adjusted for industry mean. DEBT$_{knw}$-adj = DEBT-adj interacting with industry dummy variable. BONUS = target bonus as a percentage of base salary for the1998 fiscal year. BONUS$_{knw}$ = BONUS interacting with IND.

Table 16 presents the estimated OLS coefficients where the group of independent variables consists of other four internal governance mechanisms plus the same set of four governance mechanisms interacting with two dummy variables. The first dummy variable, $BLOCK_{INST}$, takes the value of 1 for firms with an institutional blockholder and 0 otherwise. The second dummy variable, $BLOCK_{FAM}$, takes the value of 1 for firms with a family blockholder and 0 otherwise. For example, the variable OUT_{INST} = $(OUT*BLOCK_{INST})$ and OUT_{FAM} = $(OUT*BLOCK_{FAM})$. As such, in the OLS regression coefficients presented in Table 16, $[\boldsymbol{b}_{OUT}]$ captures the effect of independent boards for companies with a diffuse ownership structure, while $[\boldsymbol{b}_{OUT} + \boldsymbol{b}_{OUTINST}]$ captures the effect of independent boards of companies with an institutional blockholder, and $[\boldsymbol{b}_{OUT} + \boldsymbol{b}_{OUTINST} + \boldsymbol{b}_{OUTFAM}]$ captures the effect of independent boards of firms with a family blockholder. The objective is to investigate whether the type of investor has a different effect on the firm's use extent of the internal governance mechanisms investigated.

Table 16 - **OLS regression results for governance mechanisms with blockholder dummies interaction**

	MEAS	MSHARE	OUT	DEBT-adj	BONUS
MEAS		0.142**	0.357**	1.660***	1.241***
MEAS$_{inst}$		-0.011	-0.461**	-1.332***	-1.233***
MEAS$_{fam}$		0.032	-0.101	-1.720***	-0.659**
MSHARE	2.034***		-2.327***	-3.725***	-1.786
MSHARE$_{inst}$	-1.739***		2.385***	3.713**	1.473
MSHARE$_{fam}$	-1.889***		-2.085***	3.907***	1.976*
OUT	0.356*	-0.163**		-0.739	-0.148
OUT$_{inst}$	-0.625**	0.229		0.760	0.111
OUT$_{fam}$	0.106	-0.368*		0.721	-0.199
DEBT-adj	0.503***	-0.079**	-0.224***		-0.621***
DEBT$_{inst}$-adj	-0.296**	0.076	0.229**		0.871***
DEBT$_{fam}$-adj	-0.536***	0.203*	0.218**		0.559**
BONUS	0.690***	-0.069*	-0.082	-1.140***	
BONUS$_{inst}$	-0.684***	-0.032	0.072	1.430***	
BONUS$_{fam}$	-0.518***	0.138	0.025	1.108***	
Intecept	-0.098	0.097**	0.643***	0.291*	-0.037
BLOCK$_{inst}$	0.954***	-0.095*	0.085*	-0.768*	0.651**
BLOCK$_{fam}$	0.471**	0.279*	-0.186**	-0.165	0.311
R^2	0.26	0.29	0.26	0.23	0.18
R^2 –Adj	0.14	0.17	0.13	0.10	0.05

***, **, * Statistically significant at 1%, 5%, and 10% levels (two –tail), respectively.

BLOCK$_{inst}$ = Dummy variable, which takes the value of 1 for companies with an institutional blockholder and 0 otherwise. BLOCK$_{fam}$ = Dummy variable which takes the value of 1 for companies with a family blockholder and 0 otherwise MEAS = emphasis on financial performance measures: MEAS$_{inst}$ = MEAS interacting with BLOCK$_{inst}$. MEAS$_{fam}$ = MEAS interacting with BLOCK$_{fam}$. MSHARE = firm's level of managerial ownership. MSHARE$_{inst}$ = managerial ownership interacting with BLOCK$_{inst}$. MSHARE$_{fam}$ = managerial ownership interacting with BLOCK$_{fam}$. OUT = percentage of outside and unrelated directors on the board. OUT$_{inst}$ = OUT interacting with BLOCK$_{inst}$. OUT$_{fam}$ = OUT interacting with BLOCK$_{fam}$. DEBT-adj = firm's reliance on debt financing, measured by debt to firm book value ratio adjusted for industry mean. DEBT$_{inst}$ = DEBT-adj interacting with BLOCK$_{inst}$. DEBT$_{fam}$ = DEBT-adj interacting with BLOCK$_{fam}$. BONUS = target bonus as a percentage of salary for the1998 fiscal year. BONUS$_{inst}$ = BONUS interacting with BLOCK$_{inst}$. BONUS$_{fam}$ = BONUS interacting with BLOCK$_{fam}$.

Thirdly, I performed a Hausman test to examine whether *endogeneity* exists among the variables that proxy for the five internal governance mechanisms investigated (MEAS, MSHARE, OUT, DEBT, and BONUS) and the firm's contemporaneous price-to-book ratio (P/B_t). The simultaneous equation approach assumes that the dependent variable and some of the independent variables in the equation behave as if they were *endogenous* and the purpose of the Hausman (1983) test is to investigate whether this assumption is correct. For example, in the model $y = \boldsymbol{a} + \beta z + e,$ if z is an endogenous variable, z will be correlated with the residuals (e). Since the existence or nonexistence of a correlation between z and e has a large bearing on whether the least square estimator β is consistent, Hausman's test is designed to test whether the OLS estimator yields a value that is significantly different from that produced by the instrumental variable estimator (2SLS). As such, the Hausman statistic m tests the null hypothesis (H_0) of no *endogeneity*, which means no correlation between the dependent variable and the residuals. If H_0 is not rejected, both OLS and 2SLS regressions should produce consistent estimators for β. On the other hand, if H_0 is rejected, then $\boldsymbol{b}_{OLS}$ is inconsistent, and some difference can be expected between $\boldsymbol{b}_{OLS}$ and $\boldsymbol{b}_{2SLS}$ estimates. The Hausman's m statistic has a large sample chi-square distribution with one degree of freedom when the null hypothesis not rejected. Thus, contemporaneous correlation, and consequently, *endogeneity* do exist if $m > X^2_c$.[43]

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[43] Where, for (1% = 6.64) 5% significance level, $X^2_c = 3.84$ and for 10% significance level $X^2_c = 2.70$

The results in Panel A of Table 17 indicate *endogeneity* among the variables MEAS, MSHARE, OUT, and P/B$_t$-adj, justifying the use of three stage least square (3SLS) to estimate equations (1) to (3), along with equation (6) to explain P/B$_t$-adj as a system of four simultaneous equations model. All four equations are overidentified (see Appendix A) and the results for this estimation are presented in Panel B of Table 17.

