

INTRODUCTION

This paper studies reciprocal interlocks of boards of directors of large firms where an employee of firm A sits on firm B's board and at the same time an employee of firm B sits on firm A's board. The study of Boards of Directors by those in economics and finance is not new. In fact, Dooley (1969) writes of interlocking directorates, but his definition is different in that he presents evidence of interlock where "at least one director ... sat on the board of at least one other of the largest companies". Books by Mizruchi (1982) and Pennings (1980) as well as many articles, for example Bearden and Mintz (1985), Bunting and Barbour (1971) and Mintz and Schwartz (1981) discuss interlocking boards in much more detail from a sociological perspective. Mizruchi and Stearns (1988) study the longitudinal formation of interlocking directorates using a small sample of firms.

This paper uses data from the early 1990s to explore reciprocal interlocks and the effects they have on firms. There are several goals, including documenting the frequency of interlocks and the characteristics of boards that interlock, exploring several different definitions of reciprocal interlock, examining whether interlocks are symptomatic of agency problems, and whether interlocks have an effect on managerial pay.¹

INTERLOCK TYPES AND SAMPLE CHARACTERISTICS

The sample frame used in the paper is firms listed in the *Forbes* magazine 500s list which is a list of the 500 largest firms in each of four categories, sales, profits, assets, and market value, in 1992; 773 unique firms made the list in that year. I collected detailed information on the boards of directors for each of the firms in the sample from annual and proxy reports. Table 1 is an example of the kind of data collected for one of the firms, Merck & Company. For each director I collected the name, occupation, principal employer, and whether the person was retired from his or her main job. The entire data set includes 9,804

Table 1. Example of Director Data for Merck & Company, 1992^a

<i>Firm</i>	<i>Last</i>	<i>First</i>	<i>Middle</i>	<i>Occupation</i>	<i>Employer</i>	<i>Retired</i>
Merck	Atwater	H	Brewster	CH-CEO	General Mills	0
Merck	Birkin	Derek		CH	RIZ	0
Merck	Bossidy	Lawrence	A	CH-CEO	Allied Signal	0
Merck	Bowen	William	G	PR	Andrew W Mellon	0
Merck	Davis	Carolyne	K	Consultant	Self	0
Merck	Elam	Lloyd	C	Professor	Meharry Medical	0
Merck	Exley	Charles	E	CH-CEO	NCR	1
Merck	Horan	John	J	CH-CEO	Merck	1
Merck	Kelley	William	N	CEO	University of Pennsylvania Medical Center	0
Merck	Markham	Richard	J	PR-COO	Merck	0
Merck	Merck	Albert	W	Trustee	Merck Family Trusts	0
Merck	Mettler	Ruben	F	CH-CEO	TRW	1
Merck	Ross	Richard	S	Dean	Johns Hopkins University	1
Merck	Vagelos	P	Roy	CH-CEO	Merck	0
Merck	Weatherstone	Dennis		CH	JP Morgan & Company	0

^aFor each director and for all firms, the data include the last name, the first name, the middle name, the principal occupation, the principal employer, and whether or not the individual is retired from his or her main occupation. Retired = 1 if the individual is retired from his or her main occupation, 0 otherwise. The entire director data set includes 772 other tables that are set up precisely like this one.

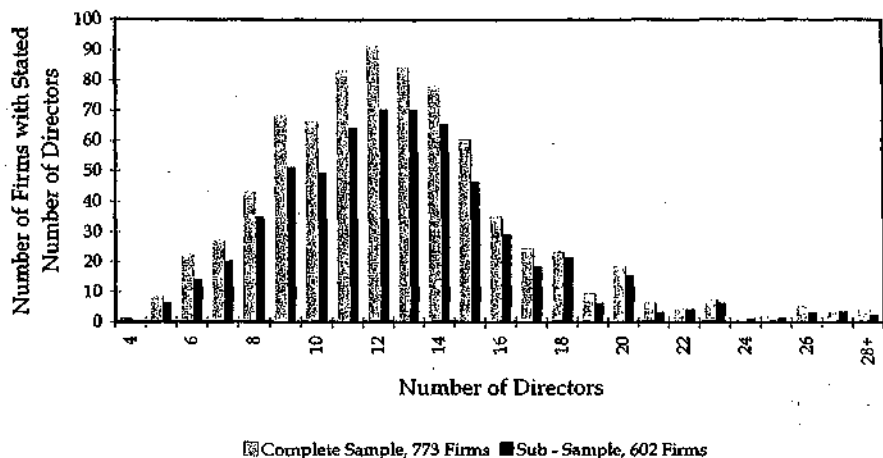


Figure 1. Distribution of number of directors per firm

director seats held by 7,519 individuals.² Figure 1 shows the distribution of the number of directors per board. The average is 13 and it is clear from the figure that most boards in this sample have between 9 and 15 members.

It was important to collect information on all firms, as if one of the sample firms was excluded then remaining firms may actually look not interlocked when, in fact, they were. In some cases, therefore, I needed to supplement the data with additional information from other sources such as *The Million Dollar Directory*, *Standard & Poor's Register of Corporations, Directors, and Executives*, *The Directory of Corporate Affiliations*, *Who's Who in Finance and Industry*, Lexis-Nexis, and Laser Disclosure.

The first interlock type is what I call current-CEO interlock. Firms A and B are current-CEO interlocked if the current CEO from firm A is a member of firm B's board and the current CEO from firm B is a member of firm A's board. Figure 2 is a histogram of the fraction interlocked by interlock type. There are two bars for each type of interlock (others explained below), representing the entire sample of 773 firms, and the subsample ($n=602$) which contains all additional data used elsewhere in the paper for each firm. About 8% of the firms are current-CEO interlocked.

Second, firms A and B are current-employee interlocked if any current employee of firm A (including the CEO) serves as a director of firm B and if any current employee of firm B (including the CEO) serves as a director of firm A. About 12% of firms are current-employee interlocked.

The third and fourth measures of interlocking only consider individuals who have retired from their main jobs. Retired individuals are not as likely to have

² There are fewer individuals than seats as some individuals serve on more than one board.

