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Abstract

The agency literature in corporate finance rests for the most part on the assumption that highly diffuse ownership is commonplace and managerial ownership small; the result is costly for shareholders. Evidence provided here is to the contrary. Even where ownership is dispersed, managerial ownership is often significant and the mean and median ownership statistics are surprisingly large. Furthermore, there is no strong consistent relation, linear or non-linear, between ownership and valuation or profit. These relations vary greatly over time. These findings support Demsetz and Lehn (1985) and contradict the agency arguments in Jensen and Meckling (1976), Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990).

Time Series and Cross Sectional Properties of Management Ownership and Valuation

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Empirical tests of the agency hypothesis[1] and inter-study comparisons of the pivotal findings therein, suffer from a lack of uniformly-derived ownership data on firms of all sizes in a CRSP-like[2] format. Morck, Shleifer and Vishny (1988) motivate this view with, "Research on ownership structure can doubtless benefit from considering smaller firms as well." The asset pricing literature has had the CRSP tapes with their near-exhaustive, near-perfect data on daily and monthly stock returns, distributions, share structures, etc., as its common ground since the 1970s. The agency literature has no similar large database of its principal variables - insider holdings and ownership concentration.[3] This paper introduces a new database of consistently derived insider holdings data on approximately 4,000 firms covering the period 1986 through 1995.[4] Using this database, Morck, Shleifer and Vishny (1988) and related papers in the agency literature are re-examined.

The lack of resolution in the apparently conflicting empirical papers by Demsetz and Lehn (1985) and Morck, Shleifer and Vishny (1988), McConnell and Servaes (1990) underscores an inter-study comparison problem.[5] These papers will be referred to as DL, MSV, and McS, respectively. Cho (1998) is recent evidence that resolving the differences in DL, MSV, and McS warrants

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[1] See page 746, "Evidence on Agency Costs," from "A Survey of Corporate Governance" Shleifer and Vishny (1997). This paper addresses only cross sectional tests, event studies are left for future work.

[2] The Center for Research in Security Prices (CRSP) of the University of Chicago.

[3] COMPUSTAT offers the accounting literature a similar common ground. However, COMPUSTAT also does not have historical stock ownership data.

[4] This database does not reduce the need for a similar ownership concentration database as it only contains information on stock ownership by directors and officers (D&O) and not major non-director shareholders.

[5] The extent of the disagreement between these papers is covered in detail in the next section.

continued investigation.[6] Comparing DL, MSV and McS is important for three reasons: [1] they are dated, yet often referenced, [2] they find simple strong linear and non-linear results which can be compared easily, and [3] determining a clear winner is possible, i.e. an unambiguous conclusion exists in each paper. Following Jensen and Meckling (1976), hereafter JM, Rozeff (1982) suggests, and Dempsey and Laber (1992) confirm, that agency costs are linearly related to managerial ownership; the later two papers offer evidence that dividend payouts vary inversely with insider holdings. In contrast, DL finds no linear relation between agency costs as measured by ownership concentration and return on equity. MSV and McS use Tobin's Q and return on assets and contradict DL, finding non-linear, albeit, very different relations with insider ownership. The comparisons are not perfect as MSV and McS use different years and measures than DL.

Despite reporting significantly different results (several years ago), the non-linear models in MSV and McS and the linear model in DL have yet to be tested with consistently defined variables in sequential annual cross sectional studies. Without such data, no resolution of the major differences is possible. Three research questions are apparent: Do the results from MSV, McS, or DL vary over time? Does a common database with consistent variables improve comparisons of their key findings? Can these three disparate empirical results be reconciled?

The existing[7] criticisms by MSV and McS of DL center on the choice of a linear or non-linear model to measure agency costs. To address this criticism, the primary findings from MSV and McS are examined over a ten year period. Statistically significant nonlinear relations of profit and valuation with ownership structure are reproduced. However, these relations change over the ten years

[6] Cho (1998) reexamines Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990) and Demsetz and Lehn (1985) giving evidence that ownership concentration is endogenous.