Table 17
Panel A - Hausman test of endogeneity among internal governance
mechanisms and with firm contemporaneous performance

	MEAS	MSHARE	OUT	DEBT-adj	BONUS	P/B$_t$-adj
MEAS		2.052	6.229**	0.025	1.158	8.781***
MSHARE	2.867*		5.558**	0.811	0.994	1.756
OUT	5.197**	8.230***		0.044	0.116	5.549**
DEBT-adj	2.432	4.062**	0.623		6.757***	1.875
BONUS	1.075	2.914*	0.746	2.852*		3.578
P/B$_t$-adj	8.729***	8.152***	3.673*	0.019	5.196**	

Table 17 (cont'd)
Panel B - 3SLS regression results for the four simultaneous equations model where MEAS, MSHARE, OUT, and P/B$_t$-adj are endogenous variables

Dependent variables / Independent variables	Predicted sign	MEAS	Predicted sign	MSHARE	Predicted sign	OUT	Predicted sign	P/B$_t$-adj
MEAS			?	-0.023	-	-0.103	-	4.226*
MSHARE	?	-0.492*			-	-0.403***	+	4.629**
OUT	-	-1.096**	-	-1.626***			+	10.598**
DEBT-adj	+	0.063	-	0.009	+	0.012	-	-0.299
BONUS	-	0.085	-	-0.073	+	-0.016	+	-0.175
P/B$_t$-adj	-	0.146***	+	0.093***	+	0.046***		
IND	-	-0.301***	?	-0.029	?	-0.015	+	1.430**
BLOCK	-	0.135	?	0.065	+	-0.029	+	-0.449
SIZE			-	0.042	+	0.024**	+	-0.160
DESC	+	-0.004						
NOISE	-	-0.001						
STRAT-adj	-	-0.973***					+	4.244*
TENURE			+	0.006*				
CROSS					+	-0.010		
CASH-adj								
RISK								
Constant		1.467***		0.876**		0.628***		-9.235***
R^2		0.05		0.08		0.05		0.03

***, **, * Statistically significant at 1%, 5%, and 10% levels (two –tail), respectively.

MEAS = emphasis on financial measures of performance; MSHARE = level of managerial ownership at the beginning of 1998 financial year; OUT = percentage of outside directors; DEBT-adj = debt to firm value ratio in 1997 adjusted for industry mean; BONUS = target bonus as a percentage of salary in 1998; P/B$_t$= market to book value ratio, measured at the end of 1997; P/B$_t$-adj = market to book value ratio in 1997 adjusted for industry mean; P/B$_{t+1}$ = market to book value ratio in 1998; P/B$_{t+1}$-adj = market to book value ratio in 1998 adjusted for industry mean; IND = dummy variable with value of 1 for a knowledge-based company and 0 for a capital-based company; BLOCK = percentage of outstanding shares held by the largest shareholder at the beginning of 1998; SIZE = natural log of firm's total value of assets at the end of 1997; DESC = number of branches; NOISE = standard deviation of firm's stock price over 12 months prior to January 1998; STRAT$_{adj}$ = ratio of R&D expenses to total book value of assets in 1997 adjusted for industry mean; TENURE = number of years as CEO; CROSS = dummy variable with value 1 for Canadian companies also listed on US stock exchange; CASH$_{adj}$ = operating cash flow return on firm market value in 1997 adjusted for industry mean; RISK = sensitivity of firm's stock market price to overall fluctuation in the TSE-300.

Discussion of the regression analyses

Regarding H1, the OLS result in the first column of Table 14 (R^2=0.17) reports a statistically non-significant association between managerial ownership (MSHARE) and the mix of financial and non-financial performance measures in the CEO bonus contract (MEAS). The Hausman test reported in Panel A of Table 17, however, provides evidence that managerial ownership is endogenously determined with the mix of financial and non-financial measures of performance in the CEO bonus contract. This suggests that the OLS estimates may lead to spurious conclusions, thereby justifying the use of a simultaneous estimation to investigate the association predicted in H1. The 3SLS estimate in the first column of Panel B of Table 17 is negative, providing empirical evidence that as firms use higher managerial ownership, they tend to de-emphasize the use of financial measures of performance in CEO bonus contract.

Rather than a substitution effect, this result suggests that firm use of non-financial performance measures in the CEO bonus contract and managerial ownership may have complementary monitoring roles. Since higher fractions of managerial ownership are assumed to align managers' preferences with shareholders wealth creation, the inclusion of non-financial measures in the incentive contract may be used in a complementary way by the board of directors to direct managerial attention to the operationally strategic aspects of firm performance.[44] This result also leads to the argument that the monitoring value of alternative performance measures, such as non-financial information, increases in firms using higher fractions of managerial ownership. Contrasting with the incentives provided

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[44] This argument is consistent with the theoretical work of Dye (1999).

by high fractions of managerial ownership, observing non-financial measures may provide information useful for determining which actions and decisions managers' take to enhance shareholder value.

An alternative interpretation for this negative association between managerial ownership and the use of financial performance measures in CEO bonus contracts is the manager's entrenchment perspective, as proposed by Ittner et al. (1997). These authors suggest that higher managerial ownership enables managers to exercise influence over the board of directors and extract benefits from the firm, including the use of non-financial measures of performance in the reward system. Non-financial measures of firm performance are not audited and may be more easily manipulated than traditional financial measures of performance. Following this line of reasoning, one may also argue that entrenched (and risk-averse) managers would avoid accounting and market-based performance measures to minimize the amount of noise[45] to which their rewards are exposed.

The regression coefficients in the first column of Table 16 (R^2=0.14) seem to support the complementary monitoring role between managerial ownership and the use of non-financial measures of performance. The regression coefficients in Table 16 indicate that firms with large shareholders and greater managerial ownership tend to de-emphasize traditional financial measures of performance in CEO bonus contracts. Since large shareholders have enough equity incentives to participate or be more proactive in

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[45] Market-wide movements in equity values are suggested as a major source of uncontrollable noise in

monitoring management and agency conflicts, managerial entrenchment may be assumed to be lower in these firms. Hence, the negative association between managerial ownership and the use of financial measures of performance in CEO bonus contracts in companies with large shareholders may be interpreted as evidence that financial performance measures have relatively less monitoring value in the presence of managerial ownership. Overall, the evidence is consistent with H1, and supports the argument that earnings- and stock-based performance measures provide noisy signals of CEO actions, and tend to be avoided in the optimal incentive contract with managers. As a result, non-financial measures are shown to be incrementally preferable in executive bonus contracts of managers with a higher fraction of stock ownership.

H2 asserted that firms with a more vigilant board of directors from outside the organization tend to de-emphasize traditional financial measures of performance and shift towards non-financial performance measures in CEO bonus contracts. Refuting this expectation, the OLS regression results in the first column of Table 14 ($R^2 = 0.17$) document a positive association between the proportion of outside directors on the board (OUT) and the firms' use of financial measures of performance in the CEO bonus contract (MEAS).

The Hausman test, however, suggests that MEAS and OUT are, in fact, jointly determined and results supporting H2 are obtained across the simultaneous estimation (3SLS). These results are documented in Panels A and B of Table 17. The 3SLS estimate

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stock- and earnings-based performance measures (Sloan, 1993).

suggests that the greater the proportion of outside directors on the board, the lower the firm's focus on traditional financial measures of performance in CEO bonus contracts. The results in the simultaneous estimation support the idea that outside directors are more likely to undertake costly information acquisition and processing activities to reduce information asymmetry and monitor more closely the managerial decision-making process. In contrast, a board of directors with a greater proportion of inside directors tends to rely on traditional financial measures due to their deep, firm-specific knowledge and information. Overall, the results in Table 17 support the argument that vigilant board structures are more likely to undertake costly information acquisition about firm-specific activities not provided by financial and market-based performance measures (Fama and Jensen, 1983; Bushman and Smith, 2000).