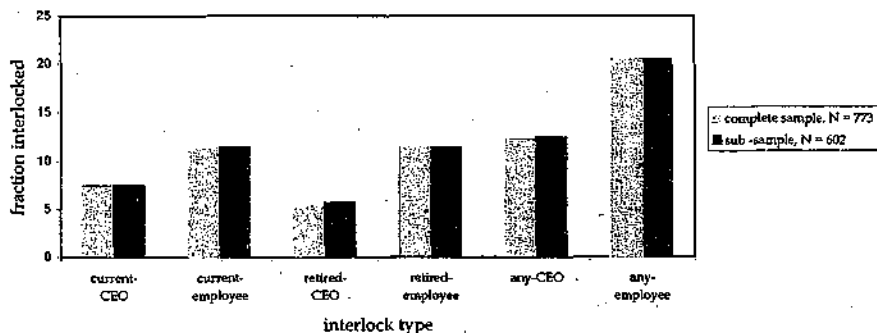


Figure 2. Fraction interlocked by interlock type

such direct input in a reciprocal arrangement. However, since they were employees of the firms in question they may have participated in a stronger form of interlock prior to becoming retired. Retired-CEO interlock occurs between firms A and B when a retired CEO of firm A serves as a director of firm B and a retired CEO of firm B serves as a director of firm A. Firms A and B are retired-employee interlocked when any retired employee (including retired CEOs) of firm A serves as a director of firm B and any retired employee (including retired CEOs) of firm B serves as a director of firm A. The fraction interlocked for these two groups are not significantly different using these measures relative to those interlocked via current employees.

The fifth measure of interlock is any-CEO interlock. Firms A and B are any-CEO interlocked when a current or retired CEO of firm A serves as a director of firm B and a current or retired CEO of firm B serves as a director of firm A. Of course each firm that is current-CEO interlocked or that is retired-CEO interlocked is also any-CEO interlocked, but some firms that are neither current-CEO interlocked nor retired-CEO interlocked may be any-CEO interlocked. This occurs, for example, when the current CEO of firm A sits on firm B's board and a retired CEO of firm B sits on firm A's board. Any-CEO interlock occurs in about 12% of firms.³

Any-employee interlock is the sixth and most comprehensive interlock measure. Two firms are any-employee interlocked if any current or retired employee of firm A serves as a director of firm B and vice versa. Any firm that is current-employee interlocked or that is retired-employee interlocked must be any-employee interlocked but additional firms can be also. This occurs, for example, when the current Vice President of firm A serves on firm B's board and the retired Treasurer of firm B serves on firm A's board. Roughly 20% of firms are any-employee interlocked.

³ The sum of the fraction of firms current-CEO interlocked and retired-CEO interlocked can be greater than the fraction any-CEO interlocked since some firms can be simultaneously current-CEO interlocked and retired-CEO interlocked.

Some of the characteristics of the boards are listed in Table 2. The average number of directors per firm is 12.71, the average fraction of inside directors is 0.25, and the average proportion of directors on a given board who are principally employed by one of the other large firms is 0.44. The table also computes averages for these variables for the any-employee interlocked and non any-employee interlocked groups separately.

Interlocked boards have, on average, more directors, fewer insiders, and are more likely to have directors from one of the other sample firms. Table 2 also lists the average market value of equity (collected from Compustat) and the average stock return (collected from CRSP). Interlocked firms are much larger (in terms of market value of equity) than non-interlocked firms although the returns are not significantly different. Finally, Table 2 lists the 12 primary occupations for board members and the average fraction for each per board.

Table 2. Summary Statistics for Boards and Firms

	<i>All</i>	<i>Non any-employee interlocked</i>	<i>Any-employee interlocked</i>
Number of directors	12.71 ^b (0.16)	12.32 (0.19)	14.24 (0.15)
Proportion insiders	0.25 ^b (.01)	0.26 (0.01)	0.23 (0.01)
Proportion of directors employed by one of original sample firms	0.44 ^b (0.01)	0.41 (0.01)	0.54 (0.01)
Market value of equity (\$millions)	4,843 ^b (336)	3,783 (324)	8,973 (975)
Stock return ^a in year t-1	0.48 (0.03)	0.49 (0.03)	0.44 (0.04)
Proportion of directors per firm who list primary occupation as			
CEO	0.32 ^b (0.01)	0.29 (0.01)	0.41 (0.01)
Chairman	0.13 (0.004)	0.13 (0.01)	0.14 (0.01)
President	0.16 ^b (0.004)	0.16 (0.01)	0.14 (0.01)
Vice chairman	0.05 (0.003)	0.05 (0.003)	0.06 (0.01)
Vice president	0.10 ^b (0.01)	0.11 (0.005)	0.08 (0.01)
Professor	0.04 ^d (0.003)	0.03 (0.003)	0.04 (0.004)
Attorney	0.02 ^c (0.002)	0.02 (0.002)	0.01 (0.003)
Doctor	0.003 (0.0001)	0.003 (0.001)	0.001 (0.001)
Government official	0.01 ^c (0.001)	0.007 (0.001)	0.013 (0.002)
Consultant	0.02 ^d (0.002)	0.024 (0.002)	0.016 (0.003)
Businessman	0.09 ^b (0.004)	0.09 (0.01)	0.07 (0.01)
Other occupation	0.07 ^b (0.004)	0.08 (0.01)	0.03 (0.004)
<i>n</i>	602	479	123

^aAnnual stock return from CRSP in 1991. All other data from 1992. ^{b,c,d}Mean differences between last two columns at 0.01, 0.05, and 0.10 levels. Standard errors are in parentheses.

Before I examine any effects of interlock on firms, it is important to try to study what interlocks really mean. Are interlocks cronyism? Are interlocks representative of customer/supplier, banking, or other business relationships among firms? Are interlocks simply representative of firm ownership? Do interlocked firms have lower accounting or stock market returns than non-interlocked firms? Do interlocks occur any more frequently than would be expected by random chance?

Are interlocks just random assignment?

What fraction of firms would be interlocked if directors were randomly assigned to board positions? We should not think *a priori* that this fraction is zero. In this section I focus on the broadest measure of interlock, any-employee interlock. To test whether the fraction any-employee interlocked is simply an artifact of random assignment, I simulate what the true fraction interlocked would be under a set of assumptions. First I assume that the actual board sizes and populations of directors are exogenous. That is, the directors who are currently in my sample are the entire population of potential directors. I further assume that for each of the 999 iterations of randomly assigning directors, each director position will be reassigned a spot in the sample. Finally, I assume that interlocks are allowed within an industry⁴ as well as across industries.

