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# Directors' Incentives and Corporate Performance

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## *Abstract*

We examine the effect of the incentives of the members of the board of directors on shareholder wealth, CEO compensation and the sensitivity of this compensation to corporate performance in laboratory setting. Two methods of appointing the board, one by the CEO and the other by the largest shareholder, constitute the main treatment. The board sets the compensation for the CEO, who makes production, investment and dividend decisions for the firm. The investors receive information about dividends, earnings and capital of each firm, and use this information to manage their portfolios by buying and selling shares in these firms.

We find that the sensitivity of the pay-performance link increases with the fraction of equity owned by the directors. Further, the wealth generated in the economy as a whole, as well as the shareholders' part of this wealth, is greater when a large shareholder serves the role of the board of directors; when CEOs choose the director, outcomes are less efficient. Implications of these findings on the role of directors and associated agency costs; on accounting standard setting, especially with regard to accounting for options; on limits to executive compensation; and on standardization of reporting requirements are discussed.

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# 1. Introduction

Managing the potentially adverse consequences of separation of ownership and control in business organizations is a fundamental problem of management. In large business organizations, especially, a diffuse and heterogenous body of ownership finds it difficult, if not impossible, to give direct and coherent instructions to skilled managers of the firm hired to run the operations. In U.S., this function is entrusted to a board of directors, consisting of fiduciaries chosen by the shareholders. How well does this practice address the problem it is supposed to?

There are several valid reasons for skepticism. First, the directors play dual roles of monitoring the managers as fiduciaries for the shareholders as well as of advising the managers. Both these roles call for expertise in affairs of the business. Yet, the first role demands that the directors keep a watchful eye on the management, and remain independent of the latter. The second role places emphasis on intimate knowledge of, and relationship with the management. Balancing the two roles is difficult under the best of circumstances.

Second, the number of potential candidates for membership of the board is too large to stage meaningful election without some process of pre-selection or nomination of a slate of candidates for the shareholders to vote on. Who is to pick these candidates? Given the sparse knowledge most shareholders have about affairs of the corporation and of the qualifications of the candidates, the burden of identifying the nominees may fall on the management or on the existing members of the board. Finally, there is the problem of monitoring the monitors, ad infinitum.

Given these difficulties, it is not hard to see why management may want to nominate their trusted associates and experts to the board which is supposed to oversee them. At least this practice helps effectively fulfill the advisory role of the board, even as it might encroach on their independence. On the other hand, picking nominees for the board who are totally independent may serve the fiduciary role. However, these independent people, may not necessarily have the expert knowledge or advancement of the goals of the shareholders as their own primary motive.

These objections to management-picked and independently-picked boards lead us back to close the loop of separation of management and control. If all shareholders of a large corporation cannot be on the board, how about having the major shareholders, at least, as members of the board. These people, at least, can be expected to monitor the management effectively as long as they cannot do favors to themselves as members of the board at the expense of other shareholders and as long as they have the necessary expertise.

We designed a simple corporate economy to try to capture in laboratory two abstractions of corporate governance structures outlined above - management appointed board versus a board consisting of largest shareholders. Though real corporate boards consist of some ten or twenty members, and this multiplicity may give rise to interesting group dynamics, such issues are not the focus of our study. We therefore choose to model our boards with but a single member.

Formally, directors are elected by shareholders. However, as a practical matter, most shareholders simply sign their proxy in favor of the management and cast their vote for the official slate of board candidates they know little about. The top management wields direct and indirect influence on who gets on this slate. It is rare for

the official slates of candidates to lose an election. It is therefore a reasonable approximation of this regime to have the management pick the director in our simplified laboratory economy.

Why and how might the governance structure (i.e., who appoints the directors) affect behavior and corporate performance? Let us start with the premise that the service on the board is rewarded through specific compensation. This compensation could be direct (cash, pension, insurance, consumable perquisites, etc.) or indirect (useful information, business contacts, actual or perceived power). Those who value this compensation more than the opportunity cost of time would want to serve on the board.

Management has the motivation to want directors who (1) have the relevant expertise and contacts, (2) have the public image to give assurance of independence to shareholders, (3) are trusted friends and (4) generous in compensating the managers. The opportunity cost of the time of candidates who have characteristics (1) and (2) is likely to be higher, and they are less available for a given board. On the margin, the management-driven governance structure will attract candidates with attributes (3) and (4).

In shareholder-driven governance structure, there is no explicit choice in picking the members of the board. People who choose to become the larger shareholders also choose to perform chores of directorship. If managerial driven boards are more generous to managers and less capable on the margin, it also follows that, they would be associated with firms that earn a lower return for their shareholders.
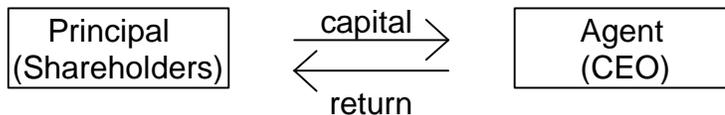
The two-party principal-agent framework for analyzing manager-shareholder relationships abstracts away from the role of the directors. Directors, too, are agents of the shareholders and act on behalf of the shareholders to control the managers. Setting compensation of the CEO is an important part of this role. However, directors' own private incentives may be in conflict with their fiduciary responsibility to shareholders. Therefore, an important question is: what role do the directors' private incentives play in determining the compensation of the chief executive officer? We examine this role in an experimental setting and assess the impact of the directors' private incentives on the level and the functional form of CEO compensation.

The conflict of interest between owners and managers forms the basic agency problem. Executives in publicly-held corporations control vast resources in their capacity as agents of the shareholders of these firms. They are supposed to use these resources in the best interests of the shareholders, but their actions are often dictated, at least in part, by their own interests. Rosen (1992) asks whether the executive efforts are directed toward serving the interests of shareholders, and notes that the formal problem is to induce executives to act in the shareholders' interests.

Compensation is an important part of the solution to this agency problem. Many economic studies, starting at least from Berle and Means (1932), have examined the possible conflict of interest due to the separation of ownership from management, and sought ways of inducing the agent to act in the interests of the principal. Penalties and rewards have been suggested as efficient incentives in some of the earliest approaches to agency theory. Every penalty constrains, but does not eliminate, self-serving behavior.

Empirical studies also suggest the extent of the agency problem, as well as ways of mitigating it. According to one estimate (Jensen and Murphy (1990b)) CEO wealth changes by a mere $3.25 for every $1000 change in shareholder wealth. Perhaps a greater percentage of a manager's compensation should be equity-based. The link between the CEOs' pay and corporate performance tends to become stronger with the years in office. When corporations announce the adoption of performance-based compensation schemes for their CEOs, their stock prices tend to rise.

These theoretical as well as empirical studies on CEO compensation have been based on a two-party agency between shareholders and managers in which the former sets the compensation for the latter. In practice, shareholders appoint directors who are delegated the exclusive right under corporate law to manage the corporation (Mehran, 1995). The role of directors is abstracted away in the standard two-party agency model.