The empirical results in the interaction of blockholder dummy variables with the internal governance mechanisms (Table 16) also support H2. The results provide evidence on the monitoring impact of large shareholders with the association between outside directors and the mix of financial and non-financial performance measures in CEO bonus contracts. The estimates in the first column of Table 16 (R^2=0.14) document that as firms have more independent boards of directors and institutional blockholders, they tend to de-emphasize traditional financial performance measures in CEO bonus contracts. The association between greater use of non-financial measures in CEO bonus contracts, institutional blockholders, and outside directors is consistent with the argument that sophisticated institutional investors tend to implicitly monitor managerial decisions by creating mechanisms for gathering specific operational information.

As expected, the first column of Table 14 also documents a significant negative industry effect on the firm's emphasis on financial measures of performance. This evidence is consistent with the prior literature on performance measurement (Bushman et al., 1996; Ittner et al., 1997) suggesting limits on the information provided by financial measures for the monitoring needs of companies with high levels of investments on intangible assets and long term return horizons (knowledge-based companies). In addition, the evidence supports the suggested ability of non-financial information to incorporate, for this group of companies, the board's proprietary information on the CEO's current strategic decisions (e.g., product development and alliances), not fully reflected in financial and stock-price information.

The OLS regression results in Table 14 do not support H3. Consistent with the prior literature, this hypothesis predicts that high reliance on debt financing would create incentives for firms to minimize the likelihood of financial distress, and consequently, use more financial measures of performance. The lack of support for this hypothesis in Table 14 may be due to the fact that only heavily debt-financed firms choose to align their performance measurement systems with the interests of debtholders. An opposite association, however, is documented in the fourth column of Table 14, which indicates a positive regression coefficient when the firm's emphasis on financial measures of performance is regressed on the firm's level of debt financing. This suggests that the firm's eligibility for contracting additional debt financing may be driven by the firm's focus on financial measures of performance. In addition, the Hausman test does not provide evidence that *endogeneity* is present between the variables MEAS and DEBT, leading to

the exclusion of Eq.(4) from the simultaneous estimation (3SLS). The results of the Hausman test and the simultaneous estimation are documented in Panels A and B of Table 17, respectively.

The findings in Table 15, where the firm's level of debt financing interacts with its respective industry, however, suggest that the predicted positive association between a firm's emphasis on financial measures of performance and debt financing (H3) is more likely to occur in the knowledge-based sub-sample. Since knowledge companies tend to use equity financing, this evidence leads to the argument that the use of debt financing by knowledge-based companies may lead them to shift to more traditional financial performance measures in response to the need of providing relevant monitoring information for debtholders on their investment payback and security.

Consistent with the arguments that the monitoring attributes of a performance measure included in a reward system are affected by the targeted dollar amount of the incentives (Bushman et al., 1996; Hemmer, 1996), H4 predicts that firms with greater emphasis on cash performance-contingent compensation tend to integrate more non-financial measures into their CEO bonus contracts. Specific to the incentive cash bonus is that boards of directors define ex-ante the cash bonus threshold and the specific performance targets for granting the bonus. [46] As such, the intuition beyond H4 is the idea that boards of directors setting a relative high cash bonus threshold (high target bonus) will tend to link this incentive to richer signals of managerial performance to better

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[46] In contrast, through stock option granting, boards of directors delegate to the capital market the tasks of

monitor the effort of multitask managers. The findings in the first column of Table 14 do not support H4. In addition, the Hausman test documented in Panel A of Table 17 indicates that simultaneity is not likely to occur between the variables BONUS and MEAS. Hence, Eq.(5) is not included in the simultaneous estimation.

Supporting evidence for H4, however, is found in the first column of Table 16, when the targeted cash bonus (BONUS) interacts with the monitoring role of large shareholders (BLOCK). The regression coefficients in Table 16 suggest that, relative to diffuse ownership and firms with institutional blockholders, family-held companies with greater target bonus are negatively associated with the use of traditional financial measures of performance in the CEO bonus contract.[47] This evidence is consistent with the discussions in H1 and H2, and supports the argument that non-financial measures in CEO bonus contracts are likely to be used to a greater extent in firms with ownership concentration as a complementary compensation method to the economic- and market-oriented incentives provided by stock ownership. A competing explanation is that in privately owned firms, accounting and market-based performance measures poorly reflect the long-term consequences of important current managerial actions, and thus have low monitoring value (incremental information). The reverse negative association between MEAS and BONUS in family-held companies (fifth column 5 of Table 16 - $R^2 = 0.05$) is consistent with this argument.

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rewarding and monitoring top managers.
[47] Although I do not report the results here, further analyses in the sample data also indicate that inside ownership also tends to be greater in companies with family blockholders.

Consistent with the prior literature on corporate governance, H5 predicts that powerful CEOs may tend to lower the proportion of outside and unrelated directors in an attempt to render the board of directors unwilling to take adversarial positions against the CEO (Agrawal and Knoeber, 1996; Barnhart and Rosenstein, 1998; Core et al., 1999). Evidence supporting H5 is found across the simultaneous estimation − Panels A and B of Table 17. The findings support the argument that managerial ownership and board composition are jointly determined, suggesting that as companies use greater managerial ownership, they tend to present less independent boards of directors. Similarly, the reciprocal effect leads to the argument that independent boards of directors may tend to avoid managerial entrenchment and make less use of managerial ownership for monitoring and aligning managerial decisions with the interest of shareholders. Consistent with the study by Barnhart and Rosenstein (1998), the magnitude of the regression coefficients in Table 17 suggests that managerial ownership has greater negative impact on board composition than vice-versa. This entrenchment perspective is also supported through the analysis of industry- and market-based specific effects on internal governance structure. In addition, the regression coefficients in Tables 15 ($R^2 = 0.03$) and 16 ($R^2 = 0.13$) suggest that as capital-based companies and institutional investors make greater use of managerial ownership, they tend to present less independent boards of directors. This evidence leads to the argument that the negative association between managerial ownership and outside directors is more likely to be stronger in companies whose external shareholders hold relatively small stakes and trade more frequently.[48]

In H6, I investigate the argument that lenders may engage in closer monitoring

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[48] This argument is consistent with the study by Barnhart and Rosenstein (1998).

activities of managerial performance and of board participation to ensure the repayment of their loans (Agrawal and Knoeber, 1996; Barnhart and Rosenstein, 1998; Begley and Felthman, 1999). Contrasting with this argument, the multivariate results in the third column of Table 14 suggest that reliance on DEBT financing may lead to less independent boards-of-directors. The findings in the third column of Table 16 indicate that the association between outside directors and debt financing is negative in companies where debt financing interacts with diffuse ownership structure, whereas it is positive in companies where debt financing interacts with large family and institutional shareholders. A possible explanation for the positive association between outside directors and debt financing in companies with blockholders is the higher level of ownership concentration in this Canadian sample of public companies compared to U.S. companies. In this respect, the study by Shrader and Simon (1997), for example, provides evidence that companies with higher ownership concentration are more likely to be funded by their parents, leading to more monitoring by related parties and less monitoring by external debtholders.