The results of the simulations are shown in Table 3. The first row describes the data from the complete sample of 773 firms. In those firms there are 9,804 director seats filled by 7,519 individual directors. The actual fraction any-employee interlocked is 20%, which is much larger than the 4.4% we would find if these directors were assigned to positions randomly. The second row (top 500 sales) repeats the analysis for the largest 500 firms by sales. In this subsample, a larger fraction of the firms are interlocked, 24%. Although there are fewer firms in this sample with which to interlock, larger firms are much more likely to interlock. Therefore the fraction interlocked in this smaller sample is larger. The simulated fraction in this subsample is also larger, at 8%, but still substantially smaller than the actual fraction. The rest of the top panel in Table 3 shows the simulated and actual fraction interlocked for various subsamples of the director data. As the sample size is decreased, both the true and simulated fraction interlocked tend to increase but the true fraction interlocked remains substantially larger than the simulated fraction.

In light of a comment by Jensen and Murphy (1990) that "disclosure of top-management compensation can help guard against 'looting' by management (in collusion with 'captive' boards of directors)", we might guess that the true fraction interlocked might be smaller today than was the case in an earlier

⁴ Technically employees of one firm cannot serve as directors for another firm in the same industry according to the Clayton Act of 1914. However, even though there have been potential violations of the act, it is very rarely enforced (see Dooley, 1969).

Table 3. Actual and simulated fraction of interlocking directorships using data from two years^a

<i>Firms</i>	<i>Seats</i>	<i>Directors</i>	<i>Simulated fraction any- employee- interlocked</i>	<i>Actual fraction any-employee- interlocked</i>
Data from 1992				
Top 773	9,804	7,519	0.0435 (0.0003)	0.2040 (0.0146)
Top 500 (sales)	6,441	4,773	0.0768 (0.0005)	0.2400 (0.0191)
Top 400 (sales)	5,285	3,912	0.0957 (0.0006)	0.2650 (0.0221)
Top 300 (sales)	4,048	3,003	0.1178 (0.0008)	0.2933 (0.0263)
Top 252 (sales)	3,469	2,593	0.1386 (0.0009)	0.2857 (0.0285)
Data from 1976				
Top 252 (sales)	3,976	3,108	0.1431 (0.0009)	0.0754 (0.0167)

^aThe first panel uses the data collected from 1992 and the second panel uses data from 1976. In Panel A Top 773 represents the entire director sample from 1992. This is all 773 of the *Forbes 500s* firms. Seats are the actual number of board director positions. For all 773 firms there were 9804 seats. However, since some directors serve on more than one board there were only 7519 unique directors in the top 773 firms. To perform the simulations, I assume that (1) directors who are currently in my sample are the entire sample of potential directors, (2) each director position has probability one of being randomly reassigned a spot in the sample, and (3) interlocks are allowed within industry. 999 iterations are performed for each sample. The actual fraction of any-employee interlocked firms is reported in the last column. Interlocking appears to happen much more frequently than if directors were randomly assigned to boards. Each row in the top panel represents a different sample from the data. The bottom panel reports results using the 252 largest firms in terms of sales in 1976. This is the size of the sample obtained from Bearden and Mintz (1985). (Standard errors are reported in parentheses).

period, as disclosure has become more common and SEC rules more strict. Surprisingly, this is not the case. Although the simulated fraction (if directors are assigned randomly) is very similar in 1992 (penultimate row in Table 3) and 1976 (last row in Table 3; 13.9 vs. 14.3%), the actual fraction is much larger in 1992 relative to 1976 (28.6 vs. 7.5%).⁵ This could be the result of measurement error in the collection of the data for 1976 but could also be due to the increased numbers of joint venture and other business relationship or customer supplier relationships among firms over the time period.

Anti-takeover amendments, poison pills and golden parachutes

To answer additional questions about agency costs I tried to study whether the firms had (1) anti-takeover amendments, (2) golden parachutes or (3) poison pills by exploring the annual reports, proxy statements, 10Qs, and 10Ks for a large subset (602) of the original 773 firms in a very simple way.⁶ A positive

⁵ I thank Beth Mintz and James Bearden for access to their director data set from 1976.

association between interlock and these phenomena might imply agency conflicts. For a given firm, I searched using a computer through the reports for the words, anti-takeover, golden parachute, and poison pill. If one of these words was detected, I read the text more carefully and determined whether these phenomena actually existed in these firms.

Table 4 shows that although the fraction of any-employee interlocked firms that have poison pills and anti-takeover amendments is higher than the fraction for non-interlocked firms, the difference is not statistically significant. However, the fraction of any-employee interlocked firms that have golden parachutes is lower than the fraction of non-interlocked firms (the results are the same for the five other measures of interlock). Even if we were willing to assume that poison pills, anti-takeover amendments or golden parachutes were symptomatic of agency conflicts (and that this is a good method for finding them), the data do not provide strong evidence that interlocked firms are more likely to have them.

Table 4. Fraction of any-employee interlocked firms and non any-employee interlocked firms with poison pills, anti-takeover amendments, and golden parachutes^a

	<i>Non any-employee interlocked firms (n=479)</i>	<i>Any-employee interlocked firms (n=123)</i>
Poison pill	3.97% (0.89)	5.69% (2.10)
Anti-takeover amendment	7.93% (1.24)	9.76% (2.69)
Golden parachute	3.34% (0.82)	0.81% (0.81)

^aTwo firms are any-employee interlocked if any current or retired employee of firm A is a director of firm B and vice versa. For these 602 firms a determination was made about whether the firms have poison pills, anti-takeover amendments, or golden parachutes by reviewing annuals reports, proxy statements, 10Ks and 10Qs for each firm. (Standard errors are reported in parentheses).

Customer/supplier, banking and other business relationships

It may also be the case that interlocks simply reflect other kinds of business relationships such as customer/supplier, banking, or other business relationships and that they are not, therefore, cronyism at all. For each interlocked firm I studied annual reports, proxy statements, 10Ks and 10Qs to study why these firms were interlocked. For each firm I again searched with a computer through the reports for the name of the firm to which it was interlocked. When the computer found the name of the other firm in these reports a determination was made as to whether the firms had a customer/supplier, banking, other business relationship, or a relationship not explained by one of the other three

⁶ Some firms were excluded since all reports could not be located.

Table 5. Fraction of any-employee and any-CEO interlocked firms with customer/supplier, banking, or other business relationships^a

	<i>Any-employee interlock</i> (<i>n</i> = 123)	<i>Any-CEO interlock</i> (<i>n</i> = 75)
Customer/supplier relationship	13.01% (3.05)	10.67% (3.59)
Banking relationship	6.50% (2.23)	13.33% (2.28)
Other business relationship	14.63% (3.20)	13.33% (3.95)

^aTwo firms are any-CEO interlocked if a current or retired CEO of firm A serves as a director of firm B and a current or retired CEO of firm B is a director of firm A. Two firms are any-employee interlocked if any current or retired employee of firm A is a director of firm B and vice versa. I studied whether the firms have customer/supplier, banking, or other business relationships by going back to annual reports, proxy statements, 10Ks and 10Qs for each interlocked firm. For example, if firm A was interlocked with firm B, a computer searched through each of firm A's reports looking for reference to firm B. When a reference was found, a determination was made about whether these relationships were customer/supplier, banking, other business relationships, or none of the others. (Standard errors are reported in parentheses)

categories. Table 5 shows the fraction of interlocked firms whose interlocks are relationship-based. For example, two firms that participate in a joint venture are considered to have a business relationship. The first column is the fraction of any-employee interlocked firms with these relationships. The second column is the fraction of any-CEO interlocked firms with these relationships.