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┌─────────────────┐      capital ↘        ┌─────────────┐
│ Principal       │   ─────────────→      │ Agent       │
│ (Shareholders)  │   ←─────────────      │ (CEO)       │
└─────────────────┘        return         └─────────────┘
```

Directors set the level and structure of CEO compensation. Shareholders hope, but cannot ensure that, in doing so, directors help ameliorate the conflict of interest between owners and managers. In most corporations, the CEO has a significant say in the selection, appointment and re-appointment of the directors and service on the board is generally lucrative. As fiduciaries, the directors face a conflict of interest while setting CEO compensation because their relationship with the CEO and their own private incentives are also factors in the compensation decision they make.

Cyert and Kumar (1996) examine the role of the board of directors in an incomplete contracting framework "based on a careful analysis of the role and private

incentives of the board of directors in the determination of managerial compensation." Their model highlights the conflict of interest faced by the board of directors and the long-term relationships between the board and the CEO. They find that the fraction of a firm's equity held by the board is negatively related to the level of CEO compensation and positively related to the sensitivity of the CEO pay-performance link. They also examine the effect of CEO tenure and suggest that the sensitivity of top management compensation to performance will decline as CEO tenure increases.

Thus, in addition to managers (e.g., the CEO) we must also consider directors as agents of the shareholders (principals). All agents may or may not act in the best interests of the principal, due to the conflict of interest that they face.

In this study, we are interested in examining the role of the directors. We, therefore, examine a slightly more detailed three-party relationship as follows:

| Principal (Shareholders) | ⟶ ⟵ | Agent Level 1 (directors) | ⟶ ⟵ | Agent Level 2 (CEO) |

This 3-stage model of governance of the firm captures the idea that the large diffuse body of shareholders cannot give directions or take account of a CEO's activity. They cannot set the compensation of CEOs either, and, of necessity, they must delegate this responsibility to a subset of shareholders. This subset is called the board of directors (while it is possible for a non-shareholder to be a member of the board, generally members of the board of publicly-held corporations hold at least some stock). These directors are elected by the shareholders and are obliged to act as their agent and in their best interest. They represent the owners in setting the direction for, and

compensation of, the CEO (another agent who manages the firm on behalf of the owners and whom we shall denote as a 2nd level agent).

If directors were to act in the best interests of the shareholders and set compensation in a manner as to minimize the conflict of interests between the principals (owners) and the 2nd level agents (CEOs), then the two-party model as used in contemporary literature would suffice. However, as economic agents in their own right, directors, too, may act opportunistically. In most corporations, selection, appointment and re-appointment of directors is a matter of discretion for the CEO, and service on the board is lucrative, Hermelin and Weisbach's (1988) findings, that board compositions change when the CEO changes, support this argument.

We would like to examine this potential conflict of interests between the shareholders and the directors. We would like to observe how directors set the compensation of the CEO, isolate the effect of directors' relationship with the CEO and examine the magnitude of this effect. If this conflict of interest exists, the role of directors would be a missing link in the two-party abstraction of the governance of public firms.

Ideally, we would like to read the minds of the directors to understand the factors that play a role in the compensation decision. We could directly ask the directors what compensation they would set with and without private incentives; but it is unlikely that we will get a clear or revealing answers.

Using field data, we can observe the directors' decision about CEO compensation, but we cannot observe the decision-making process and the factors that contribute to the decision. Directors often announce the criteria for compensating the CEO, but if their own private incentives influence their decisions, it is unlikely that they

would ever admit to such a link. This factor would exist only in the minds of directors making the compensation decision and it would be very difficult to isolate this particular factor in the decision making process, because other dynamic factors such as firm performance, growth prospects and the market for CEOs are projected as the main criteria in the compensation decision.

In order to isolate and examine the effect of the directors' relationship with the CEO it is important to keep these other factors (identified above) constant. This is possible in an experimental setting, where we can control the method by which directors are appointed. This allows us to compare the directors' and CEOs' decisions in the presence and absence of a relationship between them, while controlling all the other factors.

Specifically, we compare two regimes. In the first, the CEO appoints a director (who constitutes the single-person "board"). In the second, the largest shareholder is automatically appointed as the director. The size of the firm, CEO age and experience, firm performance variables and other factors that affect CEO compensation are controlled, and we observe the effect of directors' incentives in the two regimes on their compensation decisions.

The primary hypothesis is that a large shareholder-director, as compared to a director appointed by the CEO, will (a) choose a stronger pay-performance link and (b) induce decisions that generate higher shareholder wealth. The pay-performance link is then examined with respect to director shareholding and CEO tenure.

Our results indicate that the sensitivity of the pay-performance link increases with the fraction of equity owned by the directors. Further, the wealth generated for

shareholders and for society as a whole is higher when a large shareholder plays the role of the board of directors, in comparison with a CEO choosing the a director.

Section 2 presents a brief overview of the current literature that forms the background for this study. Section 3 develops the test hypotheses and Section 4 presents the experimental design and procedures. Results are presented in section 5 followed by concluding remarks.

## 2. Prior Work

Many studies of agency examine compensation as a means to reduce the conflict of interest between the agent and the principal. The two-party agency framework, with the shareholder as the principal and the CEO as the agent forms the basis for these studies. Berle and Means (1932) raised the basic issue regarding the conflict of interests that arises from separation of ownership from management. Simon (1952) first formulated the agency problem. Manne (1965) suggested that the threat of involuntary termination through the market for corporate control pushes managers toward aligning their actions with the interests of the shareholders.

Holmstrom (1979) showed how reward mechanisms can be used to help align the interests of the agents and principals. The underlying principle in this model is that compensation is the primary motivating factor that induces a desired action by the agent. Grossman and Hart (1983) show that this model holds under more general conditions. Other studies examine incentives of the CEO (agent), e.g., their willingness to take risk, and the role of compensation in shaping these incentives. Harris and Raviv (1979) explain that managers will want their compensation structured so that they bear

less personal risk. Hirshleifer and Suh (1992) show that potential higher returns from incentive compensation plans motivate managers to take on more risk.

Most analyses of field data, too, have been based on the two-party agency framework. Jensen and Murphy (1990b) recommend tying pay to performance by making a greater percentage of a manager's compensation equity-based. They question the effectiveness of an incentive scheme in which the CEO's wealth changes by $3.25 for every $1000 change in shareholders' wealth. Cyert, Kang, and Kumar (1997), however, suggest that the pay-performance link, on average, might be an order of magnitude stronger than the Jensen and Murphy estimates.

