THE ROLE OF CONTROLLING SHAREHOLDERS ON THE USE OF
MARKET AND ACCOUNTING PERFORMANCE MEASURES IN CEO
INCENTIVES: AN AGENCY THEORY AND CANADIAN EVIDENCE

by

Yun W. Park

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ABSTRACT

This thesis investigates the role of controlling shareholders in the use of market measures and accounting measures of performance in CEO incentives. It extends the current understanding of how market performance measures and accounting performance measures are weighted in CEO incentive contracts.

Controlling shareholders in closely held firms are likely to enjoy cheap access to the firm's information. Furthermore, controlling shareholders receive significant benefits from monitoring CEO's activities through substantial equity investment. The implication of controlling shareholders' ready access to information and improved incentive for monitoring in the CEO compensation design is investigated. A compensation contracting model is developed where shareholders have a monitor, who administers CEO compensation. For a closely held firm, the controlling shareholder serves as monitor. For a widely held firm, the board of directors serves as monitor. The analysis of the model shows that the controlling shareholders are more likely to supply verification of accounting performance measures than the directors of the board in widely held firms. The model has two related predictions: Closely held firms would place more weight on accounting-performance-based incentives in the CEO compensation than would widely held firms, all else being equal; closely held firms would place less weight on market-performance-based incentives in the CEO compensation than would widely held firms, all else being equal. The latter proposition can be tested empirically using publicly available Canadian data.

Cross-sectional regression analyses testing the theory's prediction were performed on Canadian data for the 1986-1989 period. The regression model incorporates various control variables motivated by previous studies. Tests using Canadian data support the theory's prediction. Firms with controlling shareholders had less reliance on stock-based incentives in CEO pay than did widely held firms. When different proxies of controlling shareholders as well as control variables were used, essentially the same result was obtained. The same result holds for 1986-1987 and 1988-1989 subperiods. The data support the controlling shareholder monitoring theory developed in this study.

This study has analysed the role of controlling shareholders in the use of market measures and accounting measures of performance in CEO incentives. The model of CEO compensation contracting has produced a testable prediction that firms with controlling shareholders place less weight on incentives based on market performance measures in CEO pay than widely held firms do. Empirical study gives support to the prediction of the model. Other potential explanations of the empirical results are also discussed. This study enhances our understanding of the CEO incentive design in public corporations.

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CHAPTER 1 INTRODUCTION

1.1 Objective and Overall Design of the Study

The objective of this study is to explore how ownership structure influences the CEO compensation structure in large public corporations. More specifically, this study examines the role of controlling shareholders in the use of accounting and market performance measures in CEO incentives. The study design consists of the elaboration of an agency-based theory and the empirical tests of the theory's prediction.

1.2 Motivations for the Study

The principal motivation of this research was to ascertain if the presence of controlling shareholders, who have ready access to the company information and powerful incentive to monitor the CEOs, has any influence on the use of market measures and accounting measures of performance in CEO incentives. While some understanding of the determinants of the weights of the accounting-based incentives and market-based incentives has already been gained by applying principal-agent analysis to the subject (Lambert and Larcker, 1987; Banker and Datar, 1989; Sloan, 1992), the implication of there being a controlling interest for the determination of the weights of performance measures in incentive compensation has not received careful examination to date.

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1.3 Contributions of the Study

This study sheds some light on the role of controlling shareholders in the use of market and accounting performance measures in CEO incentives. It has developed a CEO-compensation-contracting model where shareholders have a monitor who administers CEO compensation. The model shows that the presence of a controlling shareholder affects the choice of performance measures in CEO incentives. Given the economic incentive that controlling shareholders have cheaper access to information and are able to internalize the benefits of monitoring through substantial equity investment, firms with a controlling shareholder rely more on accounting performance measures, which management could misrepresent, than do widely held firms, all else being equal. The data support the model's prediction. This study documents evidence that closely held firms tend to use fewer stock-based incentives than do widely held firms when other relevant factors are controlled.

1.4 Organization of the Thesis

Chapter 2 presents an overview of the literature relevant to the subject matter. Chapter 3 develops a model for contracting CEOs' compensation and produces a testable prediction from the model. In Chapter 4, empirical findings are reported. Finally, in Chapter 5, a summary of the findings is presented and future research directions are discussed.

CHAPTER 2 LITERATURE REVIEW

This thesis attempts to evaluate the monitoring role of controlling shareholders in the context of the design of CEO incentives. This chapter presents a review of the relevant theoretical and empirical literature on the subject. Since the subject matter touches on several related literatures, this literature review surveys several related areas. Section 2.1 reviews the literature on the agency problem and ownership structure in large public corporations. Section 2.2 reviews the literature on performance measures employed in CEO incentive compensation. Section 2.3 reviews the literature on the determinants of the weights of market and accounting performance measures in CEO incentives. Section 2.4 summarizes the literature review.

2.1 Agency Problem and Ownership Structure in Large Public Corporations

A widely held firm characterized by diffuse ownership and effective control by management has been a widely adopted organisational form for many decades in the United States (Berle and Means, 1932; Fama and Jensen, 1983). Professional management allocates and deploys a pool of capital contributed by outside investors in such an organisational form. One prominent weakness of a widely held firm is that professional management, which often has little or no equity investment in the firm it manages, may pursue goals other than shareholder wealth maximization (Jensen and Meckling, 1976; Jensen, 1986 and 1993).

Berle and Means (1932) documented the extent of separation of control from ownership and the preponderance of management control in large public firms. Baumol (1959) and Williamson (1964) provided early empirical evidence and theoretical discussion of the agency problem in widely held firms. Numerous agency studies followed, which explored various aspects of agency problems in public corporations (Jensen and Meckling, 1976; Benston, 1985; Healy, 1985; Jensen, 1986 and 1993).

An alternative organisational form is a closely held firm. A public firm is closely held when a large shareholder or large shareholders who act in concert control the firm by virtue of voting power. The closely held firm has been very prominent in Canada (Eckbo and Verma, 1994; Daniels and Halpern, 1996; Morck, 1996) and less so in U.S. (Demsetz and Lehn, 1985; Morck, Shleifer, and Vishny, 1988). Since the controlling shareholder can monitor the management closely and effectively, the presence of a controlling interest has been hypothesized to reduce agency problem and improve a firm's decision-making. In support of the benefit of concentrated ownership, Gomez-Mejia, Tosi, and Hinkin (1987) show that there is a strong relationship between firm performance and CEO pay in closely held firms while CEO pay is strongly related to growth and sales increases in widely held firms. In a similar vein, Werner and Tosi (1995) show that managers in widely held firms are paid more than managers in closely held firms through higher salaries, higher bonuses, and higher long-term incentives.

2.2 Agency Theory and Performance Measures in CEO Incentives

2.2.1 CEO Incentives in Practice

Both in the United States and Canada, base salary, bonus, and stock options constitute the major components of executive compensation while deferred compensation, fringe benefits, and perquisites constitute most of the balance of compensation (Lewellen, 1971; Stewart, 1989; Pavlik, Scott, and Tiessen; 1993; Scott and Tiessen, 1995). Two main components of payoff-related incentives are bonus and stock options.

Most of the large Canadian firms make extensive use of performance-based pay to motivate their CEOs. Koplyay et al. (1992) report that Canadian top managers get 35-50% of their pay in the form of incentives while U.S. CEOs get 50-75% in incentives. They report that, in 1988, the average Canadian CEO took 30% of total pay in the form of bonus and 11% from stock purchase plans or stock options. Mehran (1992) reports that in his U.S. sample CEOs took 67% of total pay in the form of salary and bonus and 22% in the form of equity-based incentives in 1979 and 1980. More recently, Elitzur and Halpern (1995) report that in 1993 the average value of salaries of top executives in 180 large Canadian publicly traded firms was $258,000 whereas the average value of bonus was $87,000.

Accounting performance measures and market performance measures are the two kinds of performance measures used to determine the payoffs of the incentive contracts. (Lambert and Larcker, 1987; Pavlick et al., 1993). Accounting performance measures used for CEOs include return on equity (ROE), return on assets (ROA), and return on

investment (ROI) (McLaughlin, 1975; Burchman, 1991). Bonus is usually a piece-wise linear contract in accounting earnings (Healy, 1985). Some of the bonus comes from absolute amounts of earnings and some results from comparative levels of earnings (Antle and Smith, 1986; Murphy, 1985; Gibbons and Murphy, 1990). The exercise value of the executive stock option, which is the dominant form of market-performance-based incentives, is the difference between the current stock price and the exercise price of the stock option.

2.2.2 Principal-Agent Literature and Performance Measures

A formal economic theory has evolved that deals with the delegation of the management by the property owners or principals to their appointed agents when property owners cannot measure the performances of the agents perfectly. It has become known as *principal–agent theory* (Mirrlees, 1976; Shavell, 1979; Holmstrom, 1979; Grossman and Hart, 1983; Holmstrom and Milgrom, 1987). The basic premise of the principal–agent literature applies to the relationship between the chief executive officer (CEO) of large publicly-traded firms and the shareholders. Legally speaking, the shareholders are property owners, the principals, and the CEOs are their agents. The CEOs are given responsibility for the care of the shareholders' property, that is, the management of the firm's assets (Fama and Jensen, 1983).

Principal–agent theory predicts that payoff-based or incentive compensation such as bonus and stock option would be prominent in CEO compensation in order to reduce

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the agency problem when the CEO has little or no investment in the firm's common stocks (Milgrom and Roberts, 1992). Another important prediction of the principal-agent literature is that any number of signals which are informative about the CEO's contribution would be used in an optimal contract (Holmstrom, 1979). This prediction is consistent with the evidence, since CEO compensation contracts use multiple payoff-related measures (McLaughlin, 1975; Burchman, 1991). Lambert (1983) shows that incentive contracts reduce the problem of moral hazard, even in a multi-period economy.

2.2.3 Accounting Performance Measures and Market Performance Measures as Complementary Performance Measures

A number of theoretical articles have explored the economic properties of stock-based compensation. Fama and Jensen (1983) cite the stock market as one of the most important external mechanisms to control agency problems in publicly traded firms. They point out that the stock market produces prices of common stocks, which signal a wide perception of the effectiveness of internal decisions. Haugen and Senbet (1981) demonstrate that compensating the manager with stock options can greatly reduce or eliminate the agency costs of external financing discussed in Jensen and Meckling (1976).

One well-known problem with stock-based incentives is that it can subject the CEO to market risk. Banker and Datar (1989) and Sloan (1992) demonstrate analytically that, if one assumes that the accounting performance measure is less sensitive to market-wide movement than is stock price, the performance incentives based on the accounting

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performance measure are valuable. Sloan (1992) provides evidence in support of the hypothesis that earnings-based incentives help to shield executives from market-wide factors in stock prices.

Accounting-earnings-based incentive compensation has its limitations. Incentive schemes based on accounting performance measures appear to influence the accounting earnings measurement process (Healy, 1985; Verrechia, 1986). Corporate managers often engage in income smoothing, taking actions to dampen fluctuations in their firms' publicly reported net incomes (Ronen and Sadan, 1981). Trueman and Titman (1988) hypothesize that, by smoothing income, managers may attempt to reduce the estimate of various claimants of the firm about the volatility of its underlying earnings process, which in turn could lower the firm's cost of borrowing and favourably affect the terms of trade between the firm and its customers, workers, and suppliers. O'Glove (1987) provides evidence of misrepresentation of accounting performance measures, while the expropriation of the outside investors by the management has been studied extensively in the auditing literature (Baiman, Evans, and Noel, 1987; Blazenco and Scott, 1987; Baiman, Evans, and Nagarajan, 1991).

2.3 Determinants of the Weights of Market and Accounting Performance Measures in CEO Incentives

Lambert and Larcker (1987) hypothesize that the noise about the CEO's effort in the market and accounting performance measures reduces the usefulness of the respective

signals, therefore, their weights in the incentives. They also hypothesize that the weight of market performance measures is an increasing function of the firm's future growth opportunities since the stock price is a far superior measure of the firm's future growth opportunities than accounting performance measures. Finally, they hypothesize that the CEO's stock ownership is a substitute for market-performance-based incentives. In support of these hypotheses, they find that firms place relatively more weight on market performance measures than on accounting performance measures in compensation contracts for situations in which (i) the variance of the accounting performance measures is high relative to that of market performance measures, (ii) the firm is experiencing a high rate of growth, and (iii) the manager's holdings of the firm's stock is low. Garver and Garver (1995) document evidence that executives of growth firms derive a larger proportion of their total compensation from stock-based incentives than do executives of non-growth firms. They also find that the firm size is positively related to the weight of stock-based incentives.

2.4 Summary

Market performance measures and accounting performance measures are complementary measures of corporate performance valuable for incentive contracts. In an efficient market the stock price is the best measure of wealth of shareholders in the firm. Therefore, the market performance measure recommends itself as a prime measure of corporate performance to use in the CEO incentive contract. However, it has a defect

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as a performance measure for incentives in that the stock price is subject to market-wide movement, which is just noise from the standpoint of the measurement of CEO effort. One difficulty with the accounting performance measures as a basis of the CEO incentive contracting is that the CEO himself/herself is able to influence the information generation process responsible for the accounting performance measures, which are purported to measure his/her effort. To date, the noise of market performance measures relative to accounting performance measures, the growth opportunity of the firm, and the CEO's personal holdings of the firm's stocks were shown to be determinants of the relative use of these two sets of performance measures.

This study aims at taking the literature to the point where the role of controlling shareholders is carefully examined in the use of market and accounting performance measures. In Chapter 3, a model of the use of market and accounting performance measures for CEO incentives is developed. The model's prediction is tested in Chapter 4.

CHAPTER 3 MODEL

This chapter presents a model which attempts to elaborate a possible explanation for the relationship between the use of accounting and market performance measures in CEO incentives and the presence of a controlling shareholder. The exposition of the theory is as follows. An overview of the model is laid out in section 3.1. Then, a model of the use of market and accounting performance measures in CEO incentives is described and analyzed for a closely held firm and a widely held firm in section 3.2. The concluding remarks are given in section 3.3. All figures containing game trees are found at the end of the chapter.