Although this clearly does not account for all interlocks which are due to business relationships, a strong case can be made that cronyism is less likely to be a problem in the firms with these kinds of arrangements. A number of firms seem to be interlocked for business reasons. For example, of any-employee interlocked firms, 13% had identifiable customer/supplier relationships, and 15% had other business relationships. Firms that have at least one customer/supplier, banking, or other business relationship make up 26% of the any-employee interlocked firms and 22% of the any-CEO interlocked firms (clearly some of the firms have more than one of these relationships at once). This section seems to lend some evidence against the notion that interlock is just cronyism; however, a large fraction of interlocks remain unexplained by business relationships. Part of the analysis below on managerial compensation (Table 8) separates firms into all interlocked firms and those who are interlocked for reasons unexplained by customer/supplier, banking, or other business relationships. Although one cannot be certain, it is possible that the remaining firms are more likely to have agency costs than the former.

CEO and officer and director ownership

I also analysed whether interlock might just mean ownership of the firm. If it were the case that firms currently headed by founders or firms whose CEO

owned larger share holdings (either in terms of proportion of stock owned or total value of shares held) or firms whose officers and directors had larger ownership interests, were systematically more likely to be interlocked, then the interlock variable may mean something other than cronyism and something more like ownership over the firm. If the owner and manager are the same, there is no agency conflict. To help study this I have collected the percent of stock in the firm owned by the chief executive and the fraction owned by officers and directors from *Forbes*. These are included as measures of ownership structure. It may be the case that if a CEO owns more of the stock of the firm for which he is employed, his interests are more in line with those of the shareholders than otherwise.

I ran probit models where the dependent variable was any-employee interlock (not reported in the tables). Explanatory variables included CEO, officer, and director share ownership, an indicator variable for whether the CEO is a founder, firm equity value, and stock market return. Various tests suggest that CEOs with more control in terms of ownership are not more likely to be interlocked.

Performance

Do interlocked firms have lower performance than other firms? Lower profits or returns for interlocked firms might be suggestive of agency conflicts. Although interlocked firms have a lower point estimate of returns, the effects are insignificant for each measure of return: stock return (see Table 2), return on assets, and return on equity.

To summarize, there is some reason to believe that interlock is due to agency conflicts. First, simulation estimates suggest that interlocking happens far more often than can be explained by random chance. Second, although up to 26% of interlocks can be explained by customer/supplier, banking, or other business relationships, a large proportion of interlocking cannot be. Third, more interlocked firms adopt poison pills and anti-takeover amendments than non-interlocked firms (although the difference is not statistically significant). Fourth, interlocked firms tend to have lower returns (although insignificantly so) than non-interlocked firms. Finally, interlock does not seem to be correlated with firm ownership. Taken together, these facts suggest that interlock could be due to agency problems in corporate governance.

DUAL AGENCY MODEL AND MANAGERIAL PAY

Theories of managerial compensation and background

In the extensive literature on executive compensation, two theories, pay for productivity (Murphy, 1985) and tournaments (Lazear and Rosen, 1981), have received the most attention. However, neither of these directly examines the role of the body which sets executive pay – the board of directors. The pay for

productivity literature is characterized in a paper by Murphy (1985). The basic building block of most pay for productivity models, especially in regard to CEO pay, is the principal-agent relationship. The principal (the shareholders or owners of the firm) cannot perfectly observe the actions of the agent (the CEO). In order to motivate an executive, the employer can use a measure of the CEO's performance, such as the stock market return, paying him more if the measure is high and less if it is low.

The typical approach in testing pay for productivity models is to regress the natural logarithm of compensation on a set of CEO and firm characteristics, often taken from panel data. Standard firm control variables include firm size in terms of stock market value or sales. The important explanatory variable in the productivity model is firm performance, measured for example, by the stock market return of the firm.⁷ If a positive relationship exists between stock market return and CEO pay, then it is argued the CEOs are doing well for the firm.

Finally, the modern tournament literature was started by Lazear and Rosen (1981). The basis of this literature is the idea that firm compensation should be interpreted as a prize for superior job performance. The ultimate prize in a given firm is the job of CEO, whose salary is typically the highest in the firm. This is not because he is worth that much, but rather that this higher salary offers incentives to the others in the firm to work harder in competition for the prize. If a firm offers a wage that is, say, twice the CEO's marginal product, this still may be efficient for the employer since one should take into consideration not only the marginal product of the CEO but also the marginal products of the other managers in the firm who might have a chance of one day becoming CEO.⁸

Dual agency

Existing models describe managerial compensation quite well but they ignore an important ingredient of the make-up of compensation for CEOs. The composition of the Board of Directors, which ultimately votes on a given CEO's compensation, may yield additional information in helping to describe salaries of CEOs.⁹

Many of the CEOs of large firms are directors of other large firms. If a CEO

⁷ Two of the most influential papers in this literature are Murphy (1985) and Jensen and Murphy (1990). Other papers include Baker *et al.* (1988), Bizjak *et al.* (1993), Ciscel (1974), Ciscel and Carroll (1980), Coughlan and Schmidt (1985), DiNardo *et al.* (1997), Ehrenberg and Milkovich (1987), Gibbons and Murphy (1990), Hallock (1997, 1998), Hallock and Oyer (1997), Lambert and Larcker (1988), Lewellen and Huntsman (1970), Masson (1971), Murphy (1986), Roberts (1956) and Sloan (1993). Hall and Liebman (1997) provide an interesting new look at these issues.

⁸ Related work includes Baker *et al.* (1993), Leonard (1990) and O'Reilly *et al.* (1988).

⁹ If it were true that directors acted exactly in the interests of shareholders, then we would not have to explicitly account for board structure.

of firm 1 is on the Board of Directors of firm 2 and if a CEO of firm 2 is on the Board of Directors of firm 1, then the CEOs may have unusual opportunities to increase each other's salaries. I refer to this situation (above) as current-CEO interlock. Additionally, many non-CEO employees of firms in the sample serve as directors of other firms in the sample. These non-CEO employees are important for two reasons. The first is that they may someday become CEOs themselves. Second, CEO compensation appears to be linked with the compensation of other top managers (see Arreglado, 1993).