Other studies have examined the effectiveness of compensation in enhancing the managerial performance, and their focus has been on the change in compensation of the CEO as a result of a change in the wealth of the shareholders. For example, Coughlin and Schmidt (1985) use abnormal stock return (estimated from capital asset pricing model) to assess the effect of the stock market rate of return on CEO compensation. Murphy (1985) tests the same relationship, using both abnormal and total returns in a within-firms compensation regression.

Managerial compensation is actually set by directors, appointed in fiduciary capacity by the shareholders. Fama and Jensen (1983) suggest that one of the most important tasks of the board of directors is to set the level and structure of top executive compensation. CEOs often have a say in who sits on the board. Rosen (1992) notes that there is much opinion and some evidence that the boards are themselves controlled by the CEOs.

However, Cyert and Kumar (1996) note that the interaction between the CEO and the board, which would appear to play a crucial role in the determination and

evolution of CEO compensation, is essentially missing in the agency framework. They examine the role of directors in an incomplete contracting framework and find an inverse relationship between the fraction of the firm's equity held by board members and the level of CEO compensation. They also find a direct relationship between board stockholding and the sensitivity of CEO pay to performance.

There are earlier studies that support these findings. Baum and Byrne (1986) suggest that directors who have an incentive to monitor management and take strong positions on the board may be those with large stockholding in the firm. Morck, Shleifer and Vishny (1988) find a nonlinear relationship between firm performance (measured by Tobin's Q) and the percentage of equity held by outside directors. These studies suggest that the board of directors play an important role in determining CEO compensation and in reducing the conflict that arises from the separation of ownership from control.

Few empirical studies have been able to address this issue, because it is difficult to isolate the effect of the directors' relationship with the CEO in their compensation decision. However, certain aspects of this problem have been studied by Gibbons and Murphy (1992), who find that the pay-performance strength varies systematically with the tenure of the CEO; and by Rosenstein and Wyatt (1990), who find that the appointment of outside directors produces a positive stock price response.

An experimental framework would be useful in identifying the strength of the interaction, or relationship, between the CEO and the board in the compensation decision of the board, and thus, throw greater light on the role of the board of directors. This study is a first step in the direction to explore the following questions: What is the influence of the private incentives of the board of directors on the link between CEO pay

and performance, on shareholder wealth, on the level of CEO compensation and on the wealth generated in society.

## 3. Research Design

### *Hypotheses*

Cyert and Kumar (1996) develop an incomplete contracting model and suggest that the presence of a large shareholder on the board may strengthen the pay-performance link in top management compensation.  Their model is an extensive form game of imperfect information in which a manager, at the beginning of each period, chooses a director *d* from a set of potential directors *D*. The manager then privately observes a stochastic shock $\theta_t$ and chooses an effort level which results in the probabilistic performance statistic *y*. The compensation for the manager is determined following the observation of *y*, through a bargaining process between the manager and the board. The manager has the discretion to retain or terminate the appointment of the director, who, therefore, has incentives to curry favor with the manager by setting generous compensation. Directors' incentives are offset by the extent of their stockholding in the firm, as too high a compensation for the manager would deplete the firms' resources.

The primary hypothesis focuses on Cyert and Kumar's above proposition regarding the effect of the presence of a large shareholder on the board on the CEO pay-performance link.  Intuitively, it would appear that the "conflict of interest" faced by the directors appointed by the CEO due to their relationship with the CEO and their private incentives may affect their choice of the CEO's compensation decision. On the other hand, a large shareholder on the board faces no conflict of interest in his/her

relationship with the CEO and his/her private incentives (the benefits of the directorship) are far outweighed by the potential returns from their shareholding, therefore they can write an optimal contract which would align the interests of the CEO with those of the shareholders.

*H1 : Managerial Compensation has a stronger link to managerial performance when the largest shareholder serves as the director as compared to the CEO choosing the director.*

The two-party agency framework with the CEO as the agent and the shareholders as the principal assumes that the principal sets compensation for the agent to try to get the latter to act in the best interests of the former. We introduce directors as agents (level 1) who, on behalf of the shareholders (principals), set compensation for the CEOs (agents level 2). Now, if directors were to act in a true fiduciary capacity to the principals, denoting the absence of directors' private incentives, the compensation contract set by them would also be based in a manner such that the CEO (agent level 2) acts in the best interests of the shareholders (principals).

Appointing the largest shareholder as directors ensures that directors are not beholden to the CEO for reappointment each period, thus eliminating their private incentives in the compensation decision process. In this case, the director would act in a true fiduciary capacity and set a compensation contract that is optimal for shareholders, resulting in a higher value for the shareholders in the economy.

*H2 : Shareholder wealth is higher when the largest shareholder is director as compared to CEO-appointed directors.*

Now, in the case when directors are chosen by CEOs, directors would have an incentive to give the CEO a higher compensation than is due, to ensure reappointment. The effect of these private incentives of the board members can be mitigated if they

own a substantial percentage of the outstanding stock of the firm. This would tend to align their interests with those of the shareholders and the pay-performance link would be stronger. We test similar propositions proposed by Cyert and Kumar (1996) that pertain to the level and the sensitivity of CEO compensation.

*H3 : The higher the fraction of the firm's equity held by the director, the lower the level of CEO compensation.*

*H4 : The higher the fraction of the firm's equity held by the director, the stronger the sensitivity of CEO compensation to performance.*

Gibbons and Murphy (1992) report that the strength of the pay-performance link appears to vary systematically through the tenure of the CEO, which appears to be inconsistent with the predictions of agency theory. Cyert and Kumar (1996) attempt to explain this inconsistency by suggesting that the length of CEO tenure may be a proxy for the dynamics of the CEO-board interaction that may have systematic effects on the evolution of the pay-performance link in CEO compensation. Here, we test the results documented in both the above papers.

*H5 : As CEO tenure increases, the sensitivity of CEO compensation to performance declines.*

Directors who are CEO appointees face a conflict of interest and may not always fulfill their fiduciary responsibility to shareholders. In this case, directors are agents of shareholders - the third party in the agency framework. This entails certain additional agency costs, a deadweight loss to society. These costs can be eliminated if the shareholders themselves are directors and set compensation for the CEO, which is the case in our second treatment. Therefore, we would expect a higher wealth generation for the society as a whole with the largest shareholder as director as compared to the CEO choosing the director.

*H6 : Social welfare, or the total wealth generated in society, is higher when the largest shareholder is director as compared to the CEO choosing the director.*

### *Variables*

There are 5 firms (defined as a single identical production function, and a single state variable - capital) and 10 investors, who trade the shares of the firm in the capital market. Each of the firms has a single director in every period, who represents the Board of Directors. These firms are given initial capital and make decisions, over numerous periods, regarding the allocation of capital to investment (which determines production) and dividend payout. Their earnings are dependent on the production and are also subject to stochastic productivity and depreciation of capital.