3.1 A General Model of the Use of Market and Accounting Performance Measures in CEO Incentives

A general model of the use of performance measures in CEO incentives is presented here. This model of CEO compensation administration is based on Fama and Jensen (1983), who observe that in a large publicly traded firm monitors, who act for shareholders, would administer the CEO compensation as a part of the oversight of the top management. A simple and straightforward game analysis is applied to characterize the CEO incentive contract and the equilibrium behaviours of the players. There are three key players in this contracting game: the shareholders as property owners or principals, the CEO as an agent of the shareholders, and the monitor of the

CEO. Shareholders are represented by a monitor, who administers the CEO compensation. For a firm with a controlling shareholder, the role of the monitor of the CEO is played by the controlling shareholder. Similarly, the role of the monitor of the CEO is played by the board of directors for a widely held firm. The monitor is referred to as *he* and the CEO is referred to as *she* in the text.

Figure 1 describes a game model of the compensation process. The game is a dynamic seven period game. At t=0, the shareholders (SH) appoint a monitor. At t=1, the monitor contracts a CEO. The monitor designs the CEO compensation contract optimally for shareholders. Essentially, he has to make a binary choice with regard to performance measures. He can choose accounting performance measures (apm) or market performance measures (mpm) in incentives. At t=2, the CEO makes her effort decision. At t=3, nature (NATURE) moves. The action of nature is to assume a value for the cash flow which represents the events affecting the cash flows of the projects outside the control of the CEO. At t=4, the CEO receives signals called accounting performance measures. At the same time (t=4), on the other hand, the stock market values the firm. If accounting measures are chosen as performance measures for incentives, the CEO reports the accounting performance measures to the monitor at t=5. The CEO can report honestly(rh) or dishonestly(rd) at t=5. The monitor makes a verify/not verify (v/nv) decision at t=6. If market performance measures are chosen as performance measures, there is no relevant action taken in times 5 and 6. At t=7, the monitor makes the compensation payment to the CEO on the basis of the compensation

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contract drawn at $t=1$. The monitor is paid w_M by the firm. The U(i) is a payoff vector associated with the ith branch of the game tree.[1]

Let a(i) be a vector of actions associated with the ith branch in the game tree. The first, second, and third elements represent the monitor's action at time 1, the CEO's action at time 5, and the monitor's action at time 6, respectively. Then, a(1) is (apm, rd, v); a(2) is (apm, rd, nv); a(3) is (apm, rh, v); a(4) is (apm, rh, nv); a(5) is (mpm,-,-). The action vector (apm, rd, v) means that the monitor decides to use accounting performance measures in incentive contracts at $t=1$, the CEO reports accounting performance measures falsely at $t=5$, and the monitor verifies the report at $t=6$. The action vector (apm, rd, nv) means that the board decides to use accounting performance measures in incentive contracts at $t=1$, the CEO reports accounting performance measures falsely at $t=5$, and the monitor decides not to verify the claim at $t=6$. Similarly, (apm, rh, v) means that the board decides to use accounting performance measures in incentive contracts at $t=1$, the CEO reports the accounting performance measures honestly at $t=5$, and the monitor verifies the claim at $t=6$. The action vector (apm, rh, nv) means that the board decides to use accounting performance measures in incentive contracts at $t=1$, the CEO reports accounting performance measures honestly at $t=5$, and the monitor decides to verify the claim at $t=6$. Finally, the action vector

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[1] Payoffs to the shareholders, the monitor, and the CEO would describe the payoffs of the game completely. Therefore, a payoff vector can be constructed where the first, second, and third elements of the payoff vector represent the shareholders' payoff, the monitor's payoff, and the CEO's payoff, respectively.

(mpm,-,-), which is associated with the lowermost branch, indicates that if the monitor decides to use market performance measures at time 1, then the reporting and verification of accounting performance measures between the CEO and the monitor is unnecessary.

In order to analyze the game formally, we introduce the following assumptions:

Capital Structure

(CS1) The firm is financed exclusively by one class of common shares.

Production Technology

(PT1) The firm's cash flow is determined by the CEO's effort and the state of the economy called nature's move. The CEO contributes an amount "a" of effort and produces f(a) of cash flow. Nature produces a cash flow of "s". Thus, the cash flow from the operation is f(a) + s.

CEO Compensation Administration

(CCA1) Shareholders appoint a monitor, who administers CEO compensation. Administration of CEO compensation consists of designing an appropriate compensation package, verifying the accounting performance measures if necessary, and paying the CEO accordingly.

(CCA2) The monitor can choose either accounting performance measures or market performance measures as the basis of the incentive component of the CEO's compensation. The accounting performance measures are generated internally and measure the cash flows realized. The market performance measures are generated in the capital market and measure the cash flows of the firm.

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(CCA3) The monitor chooses performance measures optimally for shareholders.

(CCA4) When the firm has a controlling shareholder, he serves as the monitor of the CEO. When the firm is widely held, the board of directors serves as the monitor of the CEO.

(CCA5) The monitor's payoff consists of fixed compensation, w_M, and the cost of verification, C_V, and the market value of the monitor's investment in the firm. The cost of verification borne by the controlling shareholder is denoted by $C_{V,CS}$ and the cost of verification borne by the board of directors is denoted by $C_{V,BD}$.

(CCA6) The shareholders pay the monitor, w_M, and the CEO, w, out of personal funds.

(CCA7) If the monitor chooses accounting performance measures, the shareholders run the risk of expropriation by the CEO. The value of the potential expropriation by the CEO is Δ.

(CCA8) The firm incurs an administration cost, k, in using market performance measures for incentives.

Ownership Structure

(OS1) The controlling shareholder has δ_{CS} fraction of the common shares outstanding.

(OS2) The fractional ownership of the controlling shareholder, δ_{CS}, is large enough to give the controlling shareholder *de facto* control of the firm.

Information Environment

(IE1) The value of the CEO's potential expropriation, Δ, is greater than the verification cost borne by the monitor.

(IE2) The verification cost borne by controlling shareholders, $C_{V,CS}$ is less than the verification cost borne by the board of directors, $C_{V,BD}$.

Board of Directors

(BD1) It acts as a composite person.

(BD2) It is paid w_M for serving as monitor.

(BD3) The board of directors has δ_{BD} fraction of the common shares outstanding. The board of directors has small equity investment in the firm so that δ_{BD} is much less than δ_{CS}.

Preferences

(P1) All agents care only about the expected value of the payoffs.

Most of the assumptions are standard assumptions adopted primarily to simplify the analysis. The assumptions on the information environment, (IE1) and (IE2), are the critical ones. These assumptions are reasonable, since the controlling shareholder is likely to have cheap access to company information by virtue of its *de facto* control of the company (Assumption (OS2)). The other important assumptions are Assumptions (BD2) and (BD3), which are motivated by the fact that the directors of large public corporations in Canada receive essentially a fixed compensation and have very limited equity investment in the companies they serve as directors (Lendvay-Zwickl and Booth, 1989).

Assumption (PT1) can be interpreted as meaning that the CEO's effort level and the outcome of the random variable, which represents the events which are outside of the control of the CEO, are constrained to take only one value. This assumption renders the

analysis of the proposed compensation contracting model far more tractable. Binary choice is optimal when the covariance of the two measures is zero (Milgrom and Roberts, 1992). In general, two measures will complement each other in the spirit of Holmstrom's informativeness principle. Binary choice, however, makes the essential point of the analysis clear.

Assumption (CCA6) simplifies the analysis. Even if the pay is made out of the company's cash flow, the analysis would not be affected seriously, since the pay is typically much smaller than the company's cash flow, as was pointed out by Jackson and Lazear (1991). That the directors of the board act as one person (BD1) has been used extensively in the literature to keep the analysis manageable (Paul, 1992; Neave, 1994).

The analysis of the use of the performance measures for CEO incentives for a firm with a controlling shareholder is presented in subsection 3.2.1 and that for a widely held firm is presented in subsection 3.2.2. The difference in the choice of performance measures between the two governance structures is presented in subsection 3.2.3.

3.2 Analysis of the Model

3.2.1 Firms with a Controlling Shareholder

Figure 2 describes a game model of the compensation process for a firm with a controlling shareholder (CS). The controlling shareholder serves as the monitor of the CEO. The controlling shareholder can choose between the compensation contract where incentive is based on accounting performance measures(apm) and one where incentive is

based on market performance measures(mpm). The CEO works between times 2 and 3 and the state of economy reveals itself between times 3 and 4. If the incentive is to be based on accounting performance measures, the CEO reports the accounting performance measures to the controlling shareholder. At time 5, the CEO reports dishonestly with probability P_{rd} and reports honestly with probability P_{rh}. At time 6, the controlling shareholder verifies the claimed performance with probability P_v and does not verify the claimed performance with probability P_{nv}.[2] If the CEO makes a false claim and the controlling shareholder detects the false claim, the CEO is denied her pay.

The normal form of the subgame of the apm branch from time 5 to time 7 is

	v	nv
rd	$0, \delta_{CS}\ (f(a)\ +\ s)\ -\ C_{V,CS}$	$w\ +\ \Delta, \delta_{CS}\ (f(a)\ +\ s\ -\ \Delta)$
rh	$w, \delta_{CS}\ (f(a)\ +s)\ -\ C_{V,CS}$	$w, \delta_{CS}\ (f(a)\ +s)$

where the rows are the CEO's moves and the columns are the monitor's moves.

We look for a mixed strategy equilibrium.[3] Setting the expected payoff to the CEO playing rh and rd equal to each other, we have that $P_v w\ +\ P_{nv} w\ =\ P_v 0\ +\ P_{nv} (w+\Delta)$. Using the identity, $P_v + P_{nv}\ =\ 1$, we readily get the following results:

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[2] We have that $P_{rd} + P_{rh}\ =\ 1$ and $P_v + P_{nv}\ =\ 1$.

[3] If $C_{V,CS}$, which is the verification cost borne by the controlling shareholder, were zero, we would have a dominant strategy equilibrium. Since $C_{V,CS}$ is positive, we do not have a dominant strategy equilibrium.

$$P_{nv} = \frac{w}{w + \Delta},$$

$$P_{v} = \frac{\Delta}{w + \Delta}.$$

Note that we have the following comparative statics on the mixed equilibrium strategies:

$$\frac{\partial P_{nv}}{\partial \Delta} < 0,$$

$$\frac{\partial P_{v}}{\partial \Delta} > 0.$$

The comparative statics are as expected. They state that the probability that the controlling shareholder will not verify decreases and, therefore, the probability that the controlling shareholder will verify increases with an increasing amount of the expropriation by the CEO.

Similarly, setting the expected payoff to the controlling shareholder playing v and nv equal to each other, we have that

$P_{rh} [\delta_{CS}(f(a) + s) - C_{v,cs}] + P_{rd} [\delta_{CS}(f(a) + s) - C_{v,cs}] = P_{rh} [\delta_{CS}(f(a) + s)] + P_{rd} [\delta_{CS}(f(a) + s - \Delta)].$

Using the identity $P_{rd} + P_{rh} = 1$, we readily get the following results:

$$P_{rd} = \frac{C_{v,cs}}{\delta_{cs}\Delta},$$

$$P_{rh} = 1 - \frac{C_{v,cs}}{\delta_{cs}\Delta}.$$

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Note that the probability that the CEO will report dishonestly is given by the ratio of the verification cost incurred by the controlling shareholder, $C_{v,cs}$, to the controlling shareholder's share of loss from the CEO's expropriation, $\delta_{cs}\Delta$. Note also that, since $C_{v,cs}$, the verification cost which the controlling shareholder incurs, is much less than Δ, the value of the expropriation, by assumption (IE1) and since δ_{cs} is much larger than zero but less than one by assumption (OS2), P_{rd} is less than one and in fact close to zero. For the same reason, P_{rh} is less than one, but close to one. This means that, since the controlling shareholder's potential gain from verification or monitoring is potentially large, the CEO is likely to report honestly.

Note also that we have the following comparative statics for P_{rd}:

$$\frac{\partial P_{rd}}{\partial C_{v,cs}} > 0,$$
$$\frac{\partial P_{rd}}{\partial(\delta_{cs}\Delta)} < 0.$$

The comparative statics for P_{rd} imply that the probability of the CEO's reporting dishonestly increases as the controlling shareholder's cost of verification increases whereas the probability of the CEO's reporting dishonestly decreases as the controlling shareholder's share of loss from the CEO's expropriation increases.

We have the following related comparative statics for P_{rh}:

$$\frac{\partial P_{rh}}{\partial C_{v,cs}} < 0,$$

$$\frac{\partial P_{rh}}{\partial(\delta_{cs}\Delta)} > 0.$$

The comparative statics for P_{rh} indicate that the probability of the CEO's reporting honestly decreases as the controlling shareholder's cost of verification increases while the probability of the CEO's reporting honestly increases as the controlling shareholder's share of loss from the CEO's expropriation increases.

In view of the expected behaviours of the CEO and the monitor between times 5 to 7, we can examine the nature of the compensation contract at $t=1$. At $t=1$, the expected payoff to shareholders is $f(a) + s - P_{rd}P_{nv}\Delta$ if the monitor (the controlling shareholder) chooses accounting performance measures. This result can readily be obtained by noting that the payoff to shareholders is $f(a) + s - \Delta$ if the CEO reports dishonestly and the controlling shareholder does not verify while the payoff to shareholders is $f(a) + s$ otherwise. On the other hand, the expected payoff to shareholders is $f(a) + s - k$ if the controlling shareholder chooses market performance measures. Since the controlling shareholder chooses the performance measures in the best interest of shareholders according to the assumption (CCA3), we finally have the following condition under which the controlling shareholder chooses the accounting performance measures:

$$f(a) + s - P_{rd} P_{nv} \Delta > f(a) + s - k, \qquad (3.2.1.1)$$

where

$$P_{rd} = \frac{Cv.cs}{\delta_{cs} \Delta},$$

$$P_{nv} = \frac{w}{w + \Delta}.$$

The above relationship reduces to

$$P_{rd} P_{nv} \Delta < k. \qquad (3.2.1.2)$$

This implies that the controlling shareholder will choose accounting performance measures if the product of the joint probability of the CEO's reporting dishonestly and the controlling shareholder's not verifying, $P_{rd}P_{nv}$, and the value of the expropriation, Δ, is less than the administrative cost of using market performance measures, k.