The basic hypothesis that reciprocal interlock can lead to higher salaries for both CEOs can be formalized by thinking of a simple model in which each board has only one director. In the absence of interlock, the CEO of firm 1 is an agent for the owners of the firm represented by the board. Standard principal-agent models (e.g., Fama, 1980; Gibbons and Murphy, 1992; Holmstrom, 1979; Jensen and Meckling, 1976) suggest that the board will try to design a compensation package to maximize the value of the firm, after paying the CEO. Suppose now that CEO1 is the director of firm 2 and CEO2 is the director of firm 1. Then these two CEOs could be thought of as a pair of agents who ideally have to negotiate with the collective set of owners of firm 1 and firm 2. If the compensation of CEO1 is left in the hands of CEO2 and vice versa, it is difficult to imagine that their salaries will be set at the optimal levels from the perspective of the firms. Thus, the name dual agency. Interlocking directorates can potentially threaten the board's ability to objectively set salaries on behalf of the firm's owners. Bowen (1994) suggests, for example, that "[in] selecting board members, care should be taken to avoid incestuous relationships and to preserve a certain amount of distance between board members and the CEO". It remains an empirical issue whether reciprocally interlocking directorates pose any serious problems.

There are other board member to CEO relationships which are not explored here. Consultants and representatives of law firms often sit on boards of directors. It might be difficult for these types of directors to deny large pay increases to CEOs given that the CEO may single-handedly have full authority to relieve them (or their firms) from their services.

MANAGERIAL COMPENSATION - DO INTERLOCKS MATTER?

"The very high salaries we observe in many American corporations may not be optimal prizes, but simply a way in which corporate directors distribute rents to their friends in the executive suite. This suspicion is reinforced by the frequency with which the CEOs of one corporation serve as directors of another." - Rees (1992)

Background

An earlier study by Williamson (1963) suggests a relationship between the compensation of the top executive and other variables, including composition

of the board'. Controlling for administrative, general, and selling expenses (i.e., staff) of the firm, the concentration ratio in the industry, and the height of barriers to entry in the firm's industry, he finds that the proportion of the board represented by inside managers (those who are principally employed by the firm for which they serve as director) has an insignificantly positive effect on CEO compensation.¹⁰

Work by Weisbach (1988) and Hermalin and Weisbach (1988) also looks at inside vs. outside directors in relation to CEO turnover, which can be thought of as a crude measure of compensation.¹¹ Weisbach concludes "There is a stronger association between prior performance and the probability of resignation for companies with outsider-dominated boards than for companies with insider-dominated boards". Hermalin and Weisbach write that "When their CEO nears retirement, firms tend to add inside directors (and) just after a CEO change, inside directors with short tenures appear more likely to leave the board". They also found that inside directors are more likely to leave a board after a firm performs poorly and when a firm exits a market, and outside directors are more likely to join.¹²

A group of authors has begun studying the differences among three theories: 'social comparison', economic and psychological. O'Reilly *et al.* (1988), using a sample of 105 firms, found a "strong association between CEO compensation and the compensation of outside members of the board of directors", even when controlling for return on assets, sales, and assets. Belliveau *et al.* (1996) used a sample of 61 firms and concluded that "social similarity and status differences significantly increase CEO compensation after controlling for variables representing economic, social comparison, and other social influence explanations for CEO compensation". Main *et al.* (1995) also studied whether the CEO's social influence over the board can yield higher CEO pay. They found, for example, that CEOs appointed before the chairs of their compensation committees received 11% more pay than CEOs appointed after their compensation committee chairs. Finally, Newman and Wright (1995) found, in a sample of 161 firms, that CEOs who have at least one insider on their compensation committees have higher compensation.

¹⁰ Other authors such as Mayers and Smith (1992) also consider the relative fraction of insiders to outsiders (also see Rediker and Seth, 1995).

¹¹ Dismissal is a form of very low compensation.

¹² Kaplan and Minton (1994) investigated the appointments of outside directors to boards in Japan and the USA. They found that turnover of Japanese executives was higher in the years where outside directors employed by banks or other nonfinancial companies are added to boards. They conclude that "banks and corporate shareholders play an important monitoring and disciplinary role in Japan." Kaplan (1994) found that in Germany, where there are both supervisory and management boards, board turnover increases with poor stock performance. Yermack (1996) provides an interesting examination and shows an "inverse association between board size and firm value."

This section is aimed at three issues. First, do CEOs who lead interlocked firms earn more? Second, does the 'return' to interlock vary by definition of interlock (from, for example, considering current CEOs vs. retired CEOs)? Third, does redefining those interlocked firms that have documented customer/supplier, banking, or other business relationships as not interlocked affect the return to interlock?

The 1992 data on CEO compensation and characteristics are from *Forbes* magazine's annual compensation survey. There are three primary measures of pay: (1) salary plus bonus, (2) salary plus bonus plus other (which includes such items as the value of contributions to savings plans and memberships to clubs) and (3) total compensation (which is the sum of (2) plus exercised options).¹³ *Forbes* also reports information on the CEO's age, seniority as CEO and seniority with the firm, as well as other variables.

Table 6 displays means of the variables on CEOs for any-employee and non any-employee interlocked firms separately. The CEOs earned between \$1.1 and \$2.6 million depending on how pay was measured. The average age of the CEOs was 57, the average seniority in the firm was 24 years and the average seniority as CEO was 9 years. Interlocked CEOs earned more, were older, and had been CEO for fewer years than CEOs who were not interlocked.

Table 7 begins to answer the first of the three questions posed at the beginning of this section.¹⁴ The last three columns in Table 7 show raw wage differentials for the three measures of pay. For example, current-CEO interlocked firms pay their CEOs an average of 32.63% more than non-current-CEO interlocked firms. For the first two measures of pay, it is clear from the tables that CEOs heading interlocked firms earn substantially more than CEOs who are not. This is not universally true, however, for the third measure of pay (total compensation), but as I stated earlier, this is an unusual way to measure pay. However, as we have seen in Table 2, interlocked firms have several easily observed characteristics (for example market value of equity is much higher in interlocked firms) that are much different from non-interlocked firms. Perhaps interlock picks up these other variables.