The motivation for the predicted negative association between managerial ownership and debt financing (H7) is the argument that high ownership fractions tend to induce the CEO to issue debt contracts that restrict additional borrowing (Jensen, 1986; Williamson, 1986; Begley and Feltham, 1999). As documented in the fourth column of Table 16 (R^2=0.10), the predicted negative association between managerial ownership and debt financing is found in companies with diffuse ownership, whereas this same association is significantly positive in the sampled public companies where managerial ownership interacts with either family or institutional blockholders. This positive association

contradicts H7, but may support the power maintenance perspective (Begley and Feltham, 1999). The power maintenance perspective suggests that higher ownership tends to induce the CEO to issue debt contracts that restrict dividends[49] but not additional borrowing. Thus, in this sample, CEOs with larger ownership tend to be members of the founding family, whereas those with smaller ownership are professional managers. Members of founding families may be more concerned about the value of their firm equity, preferring covenants that restrict dividends, while professional managers may be more concerned about their human capital, and therefore prefer to restrict additional borrowing, as predicted by the U.S. evidence. In this case, the nature of debt covenants may be more sensitive to managerial ownership than the level of debt financing. Future research on this issue could investigate the incentive factors that are likely to impact the nature of debt covenants and their restrictiveness.

The entrenchment perspective motivates H8, predicting a negative association between the level of managerial ownership and the relative importance of the CEO target bonus. Overall, the findings do not support this hypothesis and a positive effect of managerial ownership on target bonus is documented when managerial ownership interacts with family blockholders, as documented in the fifth column of Table 16 (R^2=0.05). This positive association may be explained by the fact that CEOs of companies with family blockholders also tend to be members of the founding family, and for these companies, the cash bonus may be the only incentive mechanism to motivate and value the CEOs' human capital.

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[49] Begley and Feltham (1999), argue that dividend restrictions would facilitate resistance of pressure from

Motivated by the argument that CEO compensation tends to be more closely aligned with firm performance in firms with independent boards than in firms with weak boards, H9 predicts a positive association between outside directors and the firm's target bonus. Overall, the findings in this investigation do not support this hypothesis (H9). The lack of a significant association between outside director and target bonus may be due to the fact that cash compensation itself appears to have become a less important component of the overall pay-performance sensitivities for top executives. This evidence may support the argument that boards do in fact delegate to the capital market the tasks of monitoring and rewarding top managers. The study by Bushman and Smith (2000), for example, documents that the total sensitivity of executive wealth to changes in shareholder wealth has become dominated by executives' stock and stock option portfolios, as opposed to cash compensation or other components of executive incentive packages. Hence, further investigation into the association between board composition and target incentives for executive performance-contingent compensation should include the value of stock option grants.

The prior literature on the relation between debt contracts and management incentives suggests that high levels of debt financing tend to increase the external factors that negatively influence managerial performance. The greater uncertainty created by debt financing is suggested as jeopardizing the incentive and monitoring functions of performance-contingent compensation, and may lead firms to de-emphasize pay-for-

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other significant equityholders to pay dividends.

performance levels (Banker and Datar, 1989; Barkema and Gomez-Mejia; 1998 Bloom and Milkovich, 1998). Similarly, the study by Gilson and Vetsuypens (1993) suggests that firms tend to systematically restructure their management compensation contracts when experiencing financial difficulty, basing more of senior managers' compensation on long-term, stock-based performance measures. Consistent with this prior U.S. evidence, H10 predicts a negative association between the use of debt financing and the firm's target bonus. The findings in the fifth column of Table 16 ($R^2 = 0.05$) provide weak support for H10 in firms with a diffuse ownership structure, whereas contrary results are found in firms with large shareholders. A possible explanation is that the presence of large shareholders in the ownership structure increases debtholder concerns about equityholder opportunism subsequent to the debt contract. In this case, a higher target bonus may represent an effort to align managerial preferences with the interest of debtholders.

In addition to the interactions between firms' choice of financial and non-financial performance measures in the CEO bonus plan and the use of other internal governance mechanisms, this thesis also examines, in H11 to H15, whether these different governance mechanisms are jointly related to differences in the firms' market to book ratios.

The three regressions performed to jointly examine the association between the governance mechanisms investigated and firm market to book ratio are documented in

Table 18.[50] Overall, the regressions presented in Table 18 do not have a significant explanatory power. The findings support H11 to some extent. The evidence suggests that, jointly with the other mechanisms investigated, firms' emphasis on financial measures of performance in CEO bonus contract is negatively associated with firms' market to book ratio. This evidence is consistent with the argument that the use of alternative performance measures such as non-financial information tends to be associated with firms' growth opportunities. The studies by Bushman et al. (1996), Ittner et al. (1997), and Davila (2000), for example, document that in firms with greater emphasis on product development and innovation-oriented strategies, accounting, and to some extent price-based, measures are not sufficient measures of CEO performance.

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[50] The regressions presented in the second and third columns of Table 18 were performed to examine the potential curvilinear relation of inside ownership (MSHARE) and board composition (OUT) with firm performance, as posited by Stulz (1988) and found empirically in U.S. samples by Morck, Shleifer and Vishny (1988) and Barnhart and Rosenstein (1998).

Table 18 -   Coefficient estimates from Ordinary Least Square (OLS) regressions of firm future performance (Market to book Ratio - P/B$_{t+1}$)

Independent Variables	Predicted signs	Dependent Variable = P/B$_{t+1}$		
MEAS	-	-1.635*	-1.873**	-2.210**
MSHARE	+	0.347	0.893	0.933
MSHARE^2	-		-1.192	6.761
MSHARE^3	+			-10.373
OUT	+	1.552	1.594	1.702
OUT^2	-		-2.243**	-15.401*
OUT^3	+			13.984*
DEBT – adj	-	-0.586	-0.783	-0.902
BONUS	+	-0.974	-0.976	-0.978
IND	+	-0.255	-0.168	-0.132
BLOCK	+	2.314	2.183	2.274
SIZE	+	0.099	0.117	0.159
STRAT –adj	+	-0.879	-1.270	-1.187
Constant		-0.478	0.527	1.668
R^2		0.10	0.13	0.16
R^2 – Adjusted		0.002	0.015	0.031

***, **, * Statistically significant at 1%, 5% and 10% levels (two –tail), respectively.

MEAS = emphasis on financial measures of performance; MSHARE = level of managerial ownership at the beginning of 1998 financial year; OUT = percentage of outside directors; DEBT-adj = debt to firm value ratio in 1997 adjusted for industry mean; BONUS = target bonus as a percentage of salary in 1998; P/B$_t$= market to book value ratio, measured at the end of 1997; P/B$_t$-adj = market to book value ratio in 1997 adjusted for industry mean; P/B$_{t+1}$ = market to book value ratio in 1998; P/B$_{t+1}$-adj = market to book value ratio in 1998 adjusted for industry mean; IND = dummy variable with value of 1 for a knowledge-based company and 0 for a capital-based company; BLOCK = percentage of outstanding shares held by the largest shareholder at the beginning of 1998; SIZE = natural log of firm's total value of assets at the end of 1997; DESC = number of branches; NOISE = standard deviation of firm's stock price over 12 months prior to January 1998; STRAT$_{adj}$ = ratio of R&D expenses to total book value of assets in 1997 adjusted for industry mean; TENURE = number of years as CEO; CROSS = dummy variable with value 1 for Canadian companies also listed in US stock exchange; CASH$_{adj}$ = operating cash flow return on firm market value in 1997 adjusted for industry mean; RISK = sensitivity of firm's stock market price to overall fluctuation in the TSE-300.