3.2.2 Widely held Firms

Here, we describe a game model of the compensation process for a widely held firm. The board of directors administers the CEO compensation contract. The game tree is essentially identical to the previous one (Figure 3). The key difference is that the board of directors (BD) is the monitor here. At time 1, the board designs a compensation contract where it indicates which of the two performance measures, namely, accounting performance measures (apm) and market performance measures (mpm), will be used for

incentives. If the apm branch is followed, the CEO reports the accounting performance measures to the board at time 5. The CEO reports dishonestly with probability P'_{rd}, and reports honestly with probability P'_{rh}. At time 6 the board verifies the claimed performance with probability P'_v, and does not verify the claimed performance with probability P'_{nv}. If the CEO makes a false report and the board finds it out, she is denied her wage at time 7. The game ends.

Consider the top four branches. They are reached if the board uses the managerial claims of the accounting performance. The normal form of the subgame from $t=5$ to $t=7$ is as follows, where the rows are the CEO's moves and the columns are the board's moves:

	v	nv
rd	$0, \delta_{BD}(f(a)+s) - C_{V,BD}$	$w + \Delta, \delta_{BD}(f(a)+s-\Delta)$
rh	$w, \delta_{BD}(f(a)+s) - C_{V,BD}$	$w, \delta_{BD}(f(a)+s)$

Using a similar analysis as for firms with the controlling shareholder as monitor, we obtain the following condition under which the board of directors in a widely held firm would choose accounting performance measures:

$$f(a) + s - P'_{rd}P'_{nv}\Delta > f(a) + s - k, \qquad (3.2.2.1)$$

where

$$P_{rd}' = \frac{C_{V,BD}}{\delta_{BD}\Delta},$$

$$P_{nv}' = \frac{w}{w + \Delta}.$$

The above relationship reduces to

$$P_{rd}'P_{nv}'\Delta < k. \tag{3.2.2.2}$$

This implies that the board of directors will choose accounting performance measures if the product of the joint probability of the CEO reporting dishonestly and the probability of the board of directors' not verifying, $P_{rd}'P_{nv}'$, and the value of the expropriation, Δ, is less than the administrative cost of using market performance measures, k.

3.2.3 Comparative Statics and a Testable Hypothesis

When we compare equations (3.2.1.1) and (3.2.2.1) or equations (3.2.1.2) and (3.2.2.2), we note that, because we have assumed that $C_{V,CS}$ is less than $C_{V,BD}$ and δ_{CS} is greater than δ_{BD}, P_{rd} is strictly less than P_{rd}'. On the basis of this observation, we conclude that a firm with a controlling shareholder would choose accounting performance measures whenever a widely held firm does, all else being equal. The difficulty of using accounting performance measures as a basis of incentive payment in a widely held firm arises from the fact that the board of directors is less able to capture the benefit of

verification than a controlling shareholder would be and from the fact that their access to information is more costly.

This observation leads to the following relationship.

$$W_{APBI} (CS=1,\cdot) > W_{APBI} (BD=1,\cdot). \qquad (3.2.3.1)$$

where W_{APBI} is the weight of accounting-performance-measures-based incentives, CS is an indicator variable taking a value of 1 if the firm has a controlling shareholder and 0 otherwise and BD is an indicator variable taking a value of 1 if the firm is widely held and 0 otherwise.

Now, we want to obtain the comparative static relating the weight of the market-performance-measures-based incentives to the presence of a controlling shareholder. We can write the total compensation, TC_0, as FC+APBI+MPBI where FC stands for fixed compensation, APBI stands for accounting-performance-measures-based incentives, and MPBI stands for market-performance-measures-based incentives. If we normalise the components by TC_0, then we have the identity that says the sum of respective weights add up to one, that is, $1=W_{FC}+W_{APBI}+W_{MPBI}$ where W_{FC}, W_{APBI}, and W_{MPBI} represent the weight of fixed compensation, the weight of the accounting-performance-measures-based incentives, and the weight of the market-performance-measures-based incentives, respectively. If we keep the weight of the fixed compensation constant, we get from equation (3.2.3.1):

$$W_{MPBI} (CS=1,\cdot) < W_{MPBI} (BD=1,\cdot). \qquad\qquad (3.2.3.2)$$

where W_{MPBI} is the weight of market-performance-measures-based incentives.

Equation (3.2.3.2) leads to the following testable prediction:

H_1: A firm with a controlling shareholder places less weight on market-performance-measures-based incentives than does a widely held firm, *ceteris paribus*.

3.3 Conclusion

The controlling shareholder is a natural monitor of the CEO for a closely held firm as the board of directors is for a widely held firm. They, however, have different economic incentives for choosing CEO performance measures. The controlling shareholder is likely to have cheaper access to company information than anyone else, including a board of directors. Furthermore, the controlling shareholder is willing to provide verification, since he/she is able to internalize the benefit of verification whereas the board of directors in a widely held firm, which tends to be paid a fixed fee and has little or no equity investment in the firm, has limited incentive to incur the verification cost of accounting performance measures. This leads to the result that a closely held firm will therefore show greater willingness to use accounting performance measures as complementary information on the CEO effort. This argument provides an

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attractive explanation for the cross-sectional variation in the relative importance of market-performance-measures-based incentives and accounting-performance-measures-based incentives for chief executives in large corporations.

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Figure 1   Extensive Form Game of CEO Incentive Contracting Where Shareholders Have a Monitor, Who Administers CEO Compensation
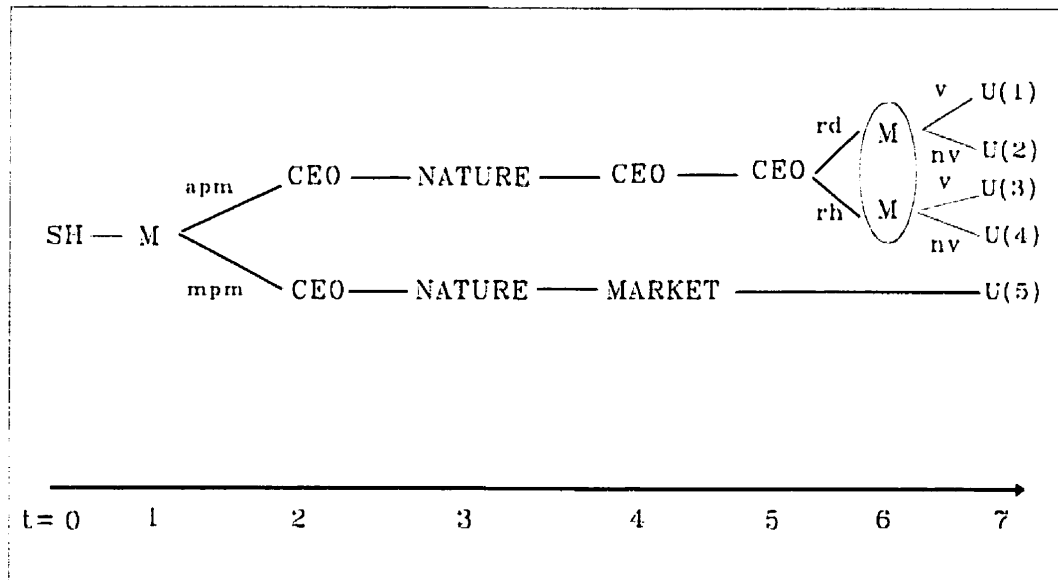
Figure 2 Extensive Form Game of CEO Incentive Contracting for a Firm with a Controlling Shareholder
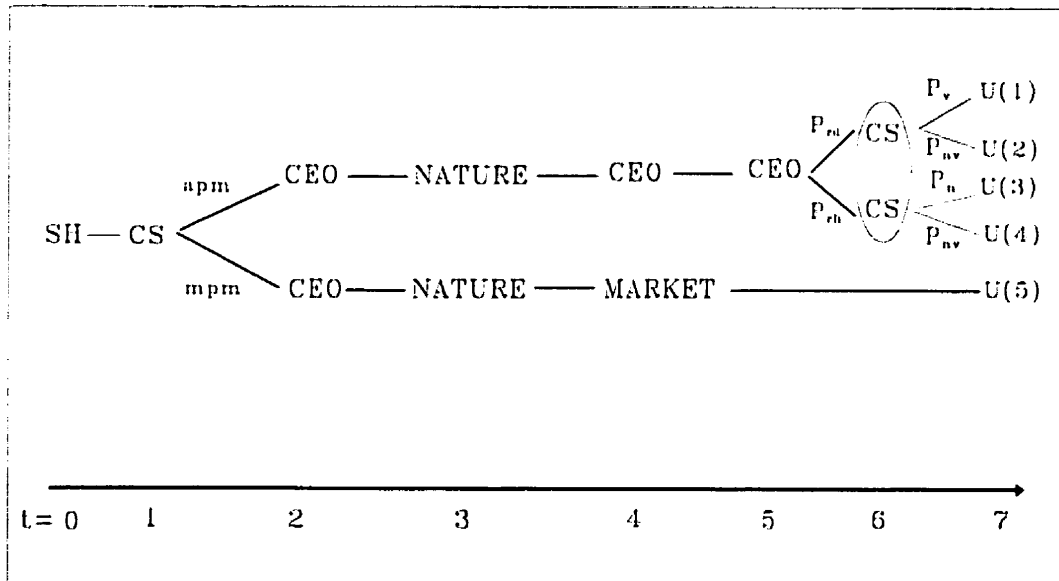
Figure 3 Extensive Form Game of CEO Incentive Contracting for a Widely held

Firm
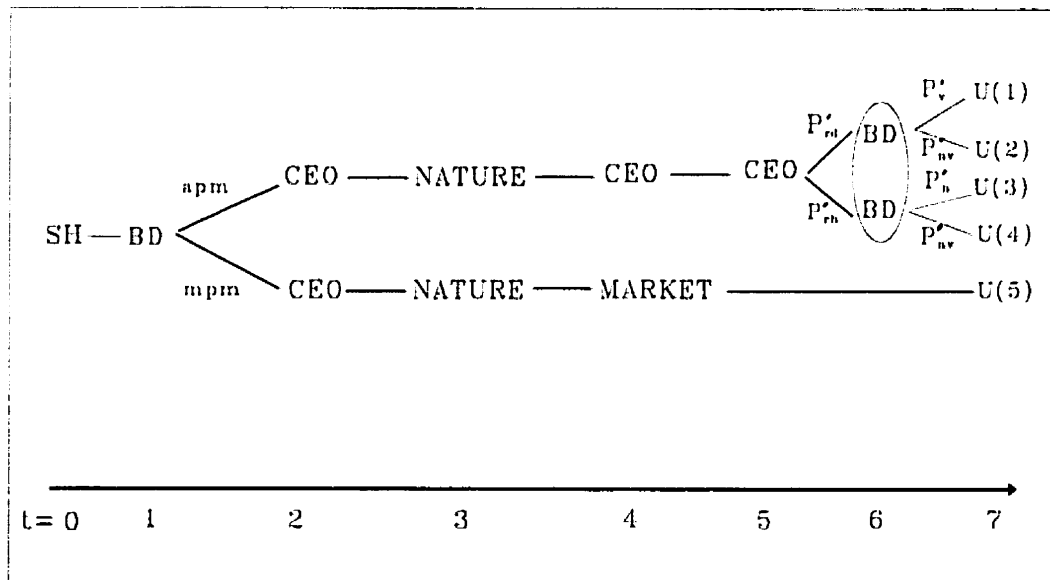
CHAPTER 4 ECONOMETRIC MODEL AND EMPIRICAL TEST

A model of the use of performance measures in CEO incentives was presented in Chapter 3. In section 4.1, econometric models are developed to test the proposition from the model and the proxy selection is discussed. Data, results, and discussion follow in sections 4.2 through 4.4.

4.1 Econometric Model

4.1.1 Regression Models

We propose to test the following hypothesis derived from the model of CEO compensation contracting presented in Chapter 3:

H_1: A closely held firm places less weight on market-performance-measures-based incentives than does a widely held firm, *ceteris paribus*.

Equation (3.2.3.2) implies that W_{MPBI}, the weight of market-performance-based incentives in the CEO's total compensation, is a function of the monitor type. From previous researches (Lambert and Larcker, 1987; Garver and Garver, 1995), we expect that, in addition to the monitor-type variables, CEO equity ownership, firm size, relative noise of the performance measures, and growth opportunity of the firm might influence the weight of market-performance-measures-based incentives in the CEO's total compensation.

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The model therefore becomes:

$$W_{MPBI} = f(CS, OTHER, CEOSTOCK, SIZE, NOISE, GROWTH),$$

where

CS = closely held firm where the monitor is the controlling shareholder,

$OTHER$ = firm which is neither closely held nor widely held,

$CEOSTOCK$ = CEO's investment in his/her firm's common stocks,

$SIZE$ = size of the firm,

$NOISE$ = noise of the market performance measures relative to the accounting

performance measures, and

$GROWTH$ = growth opportunities of the firm.

In the absence of specific predictions from theory on the functional form of the regression, the following linear functional form is assumed:

$$W_{MPBI,i} = b_0 + b_1 CS_i + b_2 OTHER_i + b_3 CEOSTOCK_i + b_4 SIZE_i + b_5 NOISE_i + b_6 GROWTH_i + e_i,$$

where the subscript i stands for firm i, and e_i is the error term for firm i.

In the foregoing model, the base case is the only other category, namely, the widely held firms. Thus, the significantly negative coefficient for CS would be direct evidence that

the H_1 holds and an insignificant coefficient for CS would retain the hypothesis that there is no difference between the closely held firms and the widely held firms.