Table 8 presents coefficients on interlock indicator variables from least squares regressions of compensation on interlock and control variables such as the CEO's age and its square, the CEO's seniority in the firm and its square, the CEO's seniority as CEO and its square, the $\ln(\text{firm market value of equity})$, lagged stock return, the number of directors and 20 industry indicator variables. The six columns have two columns each for $\ln(\text{salary plus bonus})$,

¹³ Note that this includes the value of options when exercised, not when granted, so this variable clearly has noise associated with it. A better variable would be (2) plus the current value of options granted in a given year. Recent rule changes by the SEC have made collecting the value of options granted in a given year much easier.

¹⁴ See Hallock (1997) for additional explanation of the interlock effect on executive compensation.

Table 6. Summary Statistics For CEOs^a

	<i>All</i>	<i>Non- any-employee interlocked</i>	<i>Any-employee interlocked</i>
CEO's age (years)	56.98 ^b (0.27)	56.75 (0.32)	57.88 (0.43)
CEO's firm seniority (years)	23.72 ^b (0.49)	22.62 (0.56)	28.02 (0.87)
CEO's seniority as CEO (years)	8.52 ^b (0.31)	8.87 (0.36)	7.17 (0.28)
CEO's salary plus bonus (\$millions)	1.10 ^b (0.04)	1.05 (0.05)	1.27 (0.06)
CEO's salary + bonus + other (\$millions)	1.35 ^b (0.05)	1.28 (0.06)	1.64 (0.08)
CEO's total compensation (\$millions)	2.57 (0.23)	2.45 (0.23)	3.05 (0.63)
<i>n</i>	602	479	123

^aSummary statistics are presented for all, for non any-employee interlocked firms, and for any-employee interlocked firms. Two firms are any-employee interlocked if any current or retired employee (including CEOs) of firm A serves as a director of firm B and if any current or retired employee (including CEOs) of firm B serves as a director of firm A. The measures of compensation are (salary plus bonus), (salary plus bonus plus other compensation), and (total compensation). Other compensation includes such items as insurance policies, restricted shares that vested during the year, savings plan contributions, memberships to clubs, etc. Total compensation is the sum of salary plus bonus plus other compensation plus exercised options. These compensation data are from Forbes magazine and are for 1992.

^bMean differences between the last two columns at 0.01 level of significance. Standard deviations are in parentheses.

$\ln(\text{salary plus bonus plus other})$, and $\ln(\text{total compensation})$ as the dependent variable, respectively. The rows represent which interlock type is controlled for. Only the return to interlock coefficients and their standard errors are displayed in Table 8. Each set of two numbers in the table represents a different regression.

Columns 1, 3, and 5 use the six standard interlocking definitions defined above. The returns to interlock seem to vary somewhat by measure of compensation. The returns to interlock using $\ln(\text{salary plus bonus})$, and $\ln(\text{salary plus bonus plus other})$ are always positive and in one case large and statistically significant. The returns to interlock using $\ln(\text{total compensation})$ are never significant and sometimes even negative. This is not particularly surprising given the discussion above that this is a poor measure of compensation. Although the measures vary somewhat, it is puzzling that the return to current-CEO interlock is smaller than the return to current employee interlock and that the retired interlock return measures are typically the same or only slightly smaller than the current ones. Clearly, controlling for the additional covariates has a significant effect on the large positive returns to interlock implied by Table 7.

Columns 2, 4, and 6 of Table 8 help to answer the third question: 'does redefining those interlocked firms that have documented customer/supplier,

Table 7. Interlocked vs non-interlocked percentage compensation differentials for various measures of interlocking and three measures of compensation^a

Interlock type	Fraction interlocked	$\frac{((\text{Interlocked pay}) - (\text{Non-interlocked pay}))}{(\text{Non-interlocked pay})}$		
		Salary plus bonus	Salary plus bonus plus other	Total compensation
1. Current-CEO	7.48	32.63 ^c	29.29 ^c	63.79 ^d
2. Current-employee	11.46	27.78 ^c	20.21 ^b	36.22
3. Retired-CEO	5.65	20.36	18.42	-15.76
4. Retired-employee	11.46	19.83 ^d	25.52 ^c	17.42
5. Any-CEO	12.45	29.79 ^c	26.88 ^c	34.27
6. Any-employee	20.43	21.05 ^c	28.20 ^b	24.65

^aThe first measure of interlock is 1. current-CEO interlock. Two firms are current-CEO interlocked if a current CEO from firm A sits on the board of firm B and a current CEO of firm B sits on the board of firm A. The other measures of interlock are also reciprocal arrangements but for different subsets of employees: 2. current-employee includes any current employees (including the CEOs), 3. retired-CEO only includes retired CEOs, 4. retired-employee includes any retired individuals including the CEOs, 5. any-CEO includes current or retired CEOs, and 6. any-employee is the most comprehensive measure and includes any current or retired employees including CEOs. The measures of compensation are (salary plus bonus), (salary plus bonus plus other compensation), and (total compensation). Other compensation includes such items as insurance policies, restricted shares that vested during the year, savings plan contributions, memberships in clubs etc. Total compensation is the sum of salary plus bonus plus other compensation plus exercised options. These compensation data are from Forbes magazine and are for 1992. This analysis is for the sample that includes complete data on board structure as well as complete data on compensation and other CEO and firm characteristics ($n = 602$). The interlocked fractions in the first column are basically the same if the entire board data are used. Asterisks represent statistically significant difference between mean compensation of interlocked and non-interlocked CEOs for given compensation and interlock measures at the 0.01(b), 0.05(c), and 0.10(d) levels.

banking, or other business relationships as not interlocked have an effect on the return to interlock' and also offers interesting and more plausible insight into the returns to the different measures of interlock. These columns present the results from three sets of linear regressions (for each of three independent variables), with the same independent variables as in columns 1, 3, and 5 except that firms are defined as not interlocked if they have documented customer/supplier, banking, or other business relationships.