[7] According to the recent survey of corporate governance by Shleifer and Vishny (1997), "Although Demsetz (1983) and Demsetz and Lehn (1985) argue that there should be no relation between ownership structure of a firm and its performance, the evidence has not borne out their view. Morck, Shleifer, and Vishny (1988) present evidence on the relationship between cash flow ownership of the largest shareholders and the profitability of firms, as measured by Tobin's Q. ... Stulz (1988) presents a formal model of such a roof-shaped relationship between ownership and performance, which has been collaborated by subsequent empirical work (McConnell and Servaes (1990), Wruck (1989)).

examined from convex to linear to concave. This finding calls into question cross sectional tests of the agency hypothesis which use managerial ownership and profit or valuation data from only one or two years. Neither, MSV, McS, Cho (1998), nor the recent survey by Shleifer and Vishny (1997) consider time-varying ownership-valuation relations. This finding is new to the literature.

This paper's contribution to the corporate finance literature is four fold: [1] a comparison of three important but conflicting papers, [2] some resolution of their principal differences, [3] evidence that the relation between valuation and ownership changes significantly over a ten year period, and [4] some motivation for further work on a new CRSP-like database of insider holdings. In total, these findings support the non-agency-based, endogenous ownership theory and empirical findings in DL with one important innovation; the equilibrium may be slow to adjust to changes in market value. These data provide no evidence for the agency hypothesis, if in fact, the agency hypothesis predicts that agency relations cause consistent, wide-spread, measurable organizational inefficiencies, either convergence-of-interests or managerial entrenchment.

The remainder of this paper is organized as follows: Section 2 reviews the agency literature and presents new data as it pertains to the unresolved conflict between MSV, McS and DL; section 3 contains an analysis which adds to the linear-versus-non-linear debate. Section 4 concludes.

2.0 Background

Jensen has summarized the extensive agency literature in corporate finance as follows: "Agency costs are organizational inefficiencies. Agency costs come from conflicts of interest between rational human beings, stockholders and managers."[8] Building upon Berle and Means (1932) and JM, MSV summarize the primary empirical premise of the agency literature as follows, "Many large

[8] Non-Rational Behavior, Agency Costs, and Organizations, a lecture at University of Southern California, presented by Michael C. Jensen on February 28, 1997.

American corporations are not run by the people who own them." Figure 1, Panel A shows this is most certainly true. Panel A contains the cumulative density functions (CDFs) of market value (MV) and the number of firms (N) as a function of insider holdings percentage (α). The CDFs include all US firms for which market capitalization and insider holdings are available for 1986 and 1995. The CDF for 1986 is based on data on 3,400 firms with a total of $1.98 trillion in market value. The corresponding figures for 1995 are 3,701 and $4.46 trillion.[9] The insider holdings data are directors' and officers' (D&Os') stock ownership percentage. In both years, 90% of this sample of US stock market value is in firms with α<20%. Confirming Holderness and Sheehan (1988)[10], D&Os have 50% or higher ownership in approximately 12% to 13% of firms. Median D&Os' ownership is between 15% and 17%. Panel B shows all four CDFs for the first five percentage points of α from Panel A. Firms with α<5% account for nearly 75% of market value and roughly 25% of the number of firms in 1986 and 1995. In Panel B, separation in the CDFs is visible, but in both CDFs note that firms with α<1% account for 49.6% (1986) and 43.1% (1995) of total stock market value and 9.85% (1986) and 7.13% (1995) of firms by number.

2.1 D&Os' Percentage Stock Ownership Effects

Academic studies have long warned of the negative effects of low percentage ownership by managers and the impact of agency costs on shareholder profits, firm productivity, or market valuation.[11] From Shleifer and Vishny (1997), "A vast empirical literature on incentive contracts in general and management ownership in particular dates back to at least Berle and Means (1932), who argue that management ownership in large firms is too small to make managers interested in profit maximization." DL argue that a simple and easily testable prediction of the agency hypothesis is a *positive relation between the accounting profit rate and ownership concentration.*

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[9] See Appendix A for a complete discussion of the database used in this paper.
[10] Using 1984 Spectrum, 663 of 5,240 firms (12.7%) are reported to have majority shareholders.
[11] See Smith (1776), Veblen (1924), Berle and Means (1932), Galbraith (1967), Jensen and Meckling (1976), Demsetz (1983), DL, Shleifer and Vishny (1986), MSV, McS, Denis and Sarin (1996), Cho (1998), and for a recent review, Shleifer and Vishny (1997).