The **focus variables** are:
1. Appointment of the directors
   a) The CEO appoints a director from any of the shareholders.
   b) The largest shareholder is automatically appointed as director.
2. the degree of uncertainty (which is captured in the form of stochastic depreciation and stochastic productivity of capital).

The **dependent variables** are:
1. CEO pay-performance link.
2. Shareholder wealth.
3. CEO's "unobservable" action : allocation of capital to investment and dividend.
4. Level of CEO compensation.
5. Stock prices.
6. Periodical earnings and closing capital for each firm.
7. Director shareholding.
8. Tenure of CEO.

### *Treatments*

In order to test the above hypotheses, we outline below the treatments which control for the "experience effect" of the participants in the experiment:

*Treatment #1 :*  [A1 + A2]
*Treatment #2 :*  [A2 + A1]

*where   A1 : CEO appoints Director   ;   A2 : Largest Shareholder is appointed Director*

We attempt to control for other exogenous factors in the CEO compensation decision by simplifying the structure of the board. The board, therefore, comprises of only one director, who is appointed from among all the investors in the game. In treatment A1, the CEO selects any of the investors as director. In treatment A2, the largest shareholder is automatically appointed as director of the board.

We do not consider the case where a CEO can also be a member of the board because a CEO is usually does not sit on the compensation committee of the board. We also do not consider the case of the largest shareholder appointing a representative on the board, in order to simplify the experiment. This simplification enables us to focus on the effect of directors' private incentives, while controlling other factors that may play a role in the compensation decision.

## 4. Experimental Design and Procedures

We used CapLab (Sunder, 1999) to model and conduct a business game for this experiment. It had five firms, each operated by a subject (CEO), and a stock market in which 10 shareholders held and could trade the shares of these firms. Investors also served as directors for the five firms. The type of currency used was called Game Dollars (G$).

The experiment consisted of four sessions, and each session consisted of multiple rounds or periods.  In each period:

- A director is appointed for each firm.
- Each director sets the compensation of the respective CEO.
- Each CEO makes investment-production-dividend decision.
- Shareholders receive dividends, analyze data, and trade shares of these firms (if they wish to).
- CEOs announce earnings and closing capital for each firm.

Though all participants know one another as members of a class, they individual roles assigned to them are not disclosed.  Investors were identified by numbers and CEOs by letters.  Detailed instructions for the participants, as well as the sequence of events, are presented in Appendix 1A.

### *Firms*

All firms are specified as simple identical production functions and a single-state variable: capital.  Each firm starts with an initial capital of G\$20,000. The production function has diminishing marginal returns:

$$P = C \, (I/C)^{0.5} - 0.53 \, I$$

Where $C$ = total capital available at the beginning of a period, and $I$ = capital retained in the firm (i.e., not paid out as dividend, $= C - D$).

The entire production of the firm is assumed to be sold at a price of \$1 per unit, thus making its gross earnings equal to production of the only commodity in this economy.

The firms are also subject to stochastic productivity of capital and stochastic depreciation of capital.  The productivity is defined in terms of a "strike" (production reduced to 75% of normal) or "no strike" (production is normal) with 50-50 chance each

period. Depreciation occurs at the end of each period and is either 20 or 40 percent of investment for that period, again with 50-50 chance. Both productivity and depreciation are independent random variables each period, but, in any specific period, they are identical across firms.

At the beginning of each period, each CEO decides how to allocate the firms' available capital between investment (used for production) and dividend (paid to investors). At the end of the period, CEOs announce the earnings of their firm (net of depreciation and managerial compensation).

CEO compensation from the firm is set by a two-part contract written by the director at the beginning of each period (a fixed dollar salary plus a stock bonus). The stock bonus is converted to cash at the end of the period at the average share price of the period. CEOs also receive 5 percent interest on their personal bank account balances each period.

### Shareholders

The ten shareholder/investors are initially endowed with an equal number of shares in each firm and a small amount of working capital (100 shares of each of the five firms and G$10,000 in cash). The investors earn dividends on their share holdings at the end of each period. During each period, the security market opens for trading and investors are free to buy/sell shares, subject to market rules.

Shareholder compensation is in form of dividends and trading profits. They are also paid a 5 percent interest on their cash balances at the end of each period. The Closing Portfolio Value of each investor is based on the closing share prices (the procedure for closing share valuation is given below).

## Closing Share valuation : Forecasting Game

Following Lim, Prescott and Sunder (1994) and Marimon and Sunder (1994), we have the CEOs (who do not participate in the stock market) play a stock price forecasting game. Before the trading begins, they are asked to forecast the average share prices for the period each stock (except of their own firm). The player(s) whose prediction is the closest to the actual average price receive(s) a cash bonus, which acts as an incentive for accurate forecasts.

Without any pre-announcement, and after the forecasts for the period t+1 have been submitted, the experimenter declares that the period just ended, t, is the last period of the economy. The median of the forecast prices for each firm are then used as the session's closing share price for that firm.

## Directors

The appointment of directors is a focus variable. Directors are appointed either by the CEO or the shareholders: this is pre-specified at the start of the experiment.

In CCD treatment, the CEO picks one of the ten shareholders to serve as the director at the beginning of each period. In the LACD treatment, the largest investor in the firm at the beginning of the period is automatically designated the director of the firm for that period. Any ties are resolved by random picks.

Soon after they are appointed, directors set compensation for the CEO of their firm for that specific period. The have to select a salary (which is a fixed amount) and a stock bonus (which is converted to cash at the end of the period based on the average share price in that period). Compensation for directors is fixed at G$100 per period. Shareholders were informed about the production function and the CEO's decision set,

but could not observe the CEO's actions, which is in line with the agency theory assumptions.

## Conduct of the Experiment

The subjects were masters level business students at Carnegie Mellon University. Table 1 shows the organization of the five sessions of this experiment which were organized into two sets. The first set of subjects participated in a set of three sessions (10, 10 and 8 periods respectively). A second, separate, set of subjects participated in another set of two sessions of 10 periods each. In the second session of each set, the largest shareholder was automatically appointed the director; in all other sessions, the CEO appointed the director. Before conducting the five sessions for which the data are reported, a pilot session of eight periods was conducted with undergraduate students as subjects. The experience from that session was used to streamline procedures and instructions.

All participants received an instruction set, including an overview of the experimental setting and the sequence of events [Appendix 1A]. CEOs received a specific set of instructions, which included detailed information regarding their Capital Allocation Decision [Appendix 1B]. Investors received their own set of instructions plus a template to facilitate trading on the computer [Appendix 1C].

Computerized data entry reduced time lag and errors. The program took the managers through each step in the sequence of events, privately disclosed the realizations of stochastic productivity and depreciation to each manager (based on random draws made in advance and entered into the program), and helped them see the impact of their proposed decisions on production, earnings, etc. The program