Redefining interlock in this way leaves only those firms with potentially the largest opportunity for agency problems. If the dual agency idea is correct, then this ought to yield higher returns to interlock. In all but one case, for the first two measures of compensation, the point estimate for the return to interlock is higher when firms with business relationships are considered to be not interlocked. It is also interesting to note that when interlocks are redefined

Table 8. Estimates of the return to interlock using several measures of interlock^a

Interlock type	ln(salary+bonus)		ln(salary+bonus+other)		ln(total compensation)	
	Standard interlock definition (1)	Business relationships considered not interlocked (2)	Standard interlock definition (3)	Business relationships considered not interlocked (4)	Standard interlock definition (5)	Business relationships considered not interlocked (6)
1. Current-CEO	0.068 (0.793)	0.158 (1.528)	0.039 (0.413)	0.130 (1.134)	0.004 (0.032)	-0.028 (0.177)
2. Current-employee	0.096 (1.356)	0.159 (1.794)	0.119 (1.523)	0.174 ^c (1.764)	0.014 (0.126)	-0.034 (0.247)
3. Retired-CEO	0.079 (0.812)	0.104 (1.026)	0.042 (0.392)	0.065 (0.574)	-0.047 (0.317)	-0.004 (0.026)
4. Retired-employee	0.078 (1.090)	0.076 (0.982)	0.109 (1.381)	0.111 (1.297)	0.085 (0.767)	0.070 (0.590)
5. Any-CEO	0.089 (1.282)	0.139 ^c (1.823)	0.054 (0.700)	0.104 (1.235)	0.007 (0.065)	-0.010 (0.087)
6. Any-employee	0.092 (1.583)	0.116 ^c (1.805)	0.142 ^b (2.204)	0.166 ^b (2.309)	0.060 (0.665)	0.045 (0.448)

^aThe dependent variables in each column are, respectively, ln(salary plus bonus), ln(salary plus bonus plus other compensation) and ln(total compensation). Other compensation includes such items as insurance policies, restricted shares (that vested during the year, savings plan contributions, memberships in clubs, etc. Total compensation is the sum of salary plus bonus plus other compensation plus exercised options. These salary data are from Forbes magazine and are for 1992. All specifications also control for 20 industry indicator variables, age of the CEO and its square, seniority of the CEO in the firm and its square, seniority of the CEO as CEO and its square, ln(firm value), stock return in 1991, and the number of directors on the board. The first measure of interlock is 1. current-CEO interlock. Two firms are current-CEO interlocked if a current CEO from firm A sits on the board of firm B and the current CEO of firm B sits on the board of firm A. The other measures of interlock are also reciprocal arrangements but for different subsets of employees: 2. current-employee includes any current employees (including the CEOs), 3. retired-CEO only includes retired CEOs, 4. retired-employee includes any retired individuals including the CEOs, 5. any-CEO includes current or retired CEOs, and 6. any-employee is the most comprehensive measure and includes any current or retired employees including CEOs. This is the subset of data for which information is available on customer/supplier, banking, and other business relationships. b=significant at 0.05, c=significant at 0.10. There are 602 observations. (t-statistics are in parentheses).

in this way (for the first two dependent variables) the CEO interlock coefficients are higher relative to the employee interlock coefficients than before, and the current interlock coefficients are higher relative to the retired than before. This is consistent with the dual agency hypothesis.

CONCLUDING COMMENTS

This chapter empirically studies corporate boards with reciprocal interlocking relationships and has several findings. First, it documents that there is a substantial amount of board interlocking. For example, roughly 20% of all boards are in situations where at least one current or retired employee of firm A is on the board of firm B and *vice versa*. The paper also shows that there is a significant amount of interlocking among current and even retired employees, although this is not as frequent as 20%.

The paper also shows that board interlocks may be due to agency problems in firms although the evidence certainly is not conclusive. The results of the simulations using the 1992 data suggest that interlock does not happen by chance. Directors interlock much more often than they would have had they been assigned randomly to board positions. This, however, is only a necessary condition for cronyism by directors and is not sufficient evidence to imply that directors are acting against the interests of shareholders. There seems to be other evidence that interlock may lead to agency conflicts. Although the difference is not significant, the fraction of interlocked firms to adopt poison pills and anti-takeover amendments is higher than the fraction of non-interlocked firms. It is also true that although several of the interlocks can be explained by business relationships, a substantial fraction remain unexplained. Also, interlock cannot be explained by management ownership. Other evidence in favor of the 'cronyism' hypothesis exists. Agrawal and Walkling (1994) suggest that takeover bids are more likely to occur in industries where CEOs have positive abnormal compensation, suggesting perhaps that new management can run the firm more efficiently. Also there is some evidence that the return to interlock is falling over time (Hallock (1997) shows that the return to interlock was significantly higher in 1976 than in 1992) which might suggest that recent attempts to open-up the process of executive salary determination are helping to curb cronyism.

Directors, on the other hand, may serve on each other's boards simply because they are known by one another to be of high quality. In fact, controlling for additional unobservables of CEOs that may be correlated with management ability suggests this may be true (see Hallock, 1997). In addition, if it were the case that interlock really did mean that CEOs, in collusion with directors, were extracting rents from the firm, then we might expect lower profits and returns from interlocked firms. This is not the case.

Finally, previous study of the compensation of Chief Executive Officers has excluded detailed analysis of the group which actually sets CEO pay, the board of directors. This work uses the sample of the composition of the boards of

directors of America's largest firms as well as information on CEO compensation and firm characteristics for a number of years to test the hypothesis that CEOs who are reciprocally interlocked with other CEOs via their boards of directors can raise their wages above those of their counterparts who are not interlocked. It demonstrates that interlocked CEOs earn, on average, significantly higher wages than non-interlocked CEOs. After controlling for firm and CEO characteristics, this pay gap is reduced dramatically. However, when considering only those types of interlocks which are most likely to be symptomatic of agency problems, there does appear to be some evidence of a positive return to CEO pay for CEOs who interlock.

ACKNOWLEDGEMENTS

I am grateful to Sherrilyn Billger, John Core and Arthur Rosenbloom for comments.