The empirical support for H11 in Table 18 needs to be carefully interpreted. The significant correlation between MEAS and IND[51] does not allow a conclusion as to whether the negative association between the firms' emphasis on financial information and market to book ratio, as documented in Table 18, is due to the suggested backward and short-run aspects of financial information, or simply to firms' industry membership. Nevertheless, the findings in Table 18 are indeed consistent with the argument of this thesis that the usefulness of the information provided by traditional financial measures is negatively associated with firm growth opportunities. Hence, in the spirit of Bushman and Smith (2000), future research might profitably examine direct connections between properties of financial accounting information and real managerial decisions.

The results in Table 18 do not provide support for the remaining four hypotheses (H12 to H15) examining the association between other governance mechanisms and firm market to book ratio. H12, for example, is motivated by the notion that higher managerial ownership aligns managers' preferences with those of equityholders, and therefore tend to be positively associated with firm performance. The lack of significant association between managerial ownership and market to book ratio might be due to the greater level of family-owned companies in this sample of Canadian public companies. Demsetz and Lehn (1985) and McConnel and Servaes (1990), for example, document a positive association between firm performance and managerial ownership in cases where managers own less than 5%. However, the results are less clear for ownership levels exceeding 5%. In H13, I predicted that a greater proportion of outside directors would enhance monitoring by the board, and

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[51] See correlation coefficients in Table 12.

thereby enhance firm performance. This hypothesis is not supported by the regression results in Table 18. Neither do the findings support the curvilinear relationship between board composition and firm performance, as suggested by Stulz (1988). Similarly, the predicted relationships between a firm's level of debt financing (H14) and target bonus (H15) with firm market to book ratio are not supported by the results in Table 18. The evidence suggests that, in the presence of other internal governance mechanisms, firms' use of debt financing and the relative importance of the target bonus are not likely to be associated with the variance of the firm's market to book ratio. The fact that cash compensation alone appears to have become a less important component in the overall pay-performance incentives of top executives (Bushman and Smith, 2000) may justify the lack of significant association between target bonus and market to book ratio in this investigation.

5.5   SUMMARY

This empirical analysis section developed and tested fifteen hypotheses, of which four were specifically related to the mix of financial and non-financial performance measures in CEO bonus contracts, six were corollary hypotheses related to the associations among the internal governance mechanisms investigated, and the remaining five hypotheses examined the association between the mechanisms and firm future performance, as measured by the firm market to book ratio. A total of 97 (ninety-seven) Canadian public firms provided the data for testing the proposed hypotheses. Different regression analyses were performed to test the hypotheses and the results were documented in this chapter. This chapter ends with Table 19, which summarizes the empirical support found for each hypothesis. The following chapter contains the conclusion of the thesis. It consists of a summary, the main contributions of the thesis to the accounting literature, and the limitations inherent in the method used. Finally, the thesis concludes with directions for future research.

Table 19
Summary of the hypotheses' support

Hypothesis number	Predicted sign of the association	Univariate analysis	Multivariate analysis			Simultaneous estimation 3SLS	Results
			OLS	OLS with IND dummy	OLS with BLOCK dummy		
		Table 12	Table 14	Table 15	Table 16	Table 17	
H1	MEAS= (?) f (MSHARE)	Yes	No	Yes (partial) Positive in the knowledge-based sub-sample.	Yes Positive with diffuse ownership structure. Negative with family and institutional blockholder.	Yes Negative and reciprocal association.	Support found
H2	MEAS = (-) f (OUT)	No	Contrary result. Positive association.	No	Yes (partial) Negative with institutional blockholder, and positive with diffuse ownership structure.	Yes Negative and reciprocal association.	Support found
H3	MEAS = (+) f (DEBT)	Yes	No	Yes (partial) Positive in the knowledge-based Sub-sample.	Yes Positive with diffuse ownership structure and institutional blockholder. Negative with family blockholder.	No	Support found

Table 19 (contd.)
Summary of the hypotheses' support

Hypothesis number	Predicted sign of the association	Univariate analysis	Multivariate analysis			Simultaneous estimation 3SLS	Results
			OLS	OLS with IND dummy	OLS with BLOCK dummy		
		Table 12	Table 14	Table 15	Table 16	Table 17	
H4	MEAS = (-) f (BONUS)	Contrary result	No	No Contrary result. Positive in the knowledge-based sub-sample.	Yes (partial) Negative with family blockholder and positive with diffuse ownership	No	Rejected
H5	OUT = (-) f (MSHARE)	Yes	No	Yes (partial) Negative in the capital-based Sub-sample.	Yes Negative with family blockholder and positive with institutional blockholder.	Yes Negative and reciprocal association.	Support found
H6	OUT = (+) f (DEBT)	No	Contrary Result	No	Yes (partial) Positive with family blockholder, negative with diffuse ownwership	No	Rejected
H7	DEBT = (-) f (MSHARE)	No	No	No	No Positive coefficient in firms with family and institutional blockholder.	N/A	Rejected

Table 19 (contd.)
Summary of the hypotheses' support

Hypothesis number	Predicted sign of the association	Univariate analysis	Multivariate analysis			Simultaneous estimation 3SLS	Results
			OLS	OLS with IND dummy	OLS with BLOCK dummy		
		Table 12	Table 14	Table 15	Table 16	Table 17	
H8	BONUS =(-) f(MSHARE)	No	No	No	No Positive coefficient in firms with family blockholder.	N/A	Rejected
H9	BONUS = (+) f (OUT)	No	No	No	No	N/A	Rejected
H10	BONUS = (-) f (DEBT)	No	No	No	Contrary results. Positive coefficient with institutional and family blockholders.	N/A	Rejected
			Table 18				
H11	$P/B_{t+1} = (-)$ f (MEAS)	No	Yes	N/A	N/A	N/A	Support found
H12	$P/B_{t+1} = (+)$ f (MSHARE)	No	No	N/A	N/A	N/A	Rejected
H13	$P/B_{t+1} = (+)$ f (OUT)	No	No.	N/A	N/A	N/A	Rejected
H14	$P/B_{t+1} = (-)$ f (DEBT)	Yes	No	N/A	N/A	N/A	Rejected
H15	$P/B_{t+1} = (+)$ f (BONUS)	No	No	N/A	N/A	N/A	Rejected

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1   SUMMARY

This thesis examines the interdependence between the mix of financial and non-financial measures of performance in the CEO bonus contract and firms' observed governance structures. The governance mechanisms investigated are managerial ownership, board composition, debt financing, the relative importance of the CEO target cash bonus, and the presence of large shareholders. The empirical investigation is based on a sample of 97 Canadian publicly-traded companies from two very distinct economic sectors, namely knowledge- and capital-based companies. This allows a control for and investigation of the effect of external monitoring forces such as product market, market for corporate control, and managerial labor market on the firms' internal governance configurations. The motivations for this thesis include research concerning the role of financial and non-financial information on the operation of governance systems, a review of the prior research on the interactions among governance mechanisms, and the impact of the limitations of financial accounting information on the structure of firms' incentive contracts.

6.2   CONTRIBUTIONS OF THIS THESIS

The primary contribution of this thesis is the documentation of empirical evidence that the mix of financial and non-financial performance measures in CEO bonus contracts is jointly determined with managerial ownership, board composition, and firm performance. The results not only support the roles of alternative governance mechanisms, but also the interdependence of alternate corporate governance mechanisms and their association with firm contemporaneous performance. The results suggest that firms with independent boards tend to rely to a greater extent on non-financial performance measures in order to monitor and reward top managers. The evidence supports the main argument of this thesis that non-financial information serves an important monitoring role in reducing the information asymmetry between directors and managers. The empirical findings also suggest that higher managerial ownership may lead to greater emphasis on non-financial measures of performance in the CEO bonus plan. Overall, the evidence regarding the association between the mix of performance measures in the CEO bonus plan and managerial ownership supports the notion of a complementary function between high fractions of stock owned by managers and the use of non-financial information for performance evaluation.