calculated the firms' production and earnings, the dividend per share and the managers' personal compensation, and kept the accounts.  All decisions and data were stored.  In addition, managers filled out periodic data about their firm and compensation on a Record Sheet.

Investors traded in all five securities through a computer network (using the MUDA software).  The investors filled a Dividend Sheet and an Earnings Record Sheet, which recorded closing portfolio for each period as well as their personal compensation. At the end of the experiment, investors filled the Portfolio Valuation Sheet, based on the rules discussed in Section 2.

A Director's Sheet was used for CEOs to appoint directors and for directors to record the CEO's compensation. Each session was conducted over a 3-hour period, including the time for instructions.

## Results

### *A Graphical Overview*

Graphs depicting the movement of each variable (round-wise) provide a striking view of the differences between CCD and LSAD. These graphs, are therefore, included as Appendix 2A (for Session Set A) and Appendix 2B (for Session Set B).

In the graphs, we see a marked difference between the performance of the firms in the CCD and LSAD treatments. Capital, investment and production for each firm show a rising trend in the LSAD periods, and a declining trend in the CCD periods, while there seems to be only a marginal difference in the dividend payments. The earnings in the LSAD periods are much higher than the earnings in the CCD periods. Thus, the performance of all firms, in general, was much better for when the largest shareholder

was director (LSAD). But, there seems to be no difference in the managerial compensation across these treatments. This would support the hypotheses that the pay-performance link is stronger and that the shareholder wealth is higher when the largest shareholder is director.

We also see that the director shareholding is much higher in the LSAD cases, where, as we saw earlier, the pay-performance link seems to be stronger. This could suggest that a higher director shareholding results in a stronger pay-performance link. The level of CEO compensation does not seem to be significantly different, though, especially in Session Set B.

Table 2 summarizes the data from Session Set A (mean in the first panel and medians in the second). Similar data summaries for Session Set B are presented in Table 3. Performance of firms has been much better when the largest shareholder served as the director (LSAD) compared to when the CEO chose the director (CCD). The mean and median closing capital, net earnings, investment and production are all substantially higher in the LSAD case.

However, the dividend is marginally lower in the LSAD case. There is a significant difference in the average share prices for Sessions 1 and 3 of Set A, but overall, the average share price is higher under the LSAD treatment.

CEO compensation is higher in the CCD case. However, in Table 3 for Set B, though the salary and the stock bonus paid to the CEO are significantly higher in the CCD case, the total compensation is almost the same because of the higher average share prices for LSAD. Overall, the data from both sets of sessions, conducted with two independent sets of subjects, reinforce each other.

### Pay-Performance Link

Jensen and Murphy (1990) define the pay-performance sensitivity, b, as the dollar change in the CEO's wealth associated with a dollar change in the wealth of the shareholders. Change in CEO wealth is the change in the total compensation of the CEO in that period. The change in shareholders' wealth is defined as $r_t V_{t-1}$, where $r_t$ is the inflation-adjusted rate of return on common stock realized in year t and $V_{t-1}$ is the firm value at the end of the previous year.

For the purpose of comparing the CCD and LASD treatments, we use a modified version of Jensen and Murphy's sensitivity measure. The change in shareholders' wealth is defined as the sum of dividends and capital gains earned by shareholders in that period. Thus the regression model is:

$$\Delta(\text{CEO compensation}) = a + b\,[\Delta(\text{shareholder wealth})] \qquad (1)$$

*where $\boldsymbol{D}$(shareholder wealth) = dividend$_t$ + [(avg share price)$_t$ - (avg share price)$_{t-1}$]\*1000*

Equation (1) assumes that current year performance is the only determinant of current compensation. This may not be true as the previous year's performance may influence the current year's compensation contract. We, therefore, also estimate an alternative specification of the regression equation with the time lag included:

$$\Delta(\text{CEO compensation}) = a + b_1[\Delta(\text{shareholder wealth})]_t + b_2[\Delta(\text{shareholder wealth})]_{t-1} \quad (2)$$

*where $\boldsymbol{D}$(shareholder wealth) = dividend$_t$ + [(avg share price)$_t$ - (avg share price)$_{t-1}$]\*1000*

Table 4 summarizes the regression estimates. The results for both sets of sessions reveal that the pay-performance link is stronger when the largest shareholder serves as the director (the LSAD treatment) than with the CEO choosing the director (the CCD treatment). The coefficient in the CCD case for Session Set A (Equation 1) is insignificant, while the corresponding LSAD case has a significant (at 99%) coefficient of 0.0255. Similarly for Session Set B (Equation 1), the coefficient is insignificant in the

CCD case, and significant (at 99%) in the LSAD case.  This implies that when the CEO chooses the director, there is no link between the CEO's compensation and performance.  A significant pay-performance link arises when the largest shareholder is also the director of the firm.  Estimated coefficients of lagged variables are insignificant (i.e., previous period's performance has no effect on CEO's pay.)

When we combine the two coefficients in Equation (2) [similar to the procedure followed in Jensen and Murphy (1990)], we see that the pay-performance link is significantly stronger when the largest shareholder is the director (LASD treatment) in both sets of experimental sessions.

The ratio of the total compensation of the CEO to the net worth of the firm (which is equal to the closing capital) was much higher when the CEO appointed the director. The instructions limited CEO compensation to no more than 20 percent of the opening capital of the firm.  This limit reflects the real world constraints to some extent. This limit was frequently reached when the CEO appointed the director.

The behavior of the participants was very interesting.  When the CEO appointed the director, some directors gave large compensation to the CEO to ensure their own reappointment and sold most of their shareholdings in that firm to minimize their portfolio losses. In fact, the data for appointment of directors reveals that 51 out of the 85 directors appointments in the CCD sessions of Set A were reappointments.

### Shareholder Wealth

To test whether the governance rule affects shareholder wealth, we compare the CCD and LSAD treatments. The results are given in Table 5.  In both sets of sessions, shareholder wealth is significantly higher under the LSAD treatment than under CCD.

In Set A, shareholder wealth in the CCD rounds has a mean of 2,483.6 (S1) and 269.6 (S3) compared to a mean of 3,629.9 for the LSAD (S2). Two separate t-tests for difference in means show that shareholder wealth is significantly higher under LSAD. In Set B, the CCD has a mean of 570.6 as against a mean of 2,109.2 under LSAD. A t-test reveals the difference in means to be significant at 1 percent level of significance. Seen in conjunction with the time series of various performance variables, the results strongly support the proposition that more shareholder wealth is generated when the largest shareholder is director, compared to when the CEO chooses the director.

### *Effect of Director shareholding on CEO Compensation*

We examine two propositions about the effect of the directors' shareholdings on their choice of the CEO's compensation function. One relates to the level of CEO compensation and the other to the sensitivity of the CEO pay-performance link.

In Session Set A, the identity of the director was public knowledge; all players knew the ID of the director of each firm, and the compensation awarded. To examine whether this public knowledge played a major role, a slight modification was introduced in Session Set B, where the identity of the director was not disclosed publicly.

#### *Level of CEO Compensation*

We regress the CEO's total compensation on director shareholding:

CEO Total compensation $= a + v$ (director shareholding) (3)

Here, we do not need to control for size of firms, age and experience of CEOs or other similar factors that may influence the level of compensation because, these variables are held constant in our experimental setting. The estimates regression