This prediction, shown formally as condition 1, is termed the convergence-of-interests effect.[12] In condition 1, π is profit and α is management ownership.[13]

$$\frac{\partial \pi}{\partial \alpha} > 0 \qquad \text{such that} \qquad 0 \leq \alpha < 1 \qquad [1]$$

Given condition 1 and the shareholder's objective to maximize profits and assuming α is exogenous, i.e. the manager is assigned his α independent of the prospects for π, maximization leads to a corner solution wherein outside shareholders, seeking maximum profits, are best off when no outside shareholders remain, only an entrepreneur.[14] While condition 1 has been in the economics literature since at least Smith (1776), the second exogenous condition facing shareholders, the entrenchment effect, is a more recent[15] consideration. This prediction, shown formally as condition 2, concerns the change in profit, $\Delta\pi$, which is negative for some range of α such that α^* is between some lower and upper bound, α_L and α_U.

$$\frac{\partial \pi}{\partial \alpha} < 0 \qquad \text{such that} \qquad \alpha_L < \alpha^* < \alpha_U \qquad [2]$$

MSV and McS argue that the observed profit of a firm, π_o, can be described in three parts: the ideal profit, π_i, under optimal[16] contracts with a manager earning a straight salary, plus the gain that comes from a convergence-of-interests effect, π_c, as the manager increases his ownership of the firm, minus the loss in profit, π_e, resulting from entrenchment. This relation is equation 3,

$$\pi_o(\alpha) = \pi_i + \pi_c(\alpha) - \pi_e(\alpha^*) \ . \qquad [3]$$

The presence of Conditions 1 and 2 has been tested using several proxies. DL uses accounting rate of return on equity (ROE) and the percentage ownership of the five and twenty largest shareholders as well as the Herfindahl measure of ownership concentration. MSV uses Tobin's Q

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[12] See MSV.

[13] Alternatively, as in DL, α can be shareholder concentration.

[14] JM avoids this corner solution by constructing the problem as a first best case and motivating the entrepreneur to raise equity capital by assumption or fiat.

[15] See Grossman and Hart (1988), Harris and Raviv (1988) and Shleifer and Vishny (1989).

[16] Optimal contracts consider contracting costs and are complete only if contracts are costless.

(Q) and accounting rate of return on assets at replacement cost (ROA_R) and the percentage of stock ownership by the board of directors. McS and Cho (1998) use Q and the percentage of stock ownership by all insiders. These results are reviewed immediately after an alternative to percentage stock ownership is considered.

2.2 Evidence Concerning Wealth-at-risk

Gordon (1936), referring in part to the Berle and Means work, takes a different tack, emphasizing managerial wealth-at-risk rather than percentage ownership as a converging motivation.

> "Much has been said in recent years concerning the separation of control and ownership in the large American corporation. In this connection, considerable emphasis has been placed on the small degree of stock ownership by those who manage and direct our great enterprises."

> "Attention may be called first to the number of men the value of whose stockholdings (whether common alone or all equity securities) must be considered large by any reasonable standard. Considering common stock only, no less than 31 of 179 men (about 17 percent) each had an ownership interest in their companies the value of which exceeded $1,000,000."