We adopt a Tobit specification (Davidson and MacKinnon, 1993), since the dependent variable appears to be censored at zero.[4] Using proxies for the variables as proposed in section 4.1.2, the model becomes:

$$WSOG^*_i = b_0 + b_1\ CS20_i + b_2\ OTHER_i + b_3\ LSTK_i + b_4\ LTA_i + b_5\ SDTR/SDROE_i + b_6\ MKE/BKE_i + e_i,$$

where

$e_i \sim NID(0, \sigma^2)$,

$WSOG_i = WSOG^*_i$ if $WSOG^*_i > 0$; $WSOG_i = 0$ otherwise,

$WSOG^* = $ latent variable of WSOG which is observed only when it is positive and for which zero is observed otherwise,

$WSOG = $ average weight of the stock option grant to the total compensation over the 1986-1989 period,

$CS20 = $ indicator variable taking the value of 1 if there was a non-financial-institution shareholder who maintained 20% or more of the common stocks of the firm for the 1986-1989 period and takes the value of 0 otherwise,

$OTHER = $ indicator variable taking the value of 1 for firms, which are neither firms with controlling shareholders nor are widely held and taking the value of 0 otherwise;

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[4] Three of twenty-six observations have zero values for WSOG.

firms with a shareholder having 20% or more of the common stocks for the 1986-1989 period were considered as firms with a controlling shareholder and firms with no shareholder having 10% or more of the common stocks during the 1986-1989 period were considered as closely held firms,

LSTK = natural log of the CEO's average investment in the firm's common stocks over the 1986-1989 period,

LTA = natural log of average total assets over the 1986-1989 period,

SDTR/SDROE = ratio of standard deviation of total return on the stock to standard deviation of return on equity of the firm over the 1985-1989 period, and

MKE/BKE = average ratio of market value of equity to book value of equity over the 1986-1989 period.

We re-estimated the model using alternative proxies for the proposed variables in order to study the sensitivity of the result of the model estimation to proxy selection. We conducted omitted variables tests using a few additional variables, which were not in the model, but might affect the weight of the price-based incentives. While we feel that the four-year period is reasonable, given the irregularity in option granting patterns, we tested the regression model for each of two subperiods, 1986-1987 and 1988-1989, to see if the result holds also for two-year periods.

4.1.2 Proxy Selection

Weight of the Market-Performance-Based Incentives

The weight of the market-performance-based incentives is proxied by the average ratio of the dollar value of the stock option granted to the sum of the salary, bonus, and the present value of the stock option granted (Mehran, 1992; Garver and Garver, 1995). The valuation of the stock option grant is based on Noreen and Wolfson (1981) and is explained in detail in Appendix 4F.

Ownership Structure of the Firm

Identification of the controlling shareholders is possibly a controversial aspect of the empirical test of the theory proposed. A number of classifications have been reported in the literature; all are essentially based on the ownership concentration of voting stocks.[5] For this research, controlling shareholders have been identified using primarily the ownership of the common stocks over the 1986-1989 period.[6]

Gillen (1992, p. 201-202) defines *control person* as a person who holds a sufficient number of the voting rights attached to a firm's voting securities to materially affect the control of the firm. Citing various provincial securities acts, he holds that holding more than 20% of the voting rights is usually deemed, in the absence of

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[5] The work by Herman (1985) is an exception to the rule in that he identified controlling shareholders explicitly on the basis of not only the ownership of the voting stocks but also other relevant information collected from a wide variety of sources. Of course, the main flaw of Herman's approach is that it is subjective and not reproducible.

[6] Common stocks of public firms in Canada can have different voting rights. This can present some complication in applying a simple classification scheme in that the monetary incentive and the voting rights of shareholders are not perfectly aligned in the presence of high-vote and low-vote stocks. However, all sample firms in our study had only one class of common stocks.

evidence to the contrary, to be sufficient to materially affect the control of the firm. Following Gillen, a simple decision criterion was developed to identify controlling shareholders. *A firm, which is not a financial institution, or an individual owning 20% or more of the common stocks for the 1986-1989 period is considered to be a controlling shareholder. A firm is considered to be widely held if it does not have a large shareholder, where a large shareholder is defined as one with 10% or more of the voting stocks.* Appendix 4A lists the largest shareholders of the sample firms from 1986 to 1989 and identifies the likely controlling shareholders following the proposed proxy.

The critical level at which a large shareholder becomes a controlling shareholder is important for the identification of the controlling shareholder. Unfortunately the critical level of voting power one needs to secure corporate control can depend on many factors, such as the position of the large shareholder, the size of the firm, the number of common shareholders. Other indicator variables using different cutoffs of ownership concentration were used as well to ensure that the result of the estimation is not dependent on the precise level of ownership concentration used to identify controlling shareholders.

Salamon and Smith (1979) classified firms as ownership-controlled or closely held if one party (a) owned 10% or more of the voting stocks and had board membership or (b) had 20% or more of the voting stocks. They classified firms as management-controlled or widely held if no party controlled more than 5% of the stocks.

Representation on the board of directors was taken to be evidence of active control. We developed an alternative proxy based on Salamon and Smith classification criteria. *Firms are classified as closely held if one party owned 10% or more of the voting shares of the firm and had a board membership, or had 20% or more of the voting shares and as widely held otherwise.* The 10% threshold is adopted rather than 5% threshold as used by Salamon and Smith because publicly traded firms in Canada are required to report blocks of stocks greater than or equal to 10% of the total stocks outstanding.[7]

Morck et al. (1988) separate firms into 0%-5%, 5%-25%, and 25%-100% in terms of the ownership concentration. Similarly, Klassen (1994) divides firms into 0%-5%, 5%-20%, 20%-50%, and 50%-100% in terms of the ownership concentration. Klassen indicates that the separating values he uses are based on general accounting conventions of minimal ownership, material portfolio investment, significant influence, and control. *Based on these criteria, we adopt a set of proxies which divides firms into 0-10%, 10%-50%, and 50%-100% brackets in terms of the combined ownership of large shareholders.* The separating values, 10% and 50%, are based on the definition of "insiders" in Canadian security law and on majority control, respectively.

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[7] Canadian security law uses 10% ownership as the criterion for insider status (Gillen, 1992, pp. 162-163).

CEO Equity Ownership

Lambert and Larcker (1987) report that firms place more weight on market performance measures than on accounting performance measures when the value of the manager's holdings of the firm's stock is low. Lambert and Larcker (1987) use three proxies to measure the amount of CEO's wealth tied to stock price: (a) the market value of the CEO's shareholding in the firm, (b) the ratio of the market value of the common stocks owned by the CEO to cash compensation, and (c) percentage of the firm owned by the CEO. *For this study, the amount of the CEO's wealth tied to stock price is proxied by the natural log of the average market value of the CEO's investment in the firm's equity over the 1986-1989 period.*[8] The ratio of the market value of the common stocks owned by the CEO to the annual total compensation is used as an alternative proxy in order to examine the effect of the choice of proxy. The percentage of the CEO's ownership of the firm is not used since the CEO's ownership of the firm is typically very small.

Size

The weight of market-performance-based incentives would be negatively related to firm size if the CEOs of very large firms are less able to influence stock price since they tend to be farther removed from the actual operations of the firm than their counterparts in smaller firms. Garver and Garver (1995), however, document a positive

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[8] The natural log of the market value of the CEO's stockholding is used as the proxy for the CEO's equity investment, since some CEOs held a significant amount of the firm's stocks while most had minimal equity investment in the firm (section 4.2.2).

relationship between firm size and the weight of stock-based compensation. They indicate that a possible explanation of this finding may be that the larger firms can spread out the fixed cost of administering the stock option plan more effectively than smaller firms. An alternative explanation for this phenomenon may be that in very large firms middle managers such as divisional presidents may have substantial price-based incentives in their pay since they tend to make important operating decisions such as selecting capital investment projects and the CEOs of such firms may have to have a similar proportion of their pay derived from the market performance in order to maintain the overall incentive structure of executives within the firm. *The size of the firm is measured by the natural log of the average book value of the total assets of the firm over the 1986-1989 period.* The natural log of the average sales of the firm is used as an alternative proxy of the firm size.

Noise

Lambert and Larcker (1987) hypothesized on the basis of the principal–agent theory that the noise in the market performance as a measure of the CEO's effort is inversely related to the weight of the stock-based compensation. They documented a negative relationship between the noise of the stock performance measure relative to the noise of accounting performance measures and the weight of the stock-based compensation. *The ratio of the standard deviation of market return to the standard deviation of return on equity measured over the 1985-1989 period is used as the proxy for*

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noise of market performance measures relative to that of accounting performance measures.[9]

Growth Opportunity

Lambert and Larcker (1987), Clinch (1991), Smith and Watts (1992), Garver and Garver (1995) found that high-growth firms are more likely to use stock-based compensation than low-growth firms. *The average ratio of the market value of equity to the book value of equity over the 1986-1989 period is used as the proxy for the growth opportunity.* The ratio of research and development to sales is used as an alternative proxy for the growth opportunity for sensitivity analysis.

4.2 Sample and Summary Statistics

4.2.1 Sample

Data were collected over the 1986-1989 period. We decided to collect data up to 1989 because the legislative changes introduced after 1989 altered the information environment of executive compensation. Prior to 1990, Canadian firms interlisted in Canadian and U.S. stock exchanges had to report detailed compensation information of the firm's five most highly paid executives under U.S. regulations, while Canadian firms listed only in Canadian stock exchanges reported only aggregated compensation

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[9] The standard deviation based on sixty observations of monthly rate of return on stock for the 1985-1989 period was annualized to give the standard deviation of market performance measures. The standard deviation of accounting performance measures was based on five annual observations of return on equity for the 1985-1989 period.

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information of the firm's executives under Canadian regulations. After Multi Jurisdiction Disclosure System was implemented in 1990, the interlisted Canadian firms could choose to continue reporting under U.S. regulations or to report under Canadian regulations. Subsequently, many of the interlisted Canadian firms filed executive compensation information following Canadian requirements, which had fewer onerous disclosure requirements.[10] In 1993, the Ontario government introduced an amendment to the Ontario Securities Act whereby an issuer firm is required to report detailed compensation information of its CEO and four most highly paid executives. Thus, up to 1989 we have a CEO compensation disclosure environment characterized by limited public information. Then, we have a period of essentially no public information on CEO compensation between 1990 and 1993. After 1993, we have a period of detailed CEO compensation information in Canada.

The variables discussed in the previous section were averaged over the 1986-1989 period. Averaging over four years was necessary since, while some firms in the sample granted CEO stock options once every year or once every two years, others appeared to grant CEO stock options on an irregular interval.[11] Titman and Wessels (1988) suggest that averaging the variables over several years reduces the measurement error due to random year-to-year fluctuation in the variables.

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[10] We found this by going through the interlisted Canadian firms' proxy statements.

[11] Mehran (1992) notes the same problem and calculates two-year average stock-based incentives in the total compensation. However, since some firms showed a very irregular pattern in granting stock options, we felt that the four-year average is a better measure than the two-year average.

The population of firms studied is large Canadian public corporations. We used

three sample selection criteria: (i) the firm had to be one of the Canadian Business 500

in each of the 1986-1989 period; (ii) a detailed record of the CEO compensation in

each of the 1986-1989 period had to be available in the public domain; (iii) the CEO is

a professional CEO and not an owner/manager. The sample thus constructed consisted

of twenty-six Canadian public firms interlisted in the U.S. and Canadian stock

exchanges. The number of interlisted firms as reported in TSE Review was 103 in

1986, 111 in 1987, 142 in 1988, and 140 in 1989. The number of interlisted Canadian

firms that were in *Canadian Business 500* in each of the 1986-1989 period was only

forty-five. Of these firms, eight were eliminated since they reported the top

executives' compensation in an aggregated format in all or part of the 1986-1989

period. Of the remaining thirty-seven firms, eleven were eliminated because their

controlling shareholder was also serving as CEO.[12] The final sample size was twenty-

six firms. The limiting factor for the sample size was the availability of the CEO

compensation data. Prior to 1993, Canadian security regulation did not require firms

listed with Canadian stock exchanges to disclose detailed individual executive

compensation information.

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[12] Firms whose controlling shareholder serves as CEO are excluded from the study, since the economics of such a firm is likely to be fundamentally different from that for firms whose CEOs are genuinely hired by the firm. In the former, it is difficult to postulate a monitor of the CEO and the incentive problem is minimal; in the latter, there is an arms-length relationship between the monitor and the CEO and the incentive problem is critical.

The sample firms along with their largest shareholders and likely controlling shareholders for 1986-1989 are shown in Appendix 4A. The names of sample firms along with their large shareholders and CEOs for 1986-1989 are in Appendices 4B-4F. Market data are based on the University of Laval-TSE database. The accounting data are from Compustat; the stock ownership and compensation data are from the corporate proxy documents.

4.2.2 Sample Characteristics

Summary statistics of the proxies used for the evaluation of the proposed econometric model are given in Table 1. Annual summary statistics of the proxies used for the study are listed in Appendix 4G.

Compensation Structure

The stock option plan was the dominant market-performance-measures-based CEO incentive in use for the sample firms. All firms in the sample had executive stock option plans. Unlike Mehran's U.S. sample (1993), the restricted stock grant, performance shares plan, and the assisted stock purchases plan were virtually absent for the sample firms. Other Canadian CEO compensation studies show that the stock grant is infrequently used in Canada (Sibson & Company, 1988-1991). Some firms granted options every year while others granted options on irregular intervals. The stock options grant was usually given in tandem with the associated stock appreciation rights (SARs) in Canada.

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Table 1 shows summary statistics of percentages of CEOs' total compensation in stock options over the 1986-1989 period for the 26 sample firms. Stock option, which is essentially all of the equity-based compensation for the sample, accounts for 18.5% over the 1986-1989 period whereas the equity-based compensation accounts for 22% in Mehran's CEO compensation data over the 1979-1980 period for 124 randomly selected manufacturing U.S. firms. Mehran (1992) reports that percentage of the newly granted stock options for CEOs for his sample firms was only 5.8% whereas the corresponding figure is 18.5% in our study. This difference appears to be due to the fact that the CEOs of the sample firms in Mehran's study received a mix of equity-based incentives while the CEOs of the sample firms in our study received only stock options as equity-based incentives during the sample period.

Ownership Structure

The largest shareholders and the likely controlling shareholders of the sample firms are presented in Appendix 4A. The large shareholders and the largest shareholders of the sample firms are presented in Appendixes 4B-4F (Large shareholders are defined as ones having more than 10% of the common stocks). As expected, a large proportion of the sample firms have a high degree of ownership concentration. For the sample firms the average combined ownership of large shareholders is 35.3% showing a high ownership concentration (Appendix 4G (A)).