Consistent with the entrenchment perspective, this thesis also provides evidence that managerial ownership has a greater negative effect on board composition than vice-versa. Regarding the impact of external governance mechanisms on the firm's internal governance structure, the results support Agrawal and Knoeber's (1996) argument that industry patterns may be a factor in the choice of internal governance mechanisms. In this

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respect, the empirical results are consistent with the prior literature in management accounting, suggesting that non-financial performance measures are more suitable for monitoring management in companies with greater growth opportunities and long-term investment horizons. The negative impact of managerial ownership on the proportion of outside directors on the board tends to be stronger in capital-based companies and companies with institutional investors. Consistent with Barnhart and Rosenstein (1998), this evidence suggests that managerial entrenchment is more likely to occur in companies where shareholders hold relatively small stakes and trade more frequently. This thesis also provides strong support for Demsetz and Lehns's (1985) finding that governance structure and performance are jointly determined.

In contrast with prior research on corporate governance that has examined single relationships between governance mechanisms, this study jointly investigates the associations among the mix of performance measures in the CEO bonus contract, four internal, and four external governance mechanisms, along with firms' contemporaneous and future performance. As a result, this thesis addresses some limitations identified in two influential studies in this area, Agrawal and Knoeber (1996) and Ittner et al. (1997), by directly controlling for industry patterns and growth opportunities that could affect the firms' internal governance configuration. This thesis also employs a simultaneous estimation approach to capture and investigate the suggested association between governance mechanisms that boards and investors might use to monitor the actions of managers. This approach attempts to provide a more complete picture of the interactions between governance mechanisms and to provide a better understanding of the potential complementarities among the governance mechanisms investigated.

This thesis should prove useful in the ongoing discussion about the role of financial and non-financial information drawn from accounting systems in the operation of governance mechanisms, largely through its role in assessing managerial performance and firm value. This thesis may bring new insights to a growing literature on the economics of organizational design, the monitoring role of non-financial information, and the optimal use of governance mechanisms in monitoring and controlling the actions of managers. Finally, in contrast to most governance research that focuses on the U.S., this thesis provides governance data on Canadian publicly-traded companies.

6.3   LIMITATIONS OF THIS THESIS

As in any empirical investigation, the findings are subject to several caveats. First, the object of my analysis is the explicit choice of performance measures in the CEO annual bonus plan. Other elements of the firms' performance measurement system may provide boards of directors and investors with relevant monitoring information similar to that provided by incorporating non-financial measures into the annual bonus contract. Secondly, the distinction between explicit financial and non-financial performance measures in CEO bonus plans may not comprise all possible evaluation practices directors use to gather information and monitor CEO performance. For example, directors may also make use of relative performance measures (RPE)[52] to monitor and reward managerial efforts. Thirdly, although I include a dummy variable to control for family and institutional large shareholders, my proxy for managerial ownership does not distinguish between the

fraction of stocks owned by professional managers and the fraction owned by managers who are members of the founding family. Finally, my proxy for the relative importance of the CEOs' performance contingent compensation does not include stock option plans, and this may be the cause for the lack of significance in the hypothesized associations between the relative importance of CEO performance-contingent compensation and the other governance mechanisms investigated. Recent research (Bushman and Smith, 2000; Klassen and Mawani, 2000) has documented that executive pay-performance plans have shifted towards the use of stock option grants.

6.4   DIRECTIONS FOR FUTURE RESEARCH

This thesis suggests a number of future avenues for research on the role of financial and non-financial information in governance systems. First, the information preferences of directors and the mechanisms they choose to monitor managerial performance could be investigated by means of large-scale surveys. Such an instrument could provide inside information about the board's performance measurement practices and informal sources used for the accountability of managerial performance. Such data could lead to more in-depth examination of the interactions among the governance mechanisms. Secondly, other performance measurement practices such as subjective[53] and relative performance evaluations (RPE) could be investigated, along with their association with the mix of financial and non-financial performance measures in the CEO compensation contracts. Recent research has suggested that additional factors such as

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[52] Two recent studies, Aggarawal and Samwick (1999) and DeFond and Park (1999), document significant effects of the competitive environment in which a firm operates in the design of the incentive mechanisms included in the governance structure.

[53] For a discussion on the use of subjective performance evaluations in the evaluation and compensation of

taxation, decision rights and peer competition, which are beyond the effort-insurance trade-off captured in the standard principal-agent model, are likely to be important in the design of incentive mechanisms (Klassen and Mawani, 2000; Bushman et al., 2000). Thirdly, as suggested by Ittner et al. (1997), the use of non-financial information in CEO bonus contracts and long-term stock option plans may provide the same kind of forward-looking incentives for managers, thereby substituting for each other in the governance system. Hence, further research may profitably explore the interactions between firms' relative importance placed on stock options and other elements in the governance system. Finally, the entrenchment hypothesis of the positive association between managerial ownership and firms' use of non-financial performance measures in CEO compensation contracts can be explored through a longitudinal investigation of the sensitivity of increases in executive wealth to the use of non-financial measures in pay-performance contracts.

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corporate CEOs, see Bushman et al. (1996).

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Appendix A
Analysis of identification conditions for the proposed simultaneous equation model

The identification condition is a mathematical (as opposed to statistical) problem associated with simultaneous equation systems. Basically, the identification is concerned with the question of the possibility or impossibility of obtaining meaningful estimates for the structural parameters of a specific equation in the model. If this can be done, the particular equation is considered "identified" or "overidentified." If this cannot be done, the equation under consideration is considered "unidentified." As such, the model as a whole is qualified as identified if each singular equation in it is "identified" or "overidentified." To examine the identification of the proposed model, the order and rank conditions analysis were carried out for each of the six equations. The following paragraphs describe both tests. The *order* condition of identifiability predicts that in order for an equation to be identified or overidentified, the number of *exogenous* variables excluded from the equation must not be less than the number of *endogenous* variables included in that equation (Gujarati, 1988). This statement may be represented by the following equation:

$$K - k > or = m - 1$$

Where; $K =$ number of exogenous variables in the model
$k =$ number of exogenous variables in a given equation
$m =$ number of endogenous variables in a given equation

Thus, if *(K − k) is equal to (m − 1)* means that the equation is exactly identified, and if *(K − k) is bigger than (m − 1),* the equation is overidentified. Table A.1 presents the results of this analysis for the proposed model.