Gordon examines 107 of the 484 industrial firms listed on the New York Stock Exchange for which D&Os' holdings and executive compensation data were available in July, 1935. In addition to the fraction of the firm's stock owned by D&Os, Gordon considers the dollar value of stock holdings. Wealth-at-risk has received less emphasis in modern agency studies.[17] The logic for a wealth-

[17] Julian Franks is thanked for suggesting this paper.

related factor is obvious.[18] In the limit, a manager can offer his labor at a fixed subsistence wage rate (including zero with no perquisites) and by choice earn nearly all (or all) of his return from increases in the value of the firm's stock in his own portfolio.[19] It is worth noting that in this case, the manager's salary has arbitrarily low correlation[20] with firm profits, but his motivation to maximize profits is high because his wealth changes exactly with the shareholders' wealth.

Following Gordon, managerial investment is examined. Adjusting Gordon's threshold by the Consumer Price Index for all urban consumers (CPI-U) his $1,000,000 figure is $8.0 million by 1986 and $11.1 million by 1995.[21] In Figure 2, Panels A and B show the dollar value of the stock owned collectively[22] by D&Os (D&Os' Investment) plotted against the percentage ownership by D&Os. Panel A shows D&Os' Investment in 3,400 firms in 1986 and Panel B displays these data on 3,701 firms for 1995. The mean (median) value of D&Os' Investment is $36.51 ($8.45) million and $78.47 ($17.33) million for 1986 and 1995, respectively. Their investment exceeds $100 million (is below $1 million) for *some firms at virtually all levels of D&Os' percentage ownership.* Table 1 displays the number (percentage) of firms at selected levels of D&Os' investment. In 1986, 1,559 firms (45.9%) have D&Os' Investment of more than $10 million, by 1995 the number of firms is 2,332 (63.0%). The two extremes of D&Os' Investment are worth noting. Their investment is less than $1.0 million for 10.3% and 6.1% of firms in 1986 and 1995, respectively.

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[18] If a firm's manager has most of his personal wealth tied-up in his firm's equity, and the dollar value of that equity is a substantial figure relative to the dollar value of the manager's private benefits, shareholders might consider that their interests and the manager's interests are well-aligned regardless of whether the manager's percentage ownership is relatively low or high.

[19] Many venture capital partnerships could be considered to have this "all-equity" compensation contract with their portfolio firms. The partners in a venture capital partnership often provide important consulting advice, administrative assistance, and sometimes partners will temporarily fill key senior management positions in portfolio firms, yet the partnerships rarely charge consulting fees or allocate the partners' salaries to the portfolio firms and instead the partnerships choose to earn all their income through the appreciation of their stock holdings.

[20] Jensen and Murphy (1990) examined just such a relation of executive pay and performance and finding a small coefficient, a $3 change in pay for $1,000 change in shareholder wealth, concluded compensation agreements are inefficient.

[21] CPI-U for July, 1935 is 13.7. For July 1986 and 1995 these figures are 109.5 and 152.5, respectively. For CPI-U see http://stats.bls.gov/cpihome.htm

[22] It is not known how many directors and officers make up each management team, nor the exact split of shares among them, therefore exact comparisons to Gordon's data cannot be made. Determining the exact distribution of per capita managerial wealth-at-risk is left for future study.

Over $100 million in D&Os' Investment occurs in 6.5% of firms for 1986 and 14.5% for 1995.

It is clear that the highest D&Os' Investment does not necessarily come with the highest percentage ownership. This is possible because of the enormous range in the market value of public companies. Table 2 provides detail on firm size not obvious in Figure 2. Table 2 gives the mean and median market values for firms with D&Os' percentage ownership levels within eleven one percent-wide intervals of 0% to 11% for the years 1986 and 1995. The mean and median market values of firms for both 1995 and 1986 drop significantly across the first five one percent-wide intervals and relatively less across the next five intervals. For 1986, the mean (median) firm value decreases from $2.93 ($0.96) billion for the 0-1% interval to $451 ($172) million for the 5%-6% interval. This is a 6.50 (5.58) fold decline in firm size over the first 5 percent increase in D&Os' ownership. The second five percent increase, to the 10-11% interval, shows only a 1.33 (2.07) fold decline in mean (median) value to $339 ($83) million. For 1995, the declines are sharper. Mean (median) firm value declines 9.72 (8.95) fold over the first five percent ownership increase. The second five percent increase in insider holdings shows a 1.60 (1.51) fold increase in the mean (median) value. The sample sizes of these intervals are large, for the eleven intervals there are from 335 to 83 firms in 1986 and from 293 to 110 firms for 1995.