The controlling shareholders are identified using the requirement of continuous ownership of 20% or more of the common stocks for the 1986-1989 period by a non-

financial institutional shareholder and are listed in Appendix 4A. Of the twenty six sample firms, fifteen firms have controlling shareholders. Of the other eleven firms eight are widely held, i.e., none has more than 10% of common stocks. Three firms have either shareholders having more than 10% but less than 20% of the common stocks or have financial institutions as large shareholders. These three firms are considered as other firms. Thus, the percentage of the firms with controlling shareholders is 58%, that for the widely held firms is 31%, and that for others is 12%.

Average CEO's investment in the firm's common stocks over the 1986-1989 period ranges from $3,352 to $40,024,406 (Appendix 4G(C)). The CEOs of the sample firms invested about $673,336 on average. Half of the CEOs in the sample had equity investment in the firms they managed worth less than 75% of their annual total compensation (Appendix 4G(D)).

Firm Characteristics

The mean and median book values of assets owned by the sample firms are $2.592 billion and $2.253 billion, respectively (Table 1 and Appendix 4G(E)). Thus, the sample firms are typically large. This is a result of two of the sampling criteria used, namely, that the sample firms be Canadian Business 500 firms for the 1986-1989 period and that the firms be interlisted in both US and Canadian stock exchanges. In comparison, the sample firms in Garver and Garver's study (1995) have a median asset value of $5.668 billion in U.S. dollars. The mean and median ratios of the market value of equities to the book value of equities are 1.75 and 1.53 (Table 1 and Appendix

4G(J)). The market-to-book value ratio of equities ranges from 1.04 to 3.57 indicating that the sample firms range from limited to high growth opportunities

4.3. Empirical Results

4.3.1 Pearson Correlation Coefficients

The matrix of correlation coefficients of the proposed explanatory variables is reported in Table 2. The degree of correlation between pairs of explanatory variables ranges from 0.006 to 0.422. It is concluded that multicollinearity is present but not severe enough to warrant remedial procedures.

4.3.2 Regression Results

The main results of this thesis comprising the estimated regression coefficients of the corresponding explanatory variables appear in Table 3. The Tobit model is adopted since three out of twenty-six observations of the dependent variable have zero values indicating that the dependent variable is likely to be censored at zero (Davidson and MacKinnon, 1993). The coefficient of the indicator variable for the presence of a controlling interest (CS20) is negative and significant at all conventional levels of significance supporting the prediction of the controlling shareholder monitoring model of the incentive design. LTA and MKE/BKE, the proxies for the firm size and the growth opportunity, are significant at conventional levels of significance while LSTK, the proxy for the CEO equity ownership, and SDTR/SDROE, the proxy for the noise

of market-performance measures relative to the noise of accounting performance measures, are not.

The normality and the heteroscedasticity of the errors of the Tobit model were checked using the estimated errors, which were obtained as the difference between the observed values and the predicted values.[13] The null hypothesis of the normality of the errors is not rejected at all conventional levels of significance using Jarque-Bera asymptotic Lagrange Multiplier normality test where $\chi^2(d.f.=2) = 0.5912$. In order to check heteroscedasticity, the estimated errors, the absolute values of the estimated errors, and the squares of the estimated errors were plotted against and regressed on the predicted values of the dependent variable, the squares of the predicted values of the dependent variable, the log of the squares of the predicted values of the dependent variable, and all of the explanatory variables, respectively. From the inspection of the scatter plots and the regression analyses, it is concluded that some heteroscedasticity is present but not severe enough to warrant remedial procedures.

A positive and significant relationship between MKE/BKE, a proxy for the growth opportunity, and WSOG, the weight of the stock option grant, is observed. This result is consistent with findings reported in a number of U.S. studies (Lambert and Larcker, 1987; Clinch, 1991; Smith and Watts, 1992; Garver and Garver, 1995).

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[13] For the analysis to be absolutely rigorous, the estimated errors would have to be obtained as the difference between the values of the latent variable and the predicted values. Since the values of the latent variable are not available for three zero observations, the observed values were used as a close approximation for the purpose of constructing the estimated errors.

Our study based on Canadian data supports Smith and Watt's hypothesis (1992) that growth firms will prefer stock-based incentives to accounting-based incentives since stock price best reflects the effect of managerial action on investment opportunities.

The relationship between the CEO's holdings in the firm's stocks measured by the natural log of the present value of the stocks owned by the CEO (LSTK) and the weight of the stock option grant in the total compensation (WSOG) is not significant. Similarly, when the ratio of the CEO's equity investment in the firm to the annual total compensation is used as an alternative proxy for the CEO equity investment variable for the model in Table 3, the regression coefficient is negative but not significant. Our data do not give support to the hypothesis that CEO's stock ownership substitutes for the stock option grant while Lambert and Larcker (1987) document evidence in support of this hypothesis.

The relationship between firm size measured by the natural log of the total assets (LTA) and the weight of the stock option in the total compensation (WSOG) is negative and statistically significant at conventional levels of significance. The direction of the relationship observed in this study is opposite to the result reported by Garver and Garver (1995). An explanation for the negative relationship may be that the CEOs of our sample firms may have perceived greater difficulty in influencing the stock price in that they were far removed from the actual operating information and decision-making.

A number of control indicator variables using various cut-offs of ownership concentration were used in previous studies (Salamon and Smith, 1979; Morck, Vishney, and Schleifer, 1988; Klassen, 1995). Regression estimation was conducted using CONTROL, the proxy based on ownership control proxy proposed by Salamon and Smith (1979) and the result is reported in Table 4. The coefficient of the indicator variable for firms with controlling shareholders is shown to be negative and significant at conventional levels of significance.

Table 5 reports the estimation result using a continuous piece-wise linear measure for ownership concentration, which is obtained as combined ownership of voting shares by the large shareholders. Using 10% and 50% as cut-off points for wide distribution, minority control, and majority control, we find that about a 2% to 3% decrease in the value of stock option grant in the total compensation is associated with a 10% increase in the large shareholders' percentage ownership of the common stocks for firms with minority control. That is, between 10% and 50% of ownership concentration, the weight of market-performance-measures-based CEO incentives increases with the ownership concentration. However, the importance of market-based incentives appears to decline beyond 50% of ownership concentration. Thus, we find preliminary evidence of a piece-wise linear relationship between the weight of market-performance-measures-based CEO incentives and the ownership concentration; the weight of market-performance-measures-based CEO incentives decreases between 10% and 50% and then increases again after 50%. This observation along with the result from the main

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model indicates that the firms with controlling shareholders use less market-based incentives than do widely held firms and that firms with minority control use less market-based incentives than firms with majority control.

Cross-sectional tests for the 1986-1987 and 1988-1989 subperiods are conducted where two-year averages for the variables are used as in Mehran (1992). Tables 6 and 7 show that the coefficient of the presence of the controlling shareholder is negative and significant over the two subperiods and is comparable to the result based on four-year averages. The regression model of Table 3 was estimated again with the independent variables averaged over the 1985-1988 period since there might be a time lag between the proposed influencing factors and their effect on the dependent variable. The main result of the regression estimation using lagged variables is essentially the same as in Table 3.

There is no indication in the proxy documents and the available option plan documents of the sample firms that the firms reimburse to the optionees the dividends, which were paid out prior to the exercise of the option. In view of this, the present value of expected future dividend payments is subtracted from the Black-Scholes' option estimation as shown in Appendix 4E following Mehran (1993). However, if dividends are paid to the optionees, then the valuation of the executive stock option should not include the dividend adjustment. When dividend yield is ignored in the valuation of the stock option grant as is done in Garver and Garver (1995), the test results are essentially the same as before.

An executive stock option is really a warrant. However, dilution due to the CEO's stock option grant is minor. When the CEO's option is valued using the warrant valuation formula by Noreen and Wolfson (1981), the result is essentially the same. There are a number of features unique to the CEO stock option such as the vesting period and information asymmetry between the CEO and the market. Clearly, the Black and Scholes formula is an approximation. An alternative valuation method, which is allowed by the SEC and used in Garver and Garver's study (1995), calculates the present value of the stock option assuming 5% to 10% annual stock price appreciation over the full term of the option grant and discounting the estimated future gain back to the present using the discount rate determined from the Capital Asset Pricing Model. This approach can introduce more estimation error than the Black-Scholes option valuation approach. Despite some problems as a CEO stock option valuation tool, the Black-Scholes option pricing formula has been the preferred method in research and practice and this is the method used in this study.

The model is re-estimated using the natural log of the average sales of the firm as an alternative proxy of the firm size and the ratio of research and development to sales as an alternative proxy for the growth opportunity, respectively. The main features of the study are unaffected. We conclude that our econometric model estimation result is robust with respect to these alternative proxies for the size and growth opportunity variables.

We checked if operating leverage, financial leverage, and non-bonus tax shields are omitted variables in the model. The result of the omitted variables analysis is

reported in Table 8. We constructed three unrestricted models, each of which incorporates one of the possible omitted variables and compared them to the restricted model, which is the main model presented in Table 3, using the loglikelihood ratio test. None of the variables investigated was shown to be additionally informative.

In the unrestricted model 1, we tested if the operating risk of the firm ought to be included in the model. Operating risk of the firm may be negatively related to the relative weight of the stock option in the CEO compensation since the risk-seeking behaviour induced by the stock option may not be desirable for firms with high operating risk. Standard deviation of percentage changes in the operating income measured over the 1980-1989 period (SDEBIT) is used as a proxy for the business risk of the firm. The likelihood ratio test statistic for the unrestricted model against the restricted model is 1.672. The inclusion of the operating leverage in the model is rejected at any conventional level of significance. The likelihood ratio test thus shows that operating risk is not additionally informative about the structure of the incentives.

We tested for the inclusion of the financial risk of the firm using the unrestricted model 2 shown in Table 8. The financial risk of the firm may be negatively related to the weight of the stock option grant since risk-seeking behaviour induced by the stock option may be undesirable for firms with high financial leverage. The average ratio of the book value of the long-term debt to the book value of the total assets over the 1986-1989 period (LTD/TA) is employed as the proxy for the financial leverage. The likelihood ratio test statistic for the unrestricted model with financial leverage to the restricted model

is 0.046 and the inclusion of financial leverage in the model is rejected at all conventional levels of significance.

We tested for the inclusion of non-bonus tax shields using the unrestricted model 3 shown in Table 8. The availability of non-bonus tax shields may discourage the use of bonuses, which are tax-deductible expenses, and encourage the use of stock-based incentives.[14] To the extent that non-bonus tax shields such as depreciation, interest on debt, loss carryforwards, and investment tax credits are substitutes for bonuses for tax planning purposes, the usefulness of the bonus would be inversely related to the amount of the non-bonus tax shields. This implies that the amount of non-bonus tax shields may be inversely related to the use of a bonus and positively related to the use of stock-based incentives. Similar to Bradley, Jarrel, and Kim's (1984) proxy for the non-debt tax shield, the proxy for non-bonus tax shield is obtained as the average ratio of the sum of depreciation charges, interest expenses, loss carryforwards, and investment tax credits to earnings before depreciation, interest expenses, and taxes over the 1986-1989 period (NBTS/EBDIT). The likelihood ratio test statistic for the unrestricted model against the restricted model is 0.050. The inclusion of non-bonus tax shields in the model is rejected at all conventional levels of significance.

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[14] We want to thank Dan Thornton of Queen's University for pointing this out to us.

4.4 Discussion and Conclusion

This study provides empirical evidence that widely held firms rely more on market performance measures for CEO incentive payments than do closely held firms. This result is consistent with the controlling shareholder monitoring model developed in this study. The coefficients of the size and the growth variables are significant. The coefficient of the growth variable is shown to have the same sign as in the comparable U.S. studies.

The negative relationship between the weight of the stock option grant and the proxy for the presence of controlling interest is consistent with other hypotheses. This result is consistent with the explanation that the controlling shareholder would be averse to diluting his/her ownership interest in the firm which accompanies the stock option grant. However, the dilution of the voting control that the controlling shareholders experience due to the CEO stock option grant was typically very small in the sample firms. Accordingly, the concern about the dilution of the controlling interest on the part of the controlling shareholders must have been very limited.

A bonus gives immediate tax deduction. Thus, a bonus is a valuable source of tax shields. Since the capital market in general knows less about the firm's future profitability than the management, the reduction in reported earnings can send a negative signal about the firm's future profitability. The management of a widely held firm may worry about the consequence of reduced reported earnings which result from taking the full advantage of tax shields. For example, the firm may have to bear real

cost such as an increase in financing cost. On the other hand, the controlling shareholder can take a longer term view of a potential temporary negative reaction of the stock market to the reduced reported earnings, which result from making use of available tax shields. The empirical evidence that widely held firms rely more on the market performance measures for CEO incentive payments than do closely held firms is thus consistent with the explanation that the controlling shareholder would value a bonus as a tax shield more than the managements of widely held firms, who would have to trade off tax benefits of a bonus against costs associated with reduction in reported earnings.[15]

However, in practice, stock options can be cancelled and paid out as bonus in an amount equal to the difference between the current stock price and the strike price of the stock option grant (Mawani, 1994). Thus, the option can be used as a source of tax deduction as well. To the extent that the stock option can be cancelled and paid out as a bonus, incentive for the controlling shareholders for the use of bonuses is weakened. Since Canadian firms can cancel a stock option, this tax-based explanation for the observed relationship is weak. Furthermore, the amount of tax shields from the CEO's bonus compared to other tax shields such as depreciation and interest expenses is minimal. The tax-based explanation of the negative correlation between the weight

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[15] We thank Dan Thornton of Queen's University for alerting us to this possibility of tax-based explanation.

of the stock option grant and the indicator variable for the controlling shareholder alluded to above appears to have limited relevance.

The expropriation of the controlling shareholders against the outside shareholders may explain why the closely held firms appear to place less weight on price-based incentives than do the widely held firms.[16] In closely held firms, the controlling shareholders can expropriate the outside shareholders and this can cause the devaluation of stock price. Knowing this, the CEOs of firms with controlling shareholders may not want to tie their incentives to stock performance measures. However, while this explanation is plausible, the extent of the actual expropriation of the outside shareholders by the controlling shareholders in the Canadian context is yet to be documented and an excessive expropriation is doubtful given the supervision of regulatory bodies and possible penalties the offending controlling shareholders would face for wrong-doing.