Table A.1
The order condition of identifiability

	No. of exogenous variables excluded ($K - k$)	No. of endogenous variables included less one ($m - 1$)	Identified?
Equation 1 (MEAS)	$(9 - 4) = 5$	$(6 - 1) = 5$	Exactly
Equation 2 (MSHARE)	$(9 - 4) = 5$	$(6 - 1) = 5$	Exactly
Equation 3 (BOARD)	$(9 - 4) = 5$	$(6 - 1) = 5$	Exactly
Equation 4 (DEBT)	$(9 - 4) = 5$	$(6 - 1) = 5$	Exactly
Equation 5 (BONUS)	$(9 - 4) = 5$	$(6 - 1) = 5$	Exactly
Equation 6 (P/B)	$(9 - 4) = 5$	$(6 - 1) = 5$	Exactly

The *order* condition, however, is a necessary but not sufficient condition for identification of the model. This may occur when an equation is not identified due to the fact that exogenous variables excluded from this equation but present in the model may not be independent. Therefore, both a necessary and sufficient condition for model identification is required, which is provided by the *rank* condition of identification. In short, the *rank* condition predicts that in a model containing *M* equations in *M endogenous* variables, an equation is identified if, and only if, at least one non-zero determinant of order *(M-1)(M-1)* can be constructed from the coefficients of the variables (both endogenous and exogenous) excluded from that particular equation, but included in the other equations of the model (Gujarati, 1988). The result of the *rank* condition analysis on the proposed simultaneous equation model is that at least one non-zero determinant can be obtained from the matrix of coefficients constructed for each of the six equations included in the model. In Appendix E, I present the general matrix of coefficients constructed from the proposed model, and on which the *rank* condition analysis was based.

Appendix B
Tests for potential sample selection biases
B.1   Test of differences

The first set of tests consists of F-tests for difference between means, which is

documented in Panels A-1 and A-2 of Table B.1, and Bartlett's tests for homogeneity of

variances, documented in Panels B-1 and B-2 of Table B.1. The purpose of these tests is

to investigate, within each sub-sample, the null hypothesis that the group of companies

excluded from the target sample are not significantly different from the group of

companies included in the final sample. As expected, the results indicate that the null

hypotheses of equality of means and variances cannot be rejected for all three criteria used,

except for the number of employees in the knowledge-based subgroup.

Table B.1
Comparison between the final sample and the companies excluded
from the final sample, by sub-sample
Panel A-1
Comparison of means between knowledge companies in the final sample (N=48) and
knowledge companies excluded from the final sample (N=29).

Variables	F-test	Results
	Equality of Means	(1.79 Pr.5%)
Employees	1.059	H_0 of Equality cannot be rejected
Total Revenue	0.002	H_0 of Equality cannot be rejected
Total Assets	0.121	H_0 of Equality cannot be rejected

Panel B-1
Comparison of variance between knowledge companies in the final sample
(N=48) and knowledge companies excluded from the final sample (N=29).

Variables	Bartlett's Homogeneity of Variance test	Results $(X^2 = 3.841 \text{ Pr. } 5\%)$
Employees	4.547	Unequal variance (Pr.0.025)
Total Revenue	1.930	Equal variance
Total Assets	0.720	Equal variance

Table B.1 (cont'd)
Panel A-2 Comparison of means between capital-based companies in the final sample (N=49) and capital-based companies excluded from the final sample (N=12).

Variables	F-test Equality of Means	Results (F=1.79 Pr.5%)
Employees	0.259	H_0 of Equality cannot be rejected
Total Revenue	0.819	H_0 of Equality cannot be rejected
Total Assets	1.487	H_0 of Equality cannot be rejected

Panel B-2
Comparison of variance between capital-based companies in the final sample (N=49) and capital-based companies excluded from the final sample (N=12).

Variables	Bartlett's Homogeneity of Variance test	Results ($X^2 = 3.841$ Pr. 5%)
Employees	2.890	Equal variance
Total Revenue	2.730	Equal variance
Total Assets	1.678	Equal variance

B.2   Probit Regression

To complement the comparison of means and variances, a Probit test (Greene, 1990; Chap.20) is also performed to investigate for a possible sample bias due to the fact that the final sample excludes companies without a bonus plan and/or companies whose performance-contingent reward is not linked to specific performance criteria. In short, this test consists of two stages.

First, a Probit regression is performed using the pooled target sample (N=138) on a dummy dependent variable. This dummy variable characterizes the event that excluded 41 companies and limited the pooled final sample to 97 companies. As stated earlier, in this case the event is the presence or absence of a bonus plan in the CEO's compensation package and/or the absence of objective performance criteria. This dummy variable is noted as BONUSd. Thus, a Probit model is created to regress the critical event *j*, represented by the BONUSd variable, to a set of factors in the spirit of the OLS regression used in the second step of this test.

The following framework represents this probability model.

Prob[event j occurs]= Prob [Y=j]= F[relevant effects:parameters].(Greene, 1990 p.662)

Building on the above framework, the following Probit model was specified:

$$BONUSd = \alpha + \beta_1 DEBT + \beta_2 IND + \beta_3 BLOCK + \beta_4 SIZE + \beta_5 RISK + \varepsilon$$

Where;

BONUSd = dummy variable with value of 1 for companies with bonus contract, and 0 otherwise. As a result, this variable has 97 ones and 41 zeros.

DEBT = debt to firm value ratio;

IND = dummy variable with value of 1 for a knowledge-based company, and 0 for a capital-based company;

BLOCK = percentage of outstanding shares held by the largest shareholder;

SIZE = natural log of firm's total value of assets;

RISK = firm's Beta.

The independent variables included in this Probit model were selected by the convenient condition of having data collected for the target sample, or 138 observations.[54] The indexes presented below provide evidence that the Probit regression has a good fit model. The better the fit of the Probit model (first step), the higher the reliability of the OLS coefficient estimated in the second step for the *bonus predicted probabilities* (Probit).

Madalla R-Square	0.21
Cragg-Uhler R-Square	0.30
McFadden R-Square	0.19

The second step consists in using the predicted probabilities generated by this Probit model as one of the independent variables of an OLS regression if the dependent variable is a continuous variable. The BONUS variable is a proxy for the relative importance of the bonus plan in the CEO's total cash compensation. This variable is used as the dependent variable in the OLS regression because, logically, it is the dependent variable that would be most affected by the *predicted probabilities* of the *j* event's

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[54] Data for the MSHARE and OUT variables, for example, were collected only for the final sample, i.e. 97

occurrence or non-occurrence. The hypothesis of a sample bias due to the fact that the *j*

event limits the final sample may be rejected if the OLS coefficient of the Probit variable

(*bonus predicted probabilities)* is not significantly different from zero (t-test). Table B.2

presents the OLS coefficients estimated for the continuous variable BONUS.

Table B.2 : OLS coefficients estimated for BONUS (N=97)

	α	MEAS	MSHAR	OUT	DEBT	Probit	IND	BLOCK	SIZE	RISK
BONUS	0.215	-0.238*	0.020	0.125	-0.123	-0.358	0.110	-0.025	0.117*	-0.225*
	(0.511)	(-1.791)	(0.123)	(0.582)	(-1.033)	(0.682)	(1.183)	(-0.145)	(1.679)	(-1.811)
R^2	0.28	Adj-R^2	0.21							

 * Indicates Significance at 5% level

Results from Table B.2 indicate that the independent variables included in the OLS

regression explain a greater portion (21%) of the variation in the relative importance of

BONUS. The significant coefficients have signs consistent with the literature reviewed in

Section 2. The use of financial measures and firm's SIZE seems to have a positive effect

on the relative importance of BONUS contract, while firm's RISK seems to decrease the

relative importance of performance contingent compensation. Most important, the

coefficient of the *Probit* variable is not significant, suggesting that the presence or absence

of a bonus contract in the CEO's compensation package is not likely to affect further

regression analyses.

observations.