equation (3) are given in Table 6.  They reveal striking differences between the CCD and the LSAD treatments.  In Session Set A, the CCD treatment shows a large intercept and a strong negative relationship between CEO compensation and director shareholding, while the LSAD treatment shows a smaller intercept and a positive relationship between the two.

The CCD treatment is consistent with the tendency of some directors pay high compensation to ensure their own reappointment (and thus compensation) followed by sale of any shares of the firm run by the generously overpaid CEO to minimize portfolio losses. Under LASD treatment, as the firm does better, the director increases his or her shareholding and pays the CEO a higher level of compensation. This would give us a new focus on the role of directors.

In Session Set B, unlike Set A, there is no relationship between CEO compensation and director shareholding under CCD treatment.  Since identification of the directors was not published in Set B, it took CEOs much longer to identify the directors who were generous with high compensation.  However, the results for the LSAD treatment are about the same for the two sets of sessions.

*Sensitivity of the pay-performance link*

Here, we examine the effect of director shareholding on the sensitivity of the pay-performance link.   The sensitivity measure is defined as the change CEO compensation, as a percentage of the change in net earnings. We regress this sensitivity measure on director shareholding.

sensitivity measure =  a  +  s [director shareholding]                 (4)

The results of this regression are given in Table 7 below.

The coefficient s, for the CCD treatment in Session Set A is negative and significant, indicating that larger the number of shares held by the director, lower is the pay-performance sensitivity. These results reconfirm the strategy of used by some directors (discussed in the preceding section) to pay high compensation, regardless of CEO performance, to ensure reappointment and then sell shares in the firm to minimize portfolio losses. With lack of transparency in Session Set B, the result is not significant. Under LASD treatment, coefficient of director shareholdings is positive but it does not reach the 5 percent significance level. The same is true of Session Set B.

### Effect of tenure on CEO Compensation

To examine the proposition that the pay-performance link gets weaker as the tenure of the CEO increases, we can compare the strength of the link in the first and second halves of each session. A weakening of the pay-performance link in the latter half will be evidence in support of the proposition. However, in laboratory sessions, subjects also learn as they move through each period of a session, and confounding of learning and the tenure effect is possible. We re-estimate equation (1) used in Hypothesis 1:

$$\Delta(\text{CEO compensation}) \ = \ a \ + \ b \ [\Delta(\text{shareholder wealth})] \hspace{2cm} (1)$$
*where $D$(shareholder wealth) $=$ dividend$_t$ $+$ [(avg share price)$_t$ - (avg share price)$_{t-1}$]\*1000*

Estimation results in Table 8 yield little evidence to indicate that the pay-performance link is weaker in the second half. There seems to be little difference between the two halves and in fact, in some cases, the pay-performance link seems to be slightly stronger in the second half. Our data do not support the tenure hypothesis. This could either be due to the confounding with the learning mentioned above. Alternatively, the experimental setting does not allow for negotiation between the CEO

and the directors, which is the basis for a similar hypothesis proposed in Cyert and Kumar (1996).

### *Social Welfare*

We measure social welfare by the sum of the wealth of all agents in the economy: shareholders, as well as CEOs. We compare the differences between the average total wealth under the CCD and LSAD treatments using t-statistics. The results are shown in Table 9. In both sets of sessions, social welfare is significantly higher under LSAD than under CCD. In Session Set A, the CCD sessions (S1 and S3) have a mean of 3.613.4 and 3,602.3 respectively as compared to a mean of 4,693.2 for the LSAD session (S2). In Session Set B, the CCD treatment has a mean of 2,495.4 compared to a mean of 4,124.8 under the LSAD treatment. T-tests confirm all these differences to be highly significant. Overall, the results of the experiment strongly support the proposition that social welfare is higher when the largest shareholder is director compared to when the CEO chooses the director.

## 6. Summary and Limitations

The main propositions addressed here are that (1) the pay-performance link is stronger and (2) shareholder wealth is higher, when the largest shareholder serves as the director of the firm as compared to directors chosen by the CEO.

An experimental framework was designed to incorporate various aspects of the corporate world. CEOs controlled firms and took "unobservable" actions and observable dividend decisions. They reported the earnings and the capital of the firm each period, based on which shareholders traded in the stock market. The directors set CEO compensation contracts every period. The main treatment concerned the appointment

of directors and the results were analyzed for cases where the largest shareholder was director and where the CEO appointee was director.

The results show striking differences in the two cases. As predicted, we see a stronger pay-performance link and higher shareholder wealth when the largest shareholder is director. In regard to the relationship between the level of CEO compensation and director shareholding, we find startling differences in the two cases. A director chosen by the CEO pays higher compensation to ensure reappointment and sells shares in the firm to minimize portfolio losses. On the other hand, a director, who is the largest shareholder, structures compensation in a manner so as to achieve a stronger pay-performance link.

Thus, we find that the appointment of the largest shareholder as director ensures that the interests of the CEO are linked with those of the shareholders. Moreover, the CEO also benefits, as the firm value increases and the CEO compensation, though a smaller fraction of the firm value, may also increase in absolute terms, as seen in one of the experiments.

The benefit to CEOs is not consistent with the results in Cyert and Kumar (1996) and in Gibbons and Murphy (1992), but there are interesting behavioral aspects that are revealed by a close examination of the role of the director.

These results have their own limitations. The corporate hierarchy is missing in the experimental setting; therefore, the behavior of other managers in a corporation, their impact on a CEO's actions and the effect of their compensation packages on the CEO's compensation are ignored. The experiment does not capture the reputation factor, which would also influence a CEO's actions. The absence of a market for CEOs

is another weakness; and the players' in this game do not have corporate experience, therefore their actions may not be representative of those taken by CEOs.

The results are, therefore, presented with these limitations in mind. These limitations may be mitigated, to some extent, by the advantages of the experimental setting as we can focus on one aspect of the corporate world, while holding all other factors constant. This research attempts to provide a new direction to the current research in managerial compensation by examining some of the behavioral aspects of directors with respect to top management compensation.

## Implications for corporate governance and accounting policy

*Role of directors as agents and associated agency costs*

We focus on the role of directors as agents of shareholders and we find, in an experimental setting, that there are associated agency costs, which are higher when directors' interests are not linked with those of the shareholders. Therefore, it is worth exploring whether structuring director compensation to include a greater amount of stock-based pay or a higher institutional presence on the board of directors, especially on the compensation committee, may be to the advantage of shareholders.

*Accounting standard setting : options deducted from earnings?*

There is a continuing debate on the accounting of options granted to CEOs. FASB was initially exploring the possibility of deducting option-based compensation from the earnings of the firm. This proposal met with a great deal of opposition from industry and has therefore made little progress.

Opponents believed that if this proposed rule was approved, that the use of stock options would be reduced and, as a result, it could have serious adverse consequences