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[16] We thank Paul Halpern of the University of Toronto for pointing out this to us.

Table 1 Summary Statistics of the Variables for the 1986-1989 Period

Variable	Mean	Median	Minimum	Maximum	St. Dev.
WSOG	18.54%	15.43	0.00	69.90	15.60
LSTK	13.42	13.46	8.12	17.05	1.81
LTA	7.86	7.72	6.11	10.26	1.07
SDTR/SDROE	9.56	8.84	0.57	22.99	6.32
MKE/BKE	1.75	1.53	1.04	3.57	0.69

Table 2 Matrix of Correlation Coefficients of Independent Variables

	CS20	OTHER	LSTK	LTA	SDTR/ SDROE	MKE/BKE
CS20	1.000					
OTHER	-0.422	1.000				
LSTK	-0.361	-0.091	1.000			
LTA	-0.032	-0.204	0.057	1.000		
SDTR/SDROE	0.159	0.053	-0.348	0.006	1.000	
MKE/BKE	0.244	-0.260	0.148	-0.131	0.119	1.000

Table 3 Estimated Tobit Regression Model of the Weight of Market-Performance-Measures-Based CEO Incentives on the Presence of a Controlling Shareholder and Other Variables

The sample is 26 large interlisted Canadian firms with complete CEO compensation information disclosed in the public domain in 1986-1989. Loglikelihood of the Tobit estimation of the proposed model is -93.621.

Variables	Estimates of Coefficients	t-Statistics	P-values[a, b] (two-tailed)
Intercept	91.210	2.593	0.010
CS20	-21.229	-2.985	0.003
OTHER	-11.082	-1.156	0.248
LSTK	-1.970	-1.127	0.260
LTA	-6.029	-2.244	0.024
SDTR/SDROE	-0.557	-0.021	0.576
MKE/BKE	8.651	1.998	0.046

$WSOG^*_i = b_0 + b_1 CS20_i + b_2 OTHER_i + b_3 LSTK_i + b_4 LTA_i + b_5 SDTR/SDROE_i + b_6 MKE/BKE_i + e_i,$

$e_i \sim NID(0, \sigma^2),$

$WSOG_i = WSOG^*_i$ if $WSOG^*_i > 0$; $WSOG_i = 0$ otherwise.

$WSOG^*$ = latent variable of WSOG for which the actual value is observed when it is non-negative and zero is observed when it is negative,

WSOG = average ratio of stock option grant to the sum of salary, bonus and the market value of stock option grant over the 1986-1989 period,

CS20 = indicator variable taking the value of 1 if there was a shareholder, who is not a financial institution and maintained 20% or more of the common stocks of the firm for the 1986-1989 period and taking the value of 0 otherwise,

OTHER = indicator variable taking the value of 1 for firms, which are neither firms with controlling shareholders nor are widely held and taking the value of 0 otherwise; firms with a shareholder having 20% or more of the common stocks for the 1986-1989 period were considered as firms with a controlling shareholder and firms with no shareholder having 10% or more of the common stocks during the 1986-1989 period were considered as closely held firms,

LSTK = natural log of the CEO's average investment in the firm's common stocks over the 1986-1989 period,

LTA = natural log of the average total assets over the 1986-1989 period,

SDTR/SDROE = ratio of annualized standard deviation of monthly stock returns to standard deviation of return on equity of the firm measured over the 1985-1989 period, and

MKE/BKE = average ratio of the market value of equity to the book value of equity over the 1986-1989 period.

[a] The p-values are based on asymptotic t distribution.

[b] Two-tailed p-values are reported following the general reporting practice in the literature even though the research hypothesis being tested is one-sided ($b_1 < 0$).

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Table 4 Estimated Tobit Regression Model of the Weight of Market-Performance-Measures-Based CEO Incentives Using the Proxy for Controlling Shareholder Proposed by Salamon and Smith (1984)

The sample is 26 large interlisted Canadian firms with complete CEO compensation information disclosed in the public domain in 1986-1989. Loglikelihood of the Tobit estimation of the proposed model is -94.169.

Variables	Estimates of Coefficients	T-statistics	P-values[a] (two-tailed)
Intercept	94.571	2.672	0.008
CONTROL	-19.182	-2.815	0.005
LSTK	-2.008	-1.112	0.266
LTA	-6.407	-2.394	0.016
SDTR/SDROE	-0.205	-0.754	0.450
MKE/BKE	8.470	1.996	0.040

$WSOG^*_i = b_0 + b_1\ CONTROL_i + b_2\ LSTK_i + b_3\ LTA_i + b_4\ SDTR/SDROE_i + b_5\ MKE/BKE_i + e_i,$

$e_i \sim NID(0, \sigma^2),$

$WSOG_i = WSOG^*_i$ if $WSOG^*_i > 0$; $WSOG_i = 0$ otherwise.

CONTROL is a proxy for a controlling shareholder. It takes the value of 1 if there is a shareholder with 10% or more of the common stocks and the large shareholder sits in the board, or the large shareholder has 20% or more of the common stocks. It takes the value of zero, otherwise. The other proxy definitions are identical to Table 3.
[a] The p-values are based on asymptotic t distribution.

Table 5 Estimated Piece-Wise Linear Regression Model of the Weight of Market-Performance-Measures-Based CEO Incentives Using 10% and 50% Ownership by Large Shareholders as the Cutoff Points for Minority Control and Majority Control

The sample is 26 large interlisted Canadian firms with complete CEO compensation information disclosed in the public domain in 1986-1989. Loglikelihood of the Tobit estimation of the proposed model is -94.151.

Variables	Estimates of Coefficients	T-statistics	P-values[a] (two-tailed)
Intercept	97.381	2.704	0.012
MINCON	-0.537	-2.801	0.005
MAJCON	0.597	1.527	0.126
LSTK	-2.554	-1.330	0.184
LTA	-6.371	-2.326	0.020
SDTR/SDROE	-0.216	-0.788	0.338
MKE/BKE	10.677	2.307	0.021

$WSOG^*_i = b_0 + b_1 MINCON_i + b_2 MAJCON_i + b_3 LSTK_i + b_4 LTA_i + b_5 SDTR/SDROE_i + b_6 MKE/BKE_i + e_i$,

$e_i \sim NID(0, \sigma^2)$,

$WSOG_i = WSOG^*_i$ if $WSOG^*_i \geq 0$; $WSOG_i = 0$ otherwise.

MINCON is the proxy for a minority control. MAJCON is the proxy for a majority control. Let CONTROL stand for the combined ownership of large shareholders. Then MINCON and MAJCON are defined as follow.
MINCON = 0 if CONTROL is less than 10%,
MINCON = CONTROL-10 if CONTROL is greater than 10% and less than 50%,
MINCON = 50 if CONTROL is equal to or greater than 50%,
MAJCON = 0 if CONTROL is less than 50%,
MAJCON = CONTROL-50 if CONTROL is equal to or greater than 50%.
The other proxy definitions are identical to Table 3.
[a] The p-values are based on asymptotic t distribution.

Table 6 Estimated Tobit Regression Model of the Weight of Market-Performance-Measures-Based CEO Incentives for the 1986-1987 Subperiod

The sample is 26 large interlisted Canadian firms with complete CEO compensation information disclosed in the public domain in 1986-1989. Loglikelihood of the Tobit estimation of the proposed model is -93.248.

Variables	Estimates of Coefficients	T-Statistics	P-values[a] (two-tailed)
Intercept	71.084	2.870	0.016
CS20	-35.761	-3.149	0.002
OTHER	-35.730	-2.169	0.030
LSTK	-1.484	-1.032	0.302
LTA	-0.002	-2.044	0.042
SDTR/SDROE	-0.284	-0.475	0.634
MKE/BKE	0.215	0.049	0.961

$WSOG^*_i = b_0 + b_1 CS20_i + b_2 OTHER_i + b_3 LSTK_i + b_4 LTA_i + b_5 SDTR/SDROE_i + b_6 MKE/BKE_i + e_i,$

$e_i \sim NID(0, \sigma^2),$

$WSOG_i = WSOG^*_i$ if $WSOG^*_i > 0$; $WSOG_i = 0$ otherwise.

SDTR/SDROE is the ratio of standard deviation of total return on the stock to standard deviation of return on equity of the firm measured over 1983-1987. The other proxy definitions are identical to Table 3. Note, however, that all the averages are computed over the 1986 and 1987 values.

[a] The p-values are based on asymptotic t distribution.

Table 7 Estimated Tobit Regression Model of the Weight of Market-Performance-Measures-Based CEO Incentives for the 1988-1989 Subperiod

The sample is 26 large interlisted Canadian firms with complete CEO compensation information disclosed in the public domain in 1986-1989. Loglikelihood of the Tobit estimation of the proposed model is -93.621.

Variables	Estimates of Coefficients	T-statistics	P-values[a] (two-tailed)
Intercept	3.697	-0.096	0.924
CS20	-15.500	-1.546	0.122
OTHER	6.338	0.472	0.636
LSTK	-1.531	-0.733	0.464
LTA	0.000	-0.088	0.930
SDTR/SDROE	-0.091	-0.153	0.880
MKE/BKE	25.004	2.376	0.018

$WSOG^*_i = b_0 + b_1 CS20_i + b_2 OTHER_i + b_3 LSTK_i + b_4 LTA_i + b_5 SDTR/SDROE_i + b_6 MKE/BKE_i + e_i$,

$e_i \sim NID(0, \sigma^2)$,

$WSOG_i = WSOG^*_i$ if $WSOG^*_i > 0$; $WSOG_i = 0$ otherwise.

All the proxy definitions are identical to Table 3. Note, however, that the average is taken over the 1988 and 1989 values.

[a] The p-values are based on asymptotic t distribution.

Table 8 Tests of Omitted Variables Regarding Operating Leverage, Financial Leverage, and Non-Bonus Tax Shield

The sample is 26 large interlisted Canadian firms with complete CEO compensation information disclosed in the public domain in 1986-1989. Asymptotic t-statistics are given in parentheses. LR stands for likelihood ratio with $\chi^2(1)$ distribution. The numbers in square brackets are the corresponding p-values.

Variables	Restricted Model	Unrestricted Model 1	Unrestricted Model 2	Unrestricted Model 3
Intercept	91.210	106.02	90.889	97.307
	(2.593)	(2.886)	(2.584)	(2.169)
CS20	-21.229	-23.235	-20.917	-21.428
	(-2.985)	(-3.231)	(-2.888)	(-2.986)
OTHER	-11.082	-15.503	-10.689	-11.958
	(-1.156)	(-1.559)	(-1.097)	(-1.153)
LSTK	-1.970	-1.917	-1.841	-2.045
	(-1.127)	(-1.143)	(-0.997)	(-1.149)
LTA	-6.029	-7.444	-6.064	-6.474
	(-2.244)	(-2.579)	(-2.253)	(-1.923)
SDTR/SDROE	-0.557	-0.172	-0.154	-0.160
	(-0.021)	(-0.668)	(-0.574)	(-0.589)
MKE/BKE	8.651	8.138	-8.540	8.567
	(1.998)	(1.958)	(1.962)	(1.975)
SDEBIT		-0.008		
		(-1.292)		
LTD/TA			-5.250	
			(-0.214)	
NBTS/EBDIT				-1.317
				(-0.222)
LR		1.672	0.046	0.050
		[0.196]	[0.830]	[0.823]

Restricted Model

$WSOG^*_i = b_0 + b_1\,CS20_i + b_2\,OTHER_i + b_3\,LSTK_i + b_4\,LTA_i + b_5\,SDTR/SDROE_i + b_6\,MKE/BKE_i + e_i,$

$e_i \sim NID(0, \sigma^2),$

$WSOG_i = WSOG^*_i$ if $WSOG^*_i > 0$; $WSOG_i = 0$ otherwise.

Unrestricted Model 1

$WSOG^*_i = b_0 + b_1\,CS20_i + b_2\,OTHER_i + b_3\,LSTK_i + b_4\,LTA_i + b_5\,SDTR/SDROE_i + b_6\,MKE/BKE_i +$
$b_7\,SDEBIT_i + e_i,\; e_i \sim NID(0, \sigma^2),$

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$WSOG_i = WSOG^*_i$ if $WSOG^*_i > 0$; $WSOG_i = 0$ otherwise.

Unrestricted Model 2

$WSOG^*_i = b_0 + b_1 CS20_i + b_2 OTHER_i + b_3 LSTK_i + b_4 LTA_i + b_5 SDTR/SDROE_i + b_6 MKE/BKE_i + b_7 LTD/TA_i + e_i, \ e_i \sim NID(0, \sigma^2),$

$WSOG_i = WSOG^*_i$ if $WSOG^*_i > 0$; $WSOG_i = 0$ otherwise.

Unrestricted Model 3

$WSOG^*_i = b_0 + b_1 CS20_i + b_2 OTHER_i + b_3 LSTK_i + b_4 LTA_i + b_5 SDTR/SDROE_i + b_6 MKE/BKE_i + b_7 NBTS/EBDIT_i + e_i, \ e_i \sim NID(0, \sigma^2),$

$WSOG_i = WSOG^*_i$ if $WSOG^*_i > 0$; $WSOG_i = 0$ otherwise.

SDEBIT = standard deviation of percentage changes in earnings before interest and taxes of the firm over 1980-1989,

LTD/TA = average ratio of long-term debt to total assets over 1986-1989,

NBTS/EBDIT = average ratio of depreciation expenses, interest expenses, loss carry forwards, investment tax credits to earnings before depreciation, interest, and taxes over 1986-1989.

The other proxy definitions are identical to Table 3.