REFERENCES

- Agrawal, A. and R. Walkling (1994). Executive careers and compensation surrounding takeover bids. *Journal of Finance*, 49, 985-1014.
- Arreglado, E.R. *Top Executive Compensation: 1993 Edition*. The Conference Board.
- Baker, G., M. Gibbs and B. Holmstrom (1993). Hierarchies and compensation: a case study. *European Economic Review*, 37, 366-378.
- Baker, G., M.C. Jensen and K.J. Murphy (1988). Compensation and incentives: practice vs. theory. *Journal of Finance*, 18, 593-616.
- Bearden, J. and B. Mintz (1985). Regionality and integration in the American interlock network. In: F.N. Stockman, R. Ziegler and J. Scott (eds). *Networks of Corporate Power*. Polity Press, Cambridge, 234-249.
- Belliveau, M.A., C.A. O'Reilly III and J.B. Wade (1996). Social capital at the top: the effects of social similarity and status on CEO compensation. *Academy Management Journal*, 39, 1568-1593.
- Bizjak, J.M., J.A. Brickley and J. Coles (1993). Stock-based incentive compensation and investment behavior. *Journal of Accounting and Economics*, 16, 349-372.
- Bowen, W.G. (1994). *Inside the Boardroom*. John Wiley & Sons, New York.
- Bunting, D. and J. Barbour (1971). Interlocking directorates in large American corporations, 1896-1964. *Business History Review*, 45, 317-35.
- Ciscel, D.H. (1974). Determinants of executive compensation. *Southern Economic Journal*, 40, 613-17.
- Ciscel, D.H. and T.M. Carroll (1980). The determinants of executive salaries: an econometric survey. *Review of Economics and Statistics*, 62, 7-13.
- Coughlan, A.T. and R.M. Schmidt (1985). Executive compensation, management turnover, and firm performance: an empirical investigation. *Journal of Accounting and Economics*, 7, 43-66.
- DiNardo, J., K. Hallock and J.-S. Pischke (1997). *Unions and Managerial Pay*. NBER Working Paper 6318.
- Directory of Corporate Affiliations* (1992). National Register Publishing.
- Dooley, P.C. (1969). The interlocking directorate. *American Economic Review*, 59, 314-323.
- Ehrenberg, R.G. and G.T. Milkovich (1987). Compensation and firm performance. In: M.M. Kleiner, R.N. Block, M. Roomkin and S.W. Salsburg (eds), *Human Resources and the Performance of the Firm*. Industrial Relations Research Association, 87-122.

- Fama, E. (1980). Agency problems and the theory of the firm. *Journal of Political Economy*, 88, 288-307.
- Gibbons, R. and K.J. Murphy (1990). Relative performance evaluation of chief executive officers. *Industrial and Labor Relations Review*, 43, 30s-51s.
- Gibbons, R. and K.J. Murphy (1992). Optimal incentive contracts in the presence of career concerns: theory and evidence. *Journal of Political Economy*, 100, 468-505.
- Hall, B. and J. Liebman (1997). *Are CEOs really paid like bureaucrats?* NBER Working paper 6213.
- Hallock, K. (1997). Reciprocally interlocking boards of directors and executive compensation. *Journal of Financial and Quantitative Analysis*, 32, 331-344.
- Hallock, K. (1998). Layoffs, top executive pay, and firm performance. *American Economic Review* 88.
- Hallock, K. and P. Oyer (1997). *What Have You Done For Me Lately? Executive Compensation and the Timing of Corporate Performance*. Working Paper, University of Illinois and Northwestern University.
- Hermalin, B.E. and M.S. Weisbach (1988). The determinants of board composition. *Rand Journal of Economics*, 19, 589-606.
- Holmstrom, B. (1979). Moral hazard and observability. *Bell Journal of Economics*, 10, 74-91.
- Jensen, M.C. and W.H. Meckling (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3, 305-360.
- Jensen, M.C. and K.J. Murphy (1990). Performance pay and top management incentives. *Journal of Political Economy*, 98, 225-264.
- Kaplan, S.N. (1994). Top executives, turnover, and firm performance in Germany *Journal of Law, Economics, and Organization*, 10, 142-159.
- Kaplan, S.N. and B.A. Minton (1994). Appointments of outsiders to Japanese boards: determinants and implications for managers. *Journal of Financial Economics*, 36, 225-258.
- Lambert, R.A. and D.F. Larcker (1988). An analysis of the use of accounting and market measures of performance in executive compensation contracts. *Journal of Accounting Research*, 25 (supplement), 85-129.
- Lazear, E.P. and S. Rosen (1981). Rank-order tournaments as optimum labor contracts. *Journal of Political Economy*, 89, 841-864.
- Leonard, J.S. (1990). Executive pay and firm performance. *Industrial and Labor Relations Review*, 43, 13s-29s.
- Lewellen, W. and B. Huntsman (1970). Managerial pay and corporate performance. *American Economic Review*, 60, 710-720.
- Main, B.G.M., C.A. O'Reilly III and J. Wade (1995). The CEO, the board of directors and executive compensation: economic and psychological perspectives. *Industrial and Corporate Change*, 4, 293-332.
- Masson, R.T. (1971). Executive motivations, earnings, and consequent equity performance. *Journal of Political Economy*, 79, 1278-1292.
- Mayers, D. and C.W. Smith Jr. (1992). Executive compensation in the life insurance industry. *The Journal of Business*, 65, 51-71.
- Million Dollar Directory* (1992). Dunns Marketing Services.
- Mintz, B. and M. Schwartz (1981). Interlocking directorates and interest group formation. *American Sociological Review*, 46, 851-869.
- Mizruchi, M.S. (1982). *The American Corporate Network, 1904-1974*, Sage Publications.
- Mizruchi, M.S. and L.B. Stearns (1988). A longitudinal study of the formation of interlocking directorates. *Administrative Science Quarterly*, 33, 194-210.
- Murphy, K.J. (1985). Corporate performance and managerial remuneration: an empirical analysis. *Journal of Accounting and Economics*, 7, 11-42.
- Murphy, K.J. (1986). Incentives, learning, and compensation: a theoretical and empirical investigation of managerial labor contracts. *Rand Journal of Economics*, 17, 59-76.
- Newman, H.A. and D.W. Wright (1995). *Compensation Committee Composition and its Influence on CEO Compensation Practices*. Working Paper, University of Michigan.

- O'Reilly, C.A. III, B.G. Main and G.S. Crystal (1988). CEO compensation as tournament and social comparison: a tale of two theories. *Administrative Science Quarterly*, 33, 257-274.
- Pennings, J.M. (1980). *Interlocking Directorates*. Jossey-Bass Publishers.
- Rediker, K.J. and A. Seth (1995). Boards of directors and substitution effects of alternative governance mechanisms. *Strategic Management Journal*, 16, 85-99.
- Rees, A. (1992). The tournament as a model for executive compensation. *Journal of Post Keynesian Economics*, 14, 567-571.
- Roberts, D. (1956). A general theory of executive compensation based on statistically tested propositions. *Quarterly Journal of Economics*, 70, 270-294.
- Sloan, R. (1993). Accounting earnings and top executive compensation. *Journal of Accounting and Economics*, 16, 349-372.
- Standard and Poor's Register of Corporations, Directors, and Executives* (1992). McGraw Hill.
- Weisbach, M.S. (1988). Outside directors and CEO turnover. *Journal of Financial Economics*, 20, 431-460.
- Who's Who in Finance and Industry*, 27th edn (1992). Marquis.
- Williamson, O.E. (1963). Managerial discretion and business behavior. *American Economic Review*, 53, 1032-1057.
- Yermack, D. (1996). Higher market valuation of companies with a small board of directors. *Journal of Financial Economics*, 40, 185-211.