2.3 Importance of the Size of the Firm

DL observed that firm size is related to ownership concentration for three reasons. The larger the value-maximizing size for a particular firm, the higher the price of a given fraction, thus the lower the ownership concentration. Secondly, a given level of control is possible with a smaller fraction in larger firms, hence less concentration. Thirdly, risk aversion decreases concentration as diffuse ownership reduces capital costs. Following DL, Figure 3, Panels A and B show (in a manner not possible in Table 2) the firm size and D&Os' percentage stock ownership relation over a broad range of insider holdings. Panel A displays the mean and median market values (on a logarithmic scale) for sub-samples of firms plotted against D&Os' percentage ownership (on a linear scale) for

1986 and 1995.[23] The plots of firm size appear to decrease almost exponentially over this 35% range of managerial ownership. For example, mean firm value for 1995 declines 73 fold from nearly $7.3 billion at 0% to just under $100 million at 35%. Median firm value for 1986 declines the least, but it decreases 28 fold from 0% to 35%. The preciseness of the exponential decline in mean and median firm value is more obvious in Panel B.

Figure 3, Panel B has both axes in logarithmic scale which better reveals a surprising property of D&Os' Investment.[24] The four sets of data are the same as those in Panel A: the mean and median from 1986 and 1995. Each relation has a slope which approximates negative 1.0.[25] The slopes imply that the D&Os of widely-varying size firms, with markedly different percentage levels of ownership, have remarkably consistent mean and median managerial wealth-at-risk. The relation holds surprisingly well for mean and median D&Os' Investment over the range α which approximates 95% of stock market capitalization. This is new to the literature.

2.4 Estimating CEO Investment

Table 3, shows the mean and median D&Os' Investment for four intervals of D&Os' ownership: 0-1%, 1-2%, 10-11% and 20-21%. While α varies more than 20 fold over the range 0-1% to 20-21%, the mean (median) wealth-at-risk increases only 1.2 (1.3) fold in 1986 and 1.3 (1.4) fold in 1995. In large firms and small, much of the stock that is held by insiders resides with the CEO.[26] Mehran (1995) shows that the mean fraction of total insider holdings held by the CEO is 39.1%

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[23] Figure 3 displays the mean and median firm value for the first 36 one percent-wide intervals of D&Os' percentage stock ownership from 0% to 36%, inclusive. The figure is constructed by sorting firms by percentage stock ownership. The mean and median firm value are determined for that subset of firms with D&Os' ownership between 0% and 1%; the mean and median values are plotted at 0%. (For the log scale, in Panel B, data points are plotted at the midpoint of the interval.) This procedure is repeated for each one percent-wide subsample through the 35%-to-36% interval.

[24] Ed Leamer is thanked for suggesting this figure.

[25] If the slopes of these relations were exactly equal to negative 1.0, then the multiplication of the D&Os' percentage stock ownership and the equity market value would exactly equal a constant. This means that average and median dollar ownership is independent of firm size, etc.

[26] Mehran (1995) provides mean CEO and insider ownership percentages for 153 randomly selected public firms in the manufacturing sector. These data match well with Cyert et al. (1997) which provides data on 1,671 public companies in all sectors. The CEO's portion of mean (median) insider shares is 44.4% (32.0%). Bristow (1994) reports the CEO's portion of insider holdings at 48.8% in a set of dividend initiating firms.

Using this figure and the smallest of the means (medians) from Table 3, the CEO's portion of mean (median) D&Os' Investment is estimated at $6.92 ($2.27) million in 1986 and $15.0 ($4.65) million in 1995. These data indicate that *mean and median managerial investment is not trivial.* For many firms managerial investment remains as Gordon described it in 1935, "large by any reasonable standard."[27] Given that significant D&Os' Investment occurs, and that it occurs over a wide range of percentage ownership, it is a matter of empirical investigation to determine if profit or valuation are functions of the D&Os' ownership percentage. Determining if profit is a function of wealth-at-risk is left for a subsequent paper. Resolving the existing debate, concerning percentage ownership, is the focus of the next section.