Appendix 4A Largest Shareholders and Likely Controlling Shareholders for the Sample Firms

Company	Large Shareholders in 1986 (% owned)	Large Shareholders in 1987 (% owned)	Large Shareholders in 1988 (% owned)	Large shareholders in 1989 (% owned)	Likely Controlling Shareholders
Abitibi Price	Gulf Canada(90)	O&Y Development(78)	O&Y Development(78)	O&Y Development(82)	O&Y Development
Alcan	widely held	widely held	widely held	widely held	
BCE	widely held	widely held	widely held	widely held	
Canadian Occidental Petroleum	Occidental Petroleum(48)	Occidental Petroleum(48)	Occidental Petroleum(48)	Occidental Petroleum(48)	Occidental Petroleum
Canadian Pacific	widely held	widely held	widely held	widely held	
Domtar	SGFQ(28.0) CDPQ(16.5)	SGFQ(28.0) CDPQ(16.0)	SGFQ(27.8) CDPQ(16.2)	SGFQ(27.7) CDPQ(16.3)	
Echo Bay Mines	widely held	widely held	widely held	widely held	
Gulf Canada	Olympia & York(78.6)	Olympia & York(70.2)	Olympia & York(73)	Olympia & York(73)	Olympia & York
Imperial Oil	Exxon(69.6)	Exxon(69.6)	Exxon(69.6)	Exxon(69.6)	Exxon
Inco	widely held	widely held	widely held	widely held	
Intercity Gas	Central Capital(44.35)	Central Capital(36.6)	Central Capital(45.4)	Central Capital(44.5)	Central Capital
Interhome Energy	Gulf Canada (41) Imperial Oil (22)	GW Utilities (41) Imperial Oil (23)	Olympia & York (41) Imperial Oil (23)	Olympia & York (41) Imperial Oil (23)	Gulf Canada
LAC Minerals	widely held	widely held	widely held	widely held	

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MacMillan Bloedel	Northwood Mills(48.0)	Noranda Forest(49.5	Noranda Forest(49.9	Noranda Forest(49.9	Noranda Forest
Mitel	British Tel(51.0)	British Tel(51.0)	British Tel(51.0)	British Tel(51.0)	British Tel
Moore	widely held	Royal Trustco(13.9)	widely held	Royal Trustco(12.6) CDPQ(11.2)	
Northern Tel.	BCE(52.3)	BCE(52.5)	BCE(52.5)	BCE(53.1)	BCE
Placer Dome	widely held	widely held	widely held	widely held	
Ranger Oil	widely held	widely held	widely held	widely held	
Rio Algom	Rio Tinto-Zinc(52.8)	Rio Tinto-Zinc(51.5)	Rio Tinto-Zinc(51.5)	Rio Tinto-Zinc(51.5)	Rio Tinto-Zinc
Sceptre Resources	CDPQ(21.9)	CDPQ(18.4)	CDPQ(15.5)	CDPQ(19.7) Noverco(18.7) SOQUIB Alberta(11.6)	
Shell Canada	Shell Petroleum(72)	Shell Petroleum(71.4)	Shell Petroleum(71.0)	Shell Petroleum(78.0)	Shell Petroleum
Total Petroleum	TCFP(45.0)	TCFP(51.0)	TCFP(51.0)	TCFP(51.0)	TCFP
TCPL	BCE(48.5)	BCE(49.3)	BCE(49.1)	BCE(48.9)	BCE
AMCA Int.	CPL(50.6)	CPL(50.5)	CPL(55.4)	CPL(55.4)	CPL
Westcoast	Petro Canada(31.1)	Petro Canada(32.8)	Petro Canada(36.5)	Petro Canada(37.5)	Petro Canada

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Appendix 4B The Large Shareholders and the CEOs of the 26 Sampled Firms in 1986

Company	Large Shareholders(% owned)	CEO	Largest Shareholder(% owned)
Abitibi Price	Gulf Canada(90)	Bernd Koken	Gulf Canada(90)
Alcan	widely held	David Culver	widely held
BCE	widely held	Raymond Cyr	widely held
Canadian Occidental Petroleum	Occidental Petroleum(48)	Angus McKee	Occidental Petroleum(48)
Canadian Pacific	widely held	W.Stinson	widely held
Domtar	SGFQ(28.0) CDPQ(16.5)	James Smith	SGFQ(28)
Echo Bay Mines	widely held	John Zigarlick	widely held
Gulf Canada	Olympia & York(78.6)	S.K.McWalter	Olympia & York(78.6)
Imperial Oil	Exxon(69.6)	Arden Haynes	Exxon(69.6)
Inco	widely held	Charles Baird	widely held
Intercity Gas	Central Capital(44.35)	Robert Graham	Central Gas(44.35)
Interhome Energy	Gulf Canada (40.9) Imperial Oil (21.7)	Richard Haskayne	Gulf Canada (40.9)
LAC Minerals	widely held	Peter Allen	widely held

MacMillan Bloedel	Northwood Mills(48.0)	R.V.Smith	Northwood Mills(48.0)
Mitel	British Tel(51.0)	Anthony Griffiths	British Tel(51.0)
Moore	widely held	Keith Goodrich	widely held
Northern Tel.	BCE(52.3)	Edmond Fitzgerald	BCE(52.3)
Placer Dome	widely held	John Walton	widely held
Ranger Oil	widely held	John Pierce	widely held
Rio Algom	Rio Tinto-Zinc(52.8)	G.R.Albino	Rio Tinto-Zinc(52.8)
Sceptre Resources	CDPQ(21.9)	Richard Gusella	CDPQ(21.9)
Shell Canada	Shell Petroleum(72)	John MacLeod	Shell Petroleum(72)
Total Petroleum	TCFP(45.0)	Philip Dunoyer	TCFP(45.0)
TCPL	BCE(48.5)	Gerald Maier	BCE(48.5)
AMCA Int.	CPL(50.6)	William Holland	CPL(50.6)
Westcoast	Petro Canada(31.1)	Derek Parkinson	Petro Canada(31.1)

Appendix 4C The Large Shareholders and the CEOs of the 26 Sampled Firms in 1987

Company	Large Shareholders(% owned)	CEO	Largest Shareholder(% owned)
Abitibi Price	O&Y Development(77.8)	Bernd Koken	O&Y Development(77.8)
Alcan	widely held	David Culver	widely held
BCE	widely held	Raymond Cyr	widely held
Canadian Occidental Petroleum	Occidental Petroleum(48)	Angus McKee	Occidental Petroleum(48)
Canadian Pacific	widely held	W.Stinson	widely held
Domtar	SGFQ(28.0) CDPQ(16.0)	James Smith	SGFQ(28)
Echo Bay Mines	widely held	John Zigarlick	widely held
Gulf Canada	Olympia & York(70.2)	S.K.McWalter	Olympia & York(70.2)
Imperial Oil	Exxon(69.6)	Arden Haynes	Exxon(69.6)
Inco	widely held	Donald Phillips	widely held
Intercity Gas	Central Capital(36.6)	Robert Graham	Central Capital(36.6)
Interhome Energy	GW Utilities (40.8) Imperial Oil (22.5)	R.F. Haskayne	GW Utilities (40.8)

LAC Minerals	widely held	Peter Allen	widely held
MacMillan Bloedel	Noranda Forest(49.5)	R.V.Smith	Noranda Forest(49.5)
Mitel	British Tel(51.0)	John Jarvis	British Tel(51.0)
Moore	Royal Trustco(13.9)	Keith Goodrich	Royal Trustco(13.9)
Northern Tel.	BCE(52.5)	Edmond Fitzgerald	BCE(52.5)
Placer Dome	widely held	John Walton	widely held
Ranger Oil	widely held	John Pierce	widely held
Rio Algom	Rio Tinto-Zinc(51.5)	G.R.Albino	Rio Tinto-Zinc(51.5)
Sceptre Resources	CDPQ(18.4)	Richard Gusella	CDPQ(18.4)
Shell Canada	Shell Petroleum(71.4)	John MacLeod	Shell Petroleum(71.4)
Total Petroleum	TCFP(51.0)	Philip Dunoyer	TCFP(51.0)
TCPL	BCE(49.3)	Gerald Maier	BCE(49.3)
AMCA International	CPL(50.5)	William Holland	CPL(50.5)
Westcoast	Petro Canada(32.8)	Derek Parkinson	Petro Canada(32.8)

Appendix 4D The Large Shareholders and the CEOs of the 26 Sampled Firms in 1988

Company	Large Shareholders(% owned)	CEO	Largest Shareholder(% owned)
Abitibi Price	O&Y Developments(78)	Bernd Koken	O&Y Developments(78)
Alcan	widely held	David Culver	widely held
BCE	widely held	Raymond Cyr	widely held
Canadian Occidental Petroleum	Occidental Petroleum(48)	Angus McKee	Occidental Petroleum(48)
Canadian Pacific	widely held	W.Stinson	widely held
Domtar	SGFQ(27.8) CDPQ(16.2)	James Smith	SGFQ(27.8)
Echo Bay Mines	widely held	John Zigarlick	widely held
Gulf Canada	Olympia & York(73)	S.K.McWalter	Olympia & York(73)
Imperial Oil	Exxon(69.6)	Arden Haynes	Exxon(69.6)
Inco	widely held	Donald Phillips	widely held
Intercity Gas	Central Capital(45.4)	Robert Graham	Central Capital(45.4)
Interhome Energy	Olympia & York (41.3) Imperial Oil (22.8)	R.F. Haskayne	Olympia & York (41.3)

LAC Minerals	widely held	Peter Allen	widely held
MacMillan Bloedel	Noranda Forest(49.9)	R.V.Smith	Noranda Forest(49.9)
Mitel	British Tel(51.0)	John Jarvis	British Tel(51.0)
Moore	widely held	Keith Goodrich	widely held
Northern Tel.	BCE(52.5)	Paul Stern	BCE(52.5)
Placer Dome	widely held	Anthony Petrina	widely held
Ranger Oil	widely held	John Pierce	widely held
Rio Algom	Rio Tinto-Zinc(51.5)	Ray Ballmer	Rio Tinto-Zinc(51.5)
Sceptre Resources	CDPQ(15.5)	Richard Gusella	CDPQ(15.5)
Shell Canada	Shell Petroleum(71.0)	John MacLeod	Shell Petroleum(71.0)
Total Petroleum	TCFP(51.0)	Philip Dunoyer	TCFP(51.0)
TCPL	BCE(49.1)	Gerald Maier	BCE(49.1)
AMCA International	CPL(55.4)	William Holland	CPL(55.4)
Westcoast	Petro Canada(36.5)	Michael Phelps	Petro Canada(36.5)

Appendix 4E The Large Shareholders and the CEOs of the 26 Sampled Firms in 1989

Company	Large Shareholders(% owned)	CEO	Largest Shareholder(% owned)
Abitibi Price	O&Y Developments(82)	Bernd Koken	O&Y Developments(82)
Alcan	widely held	D.Morton	widely held
BCE	widely held	Raymond Cyr	widely held
Canadian Occidental Petroleum	Occidental Petroleum(48)	Angus McKee	Occidental Petroleum(48)
Canadian Pacific	widely held	W.Stinson	widely held
Domtar	SGFQ(27.7) CDPQ(16.3)	James Smith	SGFQ(27.7)
Echo Bay Mines	widely held	John Zigarlick	widely held
Gulf Canada	Olympia & York(73)	S.K.McWalter	Olympia & York(73)
Imperial Oil	Exxon(69.6)	Arden Haynes	Exxon(69.6)
Inco	widely held	Donald Phillips	widely held
Intercity Gas	Central Capital(44.5)	Robert Graham	Central Capital(44.5)
Interhome Energy	Olympia & York (41.2) Imperial Oil (22.8)	R.F. Haskayne	Olympia & York (41.2)
LAC Minerals	widely held	Peter Allen	widely held

MacMillan Bloedel	Noranda Forest(49.9)	R.V.Smith	Noranda Forest(49.9)
Mitel	British Tel(51.0)	John Jarvis	British Tel(51.0)
Moore	Royal Trustco(12.6) CDPQ(11.2)	Keith Goodrich	Royal Trustco(12.6) CDPQ(11.2)
Northern Tel.	BCE(53.1)	Paul Stern	BCE(53.1)
Placer Dome	widely held	Anthony Petrina	widely held
Ranger Oil	widely held	John Pierce	widely held
Rio Algom	Rio Tinto-Zinc(51.5)	Ray Ballmer	Rio Tinto-Zinc(51.5)
Sceptre Resources	CDPQ(19.7) Noverco(18.7) SOQUIB Alberta(11.6)	Richard Gusella	CDPQ(19.7)
Shell Canada	Shell Petroleum(78.0)	John MacLeod	Shell Petroleum(78.0)
Total Petroleum	TCFP(51.0)	Philip Dunoyer	TCFP(51.0)
TCPL	BCE(48.9)	Gerald Maier	BCE(48.9)
AMCA International	CPL(55.4)	William Holland	CPL(55.4)
Westcoast	Petro Canada(37.5)	Michael Phelps	Petro Canada(37.5)

Appendix 4F   Valuation of the Stock Option Grant

The present value of stock options has been evaluated using a variation of the Black-Scholes European option valuation formula, which gives an upper bound on the value of the CEO stock options.[17] This valuation suggested by Noreen and Wolfson (1981) allows for continuous dividend payments and equity dilution. Stock appreciation rights (SARs) granted in tandem with stock options are assumed to provide zero value, since the optionee has to exercise either the option or the SAR. The risk-free rate of interest was estimated from the average annual market yield on Canada bonds with 5- and 10-year maturity in the year of the option grant as determined from the *Bank of Canada Review*.

A CEO stock option is not a stock option strictly speaking. It is actually a warrant (Noreen and Wolfson, 1981). However, the difference in the valuation is negligible, since the dilution factor is very small. The number of the stocks covered by each stock option grant ranged from 5,000 to 1,600,000. The number of stocks under a single stock option grant as percentage of the total stocks outstanding never exceeded 2.14%. Thus, the adjustment for the dilution factor was not deemed necessary for our sample.

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[17] The value of an executive stock option is less than that given by the Black-Scholes formula in the sense that it is not tradable, it is vested only after certain periods of time, executives are not usually allowed to short-sell their own firm's common stocks for hedging purpose, and executives' portfolio may not be well-diversified.