on many companies. This belief was supported by Coopers and Lybrand's survey of 156 firms, 83% of who indicated that enforcement of earnings charges for stock options will cause firms to decrease the number of options made available in company stock programs.

Due to growing public pressure against executive compensation, this debate is likely to continue for a long time and may result in a reduction in the use of options as a means of compensating the CEO. This may be detrimental to shareholders' interests, because from our component-based study of determinants of compensation, we find that option-based pay is affected largely by the performance of the firm. More importantly, it is the only component that is affected strongly by future growth prospects of the firm, reflected by the market value to book value ratio. Therefore, options form the most important component of a CEO's pay in terms of aligning the interests of the CEO with those of the shareholders and reducing agency costs.

### *Limits on executive pay*

Public outcry against the magnitude of CEO compensation has been steadily increasing, fueled by a stream of reports on high compensation received by CEOs. The Wall Street Journal (11-Apr-96) reported that the ratio of the compensation of the CEO to that of the average American employee has jumped from 44:1 in 1965 to 212:1 in 1995, and median CEO compensation in 1995 jumped to nearly $2 million, as per surveys by compensation consultants.

This disparity in pay is creating pressure for limits on executive compensation and a group of congressional democrats led by Senator Jeff Bingaman is drafting tax breaks for businesses that cap the highest-paid executive's pay at around 50 times the lowest paid employee's. But, such limits have drawn adverse results in the past: the

limit of $1 million for senior executive compensation in 1993 effectively became a new pay standard, which is probably why CEOs of Fortune 200 companies with salaries under $600,000 got the biggest average raises, 22%, from 1992 to 1994. (Source: Wall Street Journal: 11-Apr-96).

This research suggests that shareholders may get a higher return and more wealth can be generated for society with a focus on the rationale behind CEO compensation and on the people that set the compensation, rather than on its magnitude. We draw evidence from field as well as experimental data, that CEO compensation is lower and has a stronger link to performance when directors have a large shareholding in the firm. Therefore, limiting CEO compensation may not be the solution to the disparity and the "unfairness" of CEO pay. Restructuring board appointments as well as director compensation may be a possible resolution to this problem.

## *Standardization of reporting requirements*

The study on determinants of CEO compensation has been made possible largely by SEC's reporting rules introduced in 1992, under which companies were forced to give details regarding top executive compensation in their proxy statements. But, these reporting rules are still inadequate, as companies use different methods to value options and other stock-based pay, which are becoming increasingly important components of executive pay. It is, therefore, very difficult for shareholders to compare compensation of top executives across firms in the same industry and apply industry performance benchmarks to relative compensation amounts. A standardization of reporting requirements would help shareholders assess whether the CEO is overpaid or not in comparison with similar firms in the industry.

REFERENCES

Baker, G. P. (1989), Piece rate contracts and performance measurement error, Mimeo, Harvard Business School.

Barro, J.R. and R.J. Barro (1990), Pay, performance and turnover of bank CEOs, *Journal of Labor Economics* 8(3) 448-81.

Baum, Laurie and John Byrne (1986), The job nobody wants, Business Week Sep.8 56-61.

Berle, A. and G. Means (1932). The modern corporation and private property, New York: Macmillan.

Black, F. and M. Scholes (1973), The pricing of options and corporate liabilities, *Journal of Political Economy* 81 637-54.

Cosh, Andrew (1975). The remuneration of chief executives in the United Kingdom, *Economic Journal* 85(1) 75-94.

Coughlin, Anne T. and Ronald M. Schmidt (1985), Executive compensation, management turnover and firm performance : an empirical investigation, *Journal of Accounting and Economics* 7(2) 43-66.

Cyert, Richard and Praveen Kumar (1996), On the determination of top management compensation: Complete and incomplete contracting perspectives, Working Paper.

Ely, Kirsten M. (1991), Inter-industry differences in the relation between compensation and firm performance variables, *Journal of Accounting Research* 29 37-58.

Fama, Eugene (1980), Agency problems and the theory of the firm, *Journal of Political Economy* 88(2) 288-307.

Gibbons, Robert and Kevin J. Murphy (1990a), Relative performance evaluation for chief executive officers, *Industrial and Labor Relations Review* 43(3) 30s-51s.

Gibbons, Robert and Kevin J. Murphy (1992), Optimum incentive contracts in the presence of career concerns: Theory and Evidence, *Journal of Political Economy, 258-276.*

Grossman, Sanford and Oliver Hart (1983), An analysis of the principal agent problem, *Econometrica* 7(1) 7-45.

Hart, Oliver (1983), The market mechanism as an incentive scheme, *Bell Journal of Economics*, 14(3) 366-82.

Harris, Milton and Arthur Raviv (1979), Optimal incentive contracts with imperfect information, *Journal of Economic Theory* 20 231-59.

Haubrich, J. (1994), Risk-aversion, performance pay and the principal-agent problem, *Journal of Political Economy* 468-505.

Hemmer, T.; S. Matsunaga; and T. Shevlin (1994), Fair value of employee stock options with expected early exercise, *Accounting Horizons*, December 23-42.

Hermelin, Benjamin and Michael Weisbach (1988), The determinants of board compensation, *Rand Journal of Economics* 19(4) 589-606.

Hermelin, Benjamin and Michael Weisbach (1988), The effect of board compensation and directors' incentives on firm performance, *Financial Management* 20 101-12.

Hirshleifer, David and Yoon Suh (1992), Risk, managerial effort and project choice, *Journal of Financial Intermediation.*

Holmstrom, Bengt (1979), Moral hazard and observability, *Bell Journal of Economics* 10(1) 74-91.

Holmstrom, Bengt (1982a), Moral hazard in teams, *Bell Journal of Economics* 13(2) 324-40.

Jensen, Michael C. and Meckling, William H. (1979), Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 3  305-60.

Jensen, Michael C. and Meckling, William H. (1979), Rights and Production functions : An application to labor managed firms and codetermination, *Journal of Business* 52 (Oct. 1979) 469-506.

Jensen, Michael C. and Murphy, Kevin J. (1990a), CEO incentives: Its not how much you pay, but how, *Journal of Applied Corporate Finance* 36-49.

Jensen, Michael C. and Murphy, Kevin J. (1990b), Performance pay and top management incentives, *Journal of Political Economy* 98(2) 225-64.

Joskow, P. and N. Rose (1994), CEO pay and firm performance: Dynamics, asymmetries, and alternative performance measures, *Mimeo : MIT.*

Kokkelenberg, E.C. (1988), The behavioral objectives of firms and executive compensation, Mimeo, Department of Economics, State University of New York at Binghampton.

Kostuik, Peter F. (1989), Firm size and executive compensation, *The Journal of Human Resources* 25(1) 90-105.

Lambert, R.A. and Larcker, D.F. (1979), An analysis of the use of accounting and market measures of performance in executive contracts, *Journal of Accounting Research*, 25 (supplement) 85-123.

Landsman, Wayne and Alan C. Shapiro (1989), Tobin's q and the relationship between accounting ROI and economic return, Accounting working paper no. 89-3, Anderson Graduate School of Management, University of California at Los Angeles.

Larcker, D.F.; Lambert, R.A.; and Weigelt, K. (1989), Tournaments and the structure of organizational incentives, Mimeo, Wharton School, University of Pennsylvania.

Lewellen, Wilber; Claudio Loderer; and Kenneth Martin (1987), Executive compensation and the executive incentive problem, *Journal of Accounting and Economics*  9 287-310.

Mehran, H. (1995), Executive compensation structure, ownership and firm performance*, Journal of Financial Economics* 38 (1995) 163-84.

Mirrlees, J.A. (1976), The optimal structure of incentives and authority within an organization, *Bell Journal of Economics* 7 (Spring) 105-31.

Morck, Randall; Andrei Schleifer; and Robert Vishny (1988), Management ownership and corporate performance: An empirical analysis, *Journal of Accounting and Economics* 7  11-42.

Murphy, K.J. (1985), Corporate Performance and managerial remuneration, *Journal of Accounting and Economics* 7 (Apr 1985) 11-42.

Murphy, K.J. (1986), Incentives, learning and compensation: a theoretical and empirical investigation of managerial labor contracts, *Rand Journal of Economics* 17 (Spring 1986) 59-76.