Appendix C
List of companies in the final sample

Knowledge-based companies	Capital-based companies
Acetex	Abitibi-Consolidated Inc.
Aeterna(Les Laboratoires) Inc.	Ainsworth Lumber Co. Ltd.
Agrium	Algoma Steel Inc
Allelix	Alliance Forest Products Inc.
Alta Genetics	Bowater Incorporated
Altarex Corp.	Canfor Corporation
Angiotech	Cartons St-Laurent Inc.
AT Plastics Inc.	Cascades Inc.
Axcan Pharma Inc.	Concert Industries
Biochem Pharma Inc.	Co-Steel Inc.
Biomira Inc.	Dofasco Inc.
Biovail Corporation	Doman Industries Ltd.
Canadian Medical Lab.Ltd.	Domtar Inc.
Cangene Corporation	Donohue Inc.
Canhorn Chemical	Fletcher Challenge Ltd.
CFS Group Inc.	GTC Transcont. Group Ltd
Cobequid Life Sciences	Harris Steel Group
DC Diagnosticare	Hollinger Inc.
Domco Inc	International Forest Prod.Ltd.
Draxis Health Inc.	Ipsco Inc.
Drug Royallty Corp. Inc.	Ivaco Inc.
Dupont Canada	Leroux Steel Inc.
Enerchem International Inc.	Les Entretreprises Repap Inc.
Genetronics	Les Papiers Perkins Ltée
Glyko Biomedical Ltd.	Magnifoam Techn. Intern. Inc.
Haemacure Corp.	Marshall-Barwick inc.
Hemosol Inc.	McGraw-Hill Ryerson
Hyal Phamaceutical Corp.	Noranda Forest (NEXFOR)
IBEX Technologies Inc.	Paperboard Industries Int.Inc.
ID Biomedical Corp.	PLM Group Ltd.
Inex Pharmaceuticals	Primex Forest Products Ltd.
Labopharm Inc.	Printera Corporation
Lorus Therapeutics Inc.	Quebecor Printing
MDS Inc.	Riverside Forest Prod. Limited
Methanex Corp	Rolland Inc.
Micrologix Biotech inc.	Roman Corporation Limited
Nova Chemicals Corp.	Sino-Forest Corporation
Novopharm	Skyjack Inc.
Patheon Inc.	Slater Steel Inc.
Phoenix Intern. Life Sc. Inc.	Slocan Forest Products Ltd.
Potash Corporation	Stelco Inc.
QLT Phototherapeutics Inc.	Stella-Jones Inc.
Sico Inc.	Taiga Forest Products ltd
Spectral Diagnostics, Inc.	Tembec Inc.
StressGen Biotechn. Corp.	The Thomson Corp.
Synsorb Biotech	Timberwest Forest Limited
Technilab Pharma	Torstar Corp.
Theratechnologies Inc.	West Fraser Timber Co. Ltd.
	ZCL Composites Inc.

Appendix D
Measurement of firms' mix of financial and non-financial
performance measures in CEO bonus contract (MEAS)

Company	Textual quotation from firm's "Management Proxy Circular"	Weight	
		Financial	*Non-financial*
Domtar Inc.	*"Starting with [the?] 1996 financial year, an EVA incentive compensation system which rewards continuous improvement in economic value added has been put in place and represents a 50% weighting of the incentive pay out (for 1997, the 50% weighting will be increasing to 75%). For 1996, incentive compensation was paid mainly on the basis of the achievement of key success factors and individual objectives, the EVA targets for the Corporation and most of its operating divisions not having been met."*	(1996) = .50 (1997) = .75	.50 .25
NORTEL Networks Corporation	*"In 1998, corporate performance measures, in order of importance, were revenue and earnings per share, expense control, and customer satisfaction and loyalty, with cash flow performance acting as an overall accelerator/ decelerator. For 1998, a minimum customer satisfaction performance level had to be achieved for any Incentive Plan award to be granted."*	3/4 = .75	1/4 = .25
BIO Chem Pharma Inc.	*"In the case of executive officers of the Corporation, the annual bonus is now more dependent on corporate performance than on personal performance. Hence, a large proportion of the annual bonus is based on such corporate performance factors as earnings per share, product pipeline development and share price performance. A relatively small proportion of the annual bonus is based on individual performance for executive officers."*	2/3 = .67	1/3 = .33
CGI Group Inc.	*"The performance measures are Company or region/business unit profitability, based on net profit, and growth in net revenues for year. Bonuses of the CEO, Chief Operating Officer and CFO are based exclusively on these two factors according to the Company's overall results."*	2/2 = 1.0	

Appendix E
The matrix of coefficients of the proposed model

	α	MEAS Y1	MSHARE Y2	OUT Y3	DEBT Y4	BONUS Y5	PERF Y6	IND X1	BLOCK X2	SIZE X3	NOISE X4	TENURE X5	CROSS X6	CASH X7	RISK X8	DESC X9	STRAT X9i
Eq.1	α_{10}	1	γ_{12}	γ_{13}	γ_{14}	γ_{15}	γ_{16}	β_{11}	β_{12}	0	β_{14}	0	0	0	0	β_{19}	β_{19i}
Eq.2	α_{20}	γ_{21}	1	γ_{23}	γ_{24}	γ_{25}	γ_{26}	β_{21}	β_{22}	β_{23}	0	β_{25}	0	0	0	0	0
Eq.3	α_{30}	γ_{31}	γ_{32}	1	γ_{34}	γ_{35}	γ_{36}	β_{31}	β_{32}	β_{33}	0	0	β_{36}	0	0	0	0
Eq.4	α_{40}	γ_{41}	γ_{42}	γ_{43}	1	γ_{45}	γ_{46}	β_{41}	β_{42}	β_{43}	0	0	0	β_{47}	0	0	0
Eq.5	α_{50}	γ_{51}	γ_{52}	γ_{53}	γ_{54}	1	γ_{56}	β_{51}	β_{52}	β_{53}	0	0	0	0	β_{58}	0	0
Eq.6	α_{50}	γ_{61}	γ_{62}	γ_{63}	γ_{64}	γ_{65}	1	β_{61}	β_{62}	β_{63}	0	0	0	0	0	0	β_{69i}

The Y's denote the endogenous (n=6) variables in the model and the Xs denote the exogenous (n=9) variables.

Equation 1 $MEAS = a_0 + \dot{a}_j b_i IM_i + b_{11} IND + b_{12} BLOCK \qquad + b_{14} NOISE \quad + b_{19} DESC \qquad + b_{19i} STRAT + e_1$

Equation 2 $MSHARE = a_0 + \dot{a} b_i IM_i + b_{21} IND + b_{22} BLOCK + b_{23} SIZE \quad + b_{25} TENURE \qquad + e_2$

Equation 3 $OUT = a_0 + \dot{a} b_i IM_i + b_{31} IND + b_{32} BLOCK + b_{23} SIZE \qquad + b_{36} CROSS \qquad + e_3$

Equation 4 $DEBT = a_0 + \dot{a} b_i IM_i + b_{41} IND + b_{42} BLOCK + b_{43} SIZE \qquad + b_{47} CASH \qquad + e_4$

Equation 5 $BONUS = a_0 + \dot{a} b_i IM_i + b_{51} IND + b_{52} BLOCK + b_{53} SIZE \qquad + b_{58} RISK \qquad + e_5$

Equation 6 $P/B = a_0 + \dot{a} b_i IM_i + b_{61} IND + b_{62} BLOCK + b_{63} SIZE \qquad + b_{69i} STRAT + e_6$