Valuation Formula

PVOG= present value of the stock option grant.

$$PVOG = N \, [Se^{-dT}\phi(Z) - Xe^{-rT}\phi(Z - s\sqrt{T})],$$

where

N = number of stocks covered by the option grant (data source: proxy document),

S = stock price as measured on the day of the grant (data source: proxy document),

ϕ = cumulative standard normal distribution function,

X = exercise price for the option grant (data source: proxy document),

T = time to expiration (data source: proxy document),

r = continuous risk-free interest rate, measured as $\ln(1+R)$, where R is the average annual market yield on Canada bonds with 5 and 10 years maturity (data source: Bank of Canada Review),

d = continuous dividend yield defined as $\ln(1+(\text{Dividend per share/closing stock price})]/12$ (data source of dividend per share and closing price: Laval-TSE database),

s = estimated monthly stock return standard deviation for the 60-month period

preceding the first day of the current fiscal year (data source: Laval/TSE Database),

and $Z = [\ln(S/X) + (r - d + s^2/2)](T/s\sqrt{T})$.

Appendix 4G Annual Summary Statistics of Proxies Used in the Study

(A) Annual Summary Statistics of the Percentages of the Common Stocks Controlled by the Large Shareholders for the Sample Firms
(Large shareholders are defined as those who have more than 10% of common stocks regardless of whether they are individual, corporate or institutional shareholders.)

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1985	26	36.81	44.50	0.00	90.00	29.19
1986	26	35.03	44.50	0.00	90.00	29.24
1987	26	34.70	44.00	0.00	77.80	27.54
1988	26	34.77	45.40	0.00	78.00	28.45
1989	26	36.63	44.50	0.00	82.00	27.65

(B) Summary Statistics of the Percentages of Stock Option Grants in the Total Compensation for the Sample Firms (WSOG) as a Proxy for the Weight of Market-Performance-Measures-Based Incentives (W_{MPBI})

Year	Sample Size	Mean	Median	Minimum	Maximum	St. Dev.
1986	26	19.04	0.00	0.00	95.40	27.67
1987	26	21.03	19.30	0.00	92.80	23.06
1988	26	17.75	16.40	0.00	61.40	17.24
1989	26	16.34	11.80	0.00	78.60	19.18

(C) Summary Statistics of the CEO's Equity Investment in the Firm for the Sample Firms in Millions of Canadian Dollars

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1986	26	2.654	0.420	0.00	29.385	7.010
1987	26	3.108	0.419	0.00	45.811	9.428
1988	26	3.239	0.946	0.00	39.813	8.388
1989	26	3.679	0.886	0.00	45.094	9.483

(D) Summary Statistics of the Ratios of the CEO's Equity Investment in the Firm to the Total Compensation for the Sample Firms in Percents

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1986	26	6.06	0.75	0.00	125.85	24.47
1987	26	5.08	0.45	0.00	102.7	19.98
1988	26	9.70	0.86	0.00	145.57	31.18
1989	26	9.06	1.41	0.00	152.50	30.85

(E) Summary Statistics of the Book Values of the Total Assets for the Sample Firms in Billions of Canadian Dollars

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1985	26	4.242	1.848	0.257	21.446	5.549
1986	26	4.265	2.049	0.242	23.714	5.493
1987	26	4.527	2.515	0.445	26.025	5.861
1988	26	4.682	2.612	0.435	28.069	6.126
1989	26	5.439	2.661	0.399	39.261	8.265

(F) Summary Statistics of the Ratios of the Standard Deviation of the Total Return on the Stock to the Standard Deviation of the Return on Equity (SDTR/SDROE) as a Proxy for the Noise of the Market Performance Measures Relative to the Accounting Performance Measures
(Standard deviations of monthly stock returns are evaluated over the preceding sixty months, then annualized; standard deviations of return on equity are evaluated over the preceding five years.)

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1985	26	6.044	4.830	0.470	20.060	4.019
1986	26	9.752	5.780	0.520	46.370	10.005
1987	26	9.594	5.900	0.540	28.580	7.757
1988	26	9.400	9.030	0.480	24.910	6.276
1989	26	9.489	6.790	0.730	54.600	10.520

(G) Summary Statistics of the Standard Deviations of the Percentage Changes in Operating Income after Depreciation (SDEBIT) as a Proxy for the Business Risk for the Sample Firms
(Standard deviations are evaluated over the preceding five years)

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1985	26	188	72	8	873	222
1986	26	168	71	6	873	214
1987	26	233	64	9	1920	404
1988	26	341	42	11	3751	804
1989	26	333	38	10	3764	808

(H) Summary Statistics of the Ratios of the Book Value of the Long-Term Debt to the Book Value of the Total Assets (LTD/TA) as a Proxy for the Financial Leverage for the Sample Firms

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1985	26	0.236	0.233	0.031	0.506	0.127
1986	26	0.225	0.192	0.025	0.506	0.130
1987	26	0.217	0.218	0.022	0.459	0.123
1988	26	0.200	0.182	0.023	0.425	0.116
1989	26	0.212	0.233	0.014	0.598	0.139

(I) Summary Statistics of the Ratios of the Sum of Depreciation Charges, Interest Expenses, Loss Carry-Forwards, and Investment Tax Credits to Earnings before Depreciation, Interest, and Taxes (NBTS/EBDIT) as a Proxy for the Amount of Non-Bonus Tax Shields (NBTS) for the Sample Firms

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1985	26	0.502	0.539	0.200	1.302	0.735
1986	26	0.907	0.671	0.224	3.282	0.754
1987	26	0.876	0.579	0.242	2.800	0.755
1988	26	0.817	0.615	0.187	3.157	0.698
1989	26	0.820	0.679	0.221	2.011	0.431

(J) Summary Statistics of the Ratios of the Market Value of the Equity to the Book Value of the Equity (MKE/BKE) as a Proxy for the Growth Opportunity (GROWTH) for the Sample Firms

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1985	26	2.379	1.970	0.930	7.760	1.805
1986	26	2.290	1.680	0.970	6.180	1.758
1987	26	1.581	1.460	0.960	2.800	0.581
1988	26	1.705	1.610	0.760	3.570	0.708
1989	26	1.445	1.450	1.010	2.050	0.325

(K) Summary Statistics of the Ratios of Research and Development to Sales as a Proxy for the Growth Opportunity (GROWTH) for the Sample Firms

Year	Sample Size	Mean	Median	Minimum	Maximum	St.Dev.
1985	26	0.012	0.003	0.000	0.101	0.027
1986	26	0.014	0.002	0.000	0.118	0.031
1987	26	0.013	0.002	0.000	0.121	0.028
1988	26	0.013	0.002	0.000	0.131	0.030
1989	26	0.014	0.002	0.000	0.120	0.030

CHAPTER 5 CONCLUSION

The stock price is a prime measure to use in CEO incentives but it is not without defect. On the other hand, accounting performance measures are under the influence of the CEO, whom one wants to evaluate. The use of these two complementary measures deserves scrutiny. We have analysed the role of controlling shareholders on the use of corporate performance measures, namely, the market performance measures and the accounting performance measures. An agency-based model has been developed which models CEO compensation administration where shareholders are represented by a monitor.

The main insight in the controlling shareholder monitoring model is that the controlling shareholder is able to monitor efficiently the information generation process, which produces accounting performance measures, and to capture some of the benefit of monitoring through substantial equity investment. The board of directors in a widely held firm, on the other hand, is generally unable to monitor the information generation process efficiently, and to internalize the benefit of verification due to limited equity investment. As a result, a closely held firm would show greater willingness to use accounting performance measures as signals of the CEO's effort. It would imply that a closely held firm would place less weight on market-performance-measures-based incentives than does a widely held firm, all else being equal.

An empirical study was conducted using Canadian corporate data over the 1986-1989 period. The CEOs of the closely held firms tended to have a smaller proportion of stock options in their total compensation than did the CEOs of the widely held firms. The result is consistent with the prediction of the proposed CEO compensation contracting model.

A limitation of this study is that the observed phenomenon that the firms with controlling shareholders use less market-based incentives than do the widely held firms can be due in part to other reasons. It can be due to the controlling shareholders' desire to prevent the dilution of their controlling interest of the firm. However, we think that this effect is limited in Canada during the study period since the dilution of the controlling interest caused by the CEO stock option grant was typically very minimal. The documented phenomenon can also be due to the fact that controlling shareholders may prefer as CEO incentives a bonus, which is immediately tax-deductible to the firm, to a stock option, which is not. We think that this effect is also limited in Canada during the study period. The tax deduction from the CEO bonus is much smaller than the tax deduction from other sources, such as depreciation and interest expenses. Furthermore, the immediate tax deduction of bonus can be mimicked to some extent by the cancellation of the stock option in exchange for a cash settlement. Another explanation for the phenomenon documented in this study is that the CEOs of firms with controlling shareholders may not want to tie their incentives to market performance measures because the controlling shareholders themselves can expropriate the outside shareholders

and cause the devaluation of stock price. While this explanation is plausible, an excessive expropriation is yet to be documented.

One can extend the current research in several direction. One can extend the model by incorporating the value that a monitor attaches to his reputation in the context of repeated games. Another way one can extend the model is by examining the role of debt-financing providers. On the other hand, the prediction of the model can be tested on U.S. data, more recent Canadian data, and senior executives. Adaptation of the proposed compensation contracting model can be made to study the incentive design for the host country executives working for foreign parent companies, and executives of post M&A targets. A future study can examine both theoretically and empirically the effect of other internal controls, in particular, the equity ownership of directors and officers, the proportion of outside directors in the board, and the equity ownership of large institutional shareholders on the use of market and accounting performance measures in CEO incentives. Finally, one can develop more precise and integrated models where executive compensation structure, capital structure, ownership structure, investment opportunities, business risks, and dividend policy interact with each other.

Bounded rationality and an uncertain information environment play a large role in all institutions' decision-making processes including the CEO compensation process (Williamson, 1975; Neave, 1991 and 1993; Milgrom and Roberts, 1992; Neave and Johnson, 1993). They lead to two important aspects of the CEO compensation contract: *ex post* renegotiation and incomplete contracts (Williamson, 1975; Milgrom and Roberts,

1992, pp. 126-165). The received theory of bounded rationality and an uncertain informational environment would thus predict that a good deal of the CEO compensation contract between the board and the CEO would be left to future bargaining, negotiations, and interpretations on a contingent basis. The careful examination of the *ex post* settling aspect of CEO incentive administration implied by bounded rationality and an uncertain informational environment is left as a future study. Finally, a careful evaluation of suboptimal behaviour in regard to the use of market and accounting performance measures in CEO incentives under the assumption of severe bounded rationality and an extremely uncertain informational environment is left as a future study.

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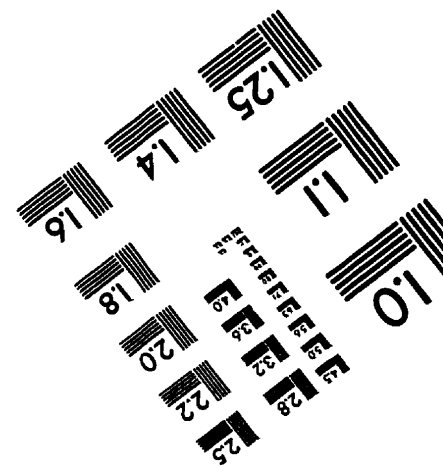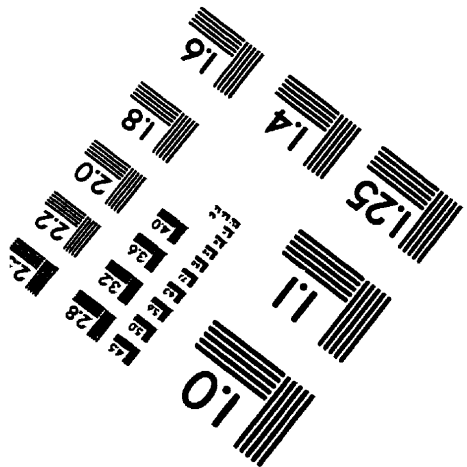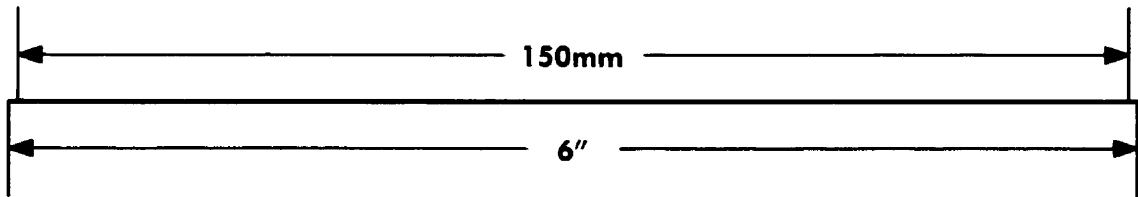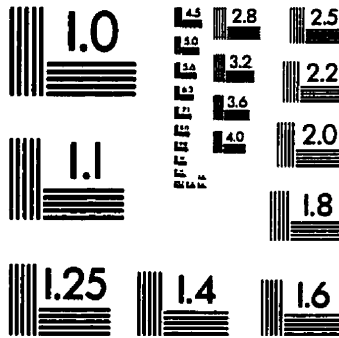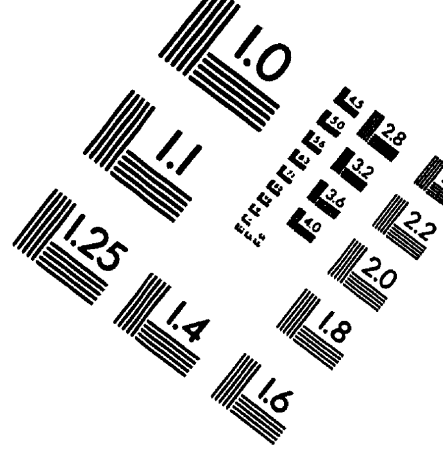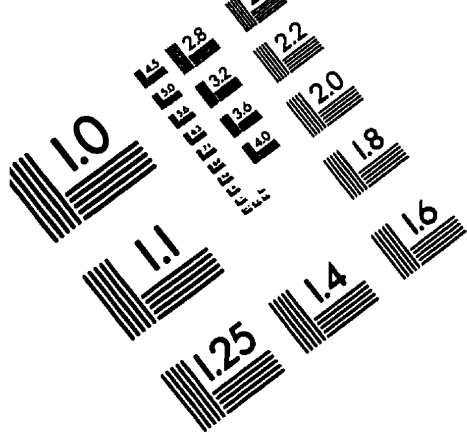
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