Rosen, Sherwin (1981), The economics of superstars, *American Economic Review* 71(5) 845-58.

Rosen, Sherwin (1982), Authority, control and the distribution of earnings, *Bell Journal of Economics* 13(2) 311-23.

Rosen, Sherwin (1992), Contracts and the market for executives in L. Wernin and H. Wijkander (ed.) *Contract Economics*, Oxford: Basil Blackwell.

Rosenstein, Stuart and Jeffrey G. Wyatt (1990), Outside directors, board independence and shareholder wealth, *Journal of Financial Economics* 26 175-91.

Schleifer, Andrei and Robert Vishny (1986), Large shareholders and corporate control, *Journal of Political Economy* 95 461-88.

Stigler, George and Friedland, Claire (1983), The literature of Economics : The case of Berle and Means, *Journal of Law and Economics* 23(2) 237-68.

Vancil, Richard F. Passing the baton : Managing the process of CEO succession, *HBS Press*, 1987.

Warner, Jerold (1985), Stock Market Reaction to Management Incentive Plan Adoption: An overview, *Journal of Accounting and Economics* 145-150.

Warner, Jerold; Watts, Ross; and Wruck Karen (1988), Stock prices and top management changes, *Journal of Financial Economics* 20 (Jan/Mar 1988) 461-92.

Weisbach, Michael (1988), Outside directors and CEO turnover, *Journal of Financial Economics* 20 (Jan/Mar 1988) 431-60.

Table 1

| Experimental Design | | | |
| --- | --- | --- | --- |
| | **Session 1** | **Session 2** | **Session 3** |
| Session Set A | **CCD,10 period** | **LSAD,10 period** | **CCD, 8 period** |
| Session Set B | **CCD,10 period** | **LSAD,10 period** | |

CCD = CEO-chosen directors; LSAD = Largest shareholder as director.

# Table 2: Summary data for Session Set A

**Panel 1 : Mean**

| VARIABLES | CCD | | | LSAD | ALL Data |
|---|---|---|---|---|---|
| | Session 1 | Session 3 | Session 1+3 | Session 2 | S1+S2+S3 |
| Closing Capital | 25,570 | 20,860 | 23,340 | 35,610 | 27,571 |
| Net Earnings | 2,484 | 270 | 1,435 | 3,630 | 2,192 |
| Dividend | 2,121 | 1103 | 1,639 | 912 | 1,388 |
| Investment | 23,090 | 20,590 | 21,910 | 31,880 | 25,348 |
| Production | 10,660 | 8,992 | 9,872 | 14,110 | 11,333 |
| Average Share Price | 30.64 | 62.2 | 45.59 | 53.46 | 48.30 |
| CEO Salary | 62 | 97 | 79 | 26 | 61 |
| CEO Bonus | 30 | 57 | 43 | 13 | 33 |
| Total CEO Compensation | 1,129 | 3,752 | 2,371 | 882 | 1,857 |
| Director shareholding | 101 | 66 | 84 | 181 | 117 |

**Panel 2 : Median**

| VARIABLES | CCD | | | LSAD | ALL Data |
|---|---|---|---|---|---|
| | Session 1 | Session 3 | Session 1+3 | Session 2 | S1+S2+S3 |
| Closing Capital | 26,040 | 20,450 | 24,210 | 33,310 | 26,732 |
| Net Earnings | 2,286 | -513 | 1,497 | 3,276 | 2,386 |
| Dividend | 1,656 | 277 | 1,013 | 843 | 856 |
| Investment | 24,650 | 20,000 | 22,180 | 28,770 | 24,532 |
| Production | 9,815 | 9,024 | 9,416 | 12,620 | 10,008 |
| Average Share Price | 29 | 61 | 50 | 54.50 | 51 |
| CEO Salary | 60 | 100 | 60 | 25 | 40 |
| CEO Bonus | 20 | 50 | 30 | 10 | 20 |
| Total CEO Compensation | 670 | 3,200 | 1,490 | 881 | 982 |
| Director shareholding | 100 | 70 | 95 | 151 | 100 |

## Table 3: Summary data for Session Set B

| VARIABLES | Panel 1 : Mean | | | Panel 2: Median | | |
|---|---|---|---|---|---|---|
| | CCD<br>Session 1 | LSAD<br>Session 2 | All Data<br>S1+S2 | CCD<br>Session 1 | LSAD<br>Session 2 | All Data<br>S1+S2 |
| Closing Capital | 14,203 | 28,077 | 21,140 | 13,455 | 27,797 | 21,863 |
| Net Earnings | 571 | 2,109 | 1,340 | 349 | 2,070 | 967 |
| Dividend | 1,666 | 1,050 | 1,358 | 1,535 | 871 | 1,100 |
| Investment | 13,553 | 25,900 | 19,276 | 12,945 | 25,306 | 19,600 |
| Production | 6,412 | 11,520 | 8,966 | 6,704 | 10,874 | 8,041 |
| Average Share Price | 21 | 35 | 28 | 20 | 35 | 22 |
| CEO Salary | 770 | 326 | 548 | 900 | 300 | 400 |
| CEO Bonus | 74 | 40 | 57 | 30 | 43 | 30 |
| Total CEO Comp. | 1,694 | 1,769 | 1,731 | 1,643 | 1,625 | 1,625 |
| Director shareholding | 104 | 120 | 112 | 100 | 120 | 112 |

## Table 4: Regression Estimates

| | Equation 1 | | | | Equation 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | *Session Set A* | | *Session Set B* | | *Session Set A* | | *Session Set B* | |
| | *CCD* | *LSAD* | *CCD* | *LSAD* | *CCD* | *LSAD* | *CCD* | *LSAD* |
| Intercept | 1,705.2 | 705.6 | 1,732.3 | 1,547.1 | 1,863.5 | 722.3 | 1,616.5 | 1,594.4 |
| [t-statistic] | [10.25]* | [3.94]* | [15.78]* | [12.19]* | [9.89]* | [3.23]* | [13.64]* | [10.51]* |
| $\Delta$(Shr. wealth) | 0.0072 | 0.0255 | 0.0048 | 0.0355 | 0.0151 | 0.0282 | 0.0219 | 0.0316 |
| [t-statistic] | [0.606] | [2.219]* | [0.218] | [3.475]* | [1.056] | [2.166]* | [0.811] | [2.783]* |
| $\Delta$(Shr. wealth), t-1 | | | | | -0.0062 | 0.0059 | 0.0245 | 0.0064 |
| [t-statistic] | -- | -- | -- | -- | [-0.486] | [0.444] | [1.029] | [0.529] |
| $R^2$ | 0.0041 | 0.0930 | 0.0011 | 0.2193 | 0.0209 | 0.1015 | 0.0301 | 0.1734 |
| Estimated b♦ | -- | -- | -- | -- | 0.0089 | 0.0341 | 0.0464 | 0.0380 |
| F-statistic for b | -- | -- | -- | -- | 0.8248 | 2.373* | 0.5679 | 3.881* |

[Note:  For Session Set A, CCD rounds, S1 and S3 have been combined and LSAD represents S2]

* represents significance at 95% confidence level.
♦The estimated b is the sum of the coefficients on the contemporaneous and lagged shareholder wealth change.

Equation 1:

$\Delta$(CEO compensation)  =  a  +  b [$\Delta$(shareholder wealth)]
   *where $D$(shareholder wealth)  =  dividend$_t$  +  [(avg share price)$_t$ - (avg share price)$_{t-1}$]\*1000*

Equation 1:

$\Delta$(CEO compensation) = a + b$_1$[$\Delta$(shareholder wealth)]$_t$ + b$_2$[$\Delta$(shareholder wealth)]$_{t-1}$
   *where $D$(shareholder wealth)  =  dividend$_t$  +  [(avg share price)$_t$ - (avg share price)$_{t-1}$]\*1000*

### Table 5: **Shareholder wealth: Summary Statistics & T-test**

| STATISTICS | Session Set A | | | Session Set B | |
|---|---|---|---|---|---|
| | CCD | | LSAD | CCD | LSAD |
| | S1 | S3 | S2 | S1 | S2 |
| Mean | 2,483.6 | 269.6 | 3,629.9 | 570.6 | 2,109.2 |
| Median | 2,286.0 | -513.0 | 3,276.0 | 348.5 | 2,069.5 |
| Standard Deviation | 2,434.7 | 2,507.2 | 2,380.5 | 1,623.2 | 2,123.7 |
| | | | | | |
| t-test statistic [$H_0 : \mu_1 = \mu_2$]: | | | | | |
| R1 and R2 | | -2.55 ** | | | -4.41 ** |
| R3 and R2 | | -7.59 ** | | | -- |

** represents significance at 5% level.

## Table 6: Level of CEO Compensation

Estimated Equation: CEO Total compensation = a + v (director shareholding)

| | Session Set A | | Session Set B | |
|---|---|---|---|---|
| | CCD | LSAD | CCD | LSAD |
| Intercept | 3,053.66 | -1,003.7 | 1,686 | -1,062.1 |
| [t-statistic] -> | [10.78] * | [-2.76] * | [4.03] * | [-0.99] |
| Coefficient l | -14.27 | 10.421 | 0.506 | 23.175 |
| [t-statistic] -> | [-4.91] * | [5.57] * | [0.13] | [2.59] * |
| $R^2$ | 0.2057 | 0.3926 | 0.0004 | 0.1352 |

* represents significance at 5% level.

## Table 7: Sensitivity of CEO Compensation

Estimated Equation: sensitivity measure = a + s (director shareholding)

| | Session Set A | | Session Set B | |
|---|---|---|---|---|
| | CCD | LSAD | CCD | LSAD |
| Intercept | 0.8671 | -0.1775 | 0.1487 | -2.7391 |
| [t-statistic] -> | [2.40] * | [-1.44] | [0.29] | [-1.79] |
| Coefficient s | -0.0078 | 0.0010 | -0.0024 | 0.0233 |
| [t-statistic] -> | [-2.01] * | [1.59] | [-0.51] | [1.86] |
| $R^2$ | 0.0505 | 0.0611 | 0.0064 | 0.0765 |

* represents significance at 5% level.

### Table 8: CEO Tenure

Estimated Equation: $\Delta$(CEO compensation) = a + b ($\Delta$(shareholder wealth))

where $\boldsymbol{D}$(shareholder wealth) = $dividend_t$ + [(avg share price)$_t$ - (avg share price)$_{t-1}$]*1000

| | Set A : 1st half | | Set A : 2nd half | | Set B : 1st half | | Set B : 2nd half | |
|---|---|---|---|---|---|---|---|---|
| | CCD | LSAD | CCD | LSAD | CCD | LSAD | CCD | LSAD |
| Intercept | 1,007.3 | 321.0 | 2,299.5 | 1,131.6 | 1,861.5 | 1,379.5 | 1,608.9 | 1,767.6 |
| [t-statistic] -> | [4.73] * | [5.94] * | [11.19]* | [3.69] * | [10.78]* | [9.25] * | [19.85]* | [8.42] * |
| Coefficient b | 0.0084 | 0.0082 | 0.0293 | 0.0375 | -0.0106 | 0.0263 | 0.0670 | 0.0402 |
| [t-statistic] -> | [0.63] | [2.15] * | [1.68] | [2.05] * | [-0.40] | [1.94] | [1.64] | [2.68] * |
| $R^2$ | 0.0095 | 0.1680 | 0.6056 | 0.1550 | 0.0068 | 0.1405 | 0.1433 | 0.2855 |

* represents significance at 5% level.
Data from the CCD sessions, R1 and R3, have been combined.


### Table 9: Social Welfare : Summary statistics & t-test

| STATISTICS | Exp. 2 | | | Exp. 3 | |
|---|---|---|---|---|---|
| | CCD | | LSAD | CCD | LSAD |
| | R1 | R3 | R2 | R1 | R2 |
| Mean | 3,613.4 | 3,062.3 | 4,693.2 | 2,495.4 | 4,124.8 |
| Median | 3,851.0 | 2,777.0 | 4,370.0 | 2,101.0 | 3,441.0 |
| Standard Deviation | 2,383.8 | 2,143.5 | 2,294.3 | 1,708.2 | 2,090.7 |
| t-test statistic [H$_0$ : $\mu_1$ = $\mu_2$]: | | | | | |
| R1 and R2 | | -2.40 * | | | -4.13 * |
| R3 and R2 | | -3.57 * | | | -- |

* represents significance at 5% level.