3.0 Reconciling DL, MSV, and McS

DL, MSV and McS are often referenced with regard to empirical tests of ownership structure and corporate performance. The principal theoretical difference is that DL contend that ownership structure is endogenously determined while MSV and McS argue the opposite. Cho (1998), hereafter Cho, provides evidence on the endogeneity of ownership structure, continuing this debate. The principal difference in empirical prediction is that DL expect no consistent relation between percentage ownership and profit (or valuation) which MSV and McS predict a consistent convex relation, described as conditions 1 and 2. DL condensed the agency logic and its principal prediction with this summary,

> "If diffuseness in control allows managers to serve their needs rather than tend to the profits of owners, then more concentrated ownership, by establishing a stronger link between managerial behavior and owner interests, ought to yield higher profit rates." [28]

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[27] Due to the CEOs' disproportionate stake, per capita D&Os' Investment is a less meaningful measure; it would be roughly equal to one-tenth of total D&Os' Investment. The mean (median) size of boards is 10.6 (10) from Mehran (1995). Larger firms and banks on average have 12 to 13 directors; for example see, "U.S. 24th Annual Board of Directors Survey by Korn/Ferry International." http://www.kornferry.com/

[28] DL, page 1174, paragraph 2, sentence 2.

To date, there has not been a re-test of DL's *specific claim regarding the relation of percentage ownership and ROE*. In this section, this specific claim will be re-tested considering MSV, McS, and Cho. On the linear relation between ownership and ROE, DL report for 1980 that,

> "[Recursive estimates of mean accounting profit rate] show no significant relationship between ownership concentration and accounting profit rate, and especially no significant positive relationship. The data simply lend no support to the Berle-Means thesis." [29]

Challenges to DL's claims have come from alternative measures of condition 1 and arguments for condition 2. Tobin's q (Q) and market-to-book (M/B) ratios can also be used as proxies of firm profitability.[30] If profit rates are higher (and presumably cash flows are as well) then the intertemporal effect of DL's prediction is higher asset valuation.[31] Specifically, Q and M/B should increase with ownership concentration. DL also examined the relation between return on equity (ROE) and ownership. The arguments that ROE, Q and M/B increase with ownership percentage rest on the agency hypothesis which contends that managers with less than 100% ownership, at some point in decreasing managerial ownership, have their perquisites subsidized by "outside" shareholders.

3.1 Nonlinear results

The first paper which documents a nonlinear relation between profit or valuation and ownership is Hermalin and Weisbach (1987). They report a complex "saw-tooth" relation between Q and CEO stock ownership. The Q relation is positive from zero to 1% ownership, negative from 1% to 5%, then positive to 20%, then negative again. Three subsequent studies, MSV, McS, and Cho use

[29] Regression results in Table 9, page 1175 of their paper.
[30] Noronha, Shome and Morgan (1996) summarize the evidence of a high correlation between Q and M/B and the problems with the P/E alternative.
[31] See Shleifer and Vishny (1986).

broader measures of managerial ownership and their principal results are summarized in Figure 4. Figure 4 shows the relation of Q and board of directors' (board) or insider holdings for 1976, 1980, 1986 and 1991 as reported in MSV, McS and Cho. Inter-study comparisons suffer somewhat as each paper uses a different measure of managerial ownership[32] and report data from different years. Insider holdings are used in McS for 1976 and 1986. For 1991, Cho uses insider holdings but excludes options. MSV uses board ownership for 1980. MSV and McS report a convergence-of-interests (condition 1) and an entrenchment effect (condition 2) because valuation rises with managerial ownership and then declines. In McS, convergence-of-interests effect is found to dominate for the ownership range 0% to 40% (1986) or 50% (1976). McS report the entrenchment effect dominates above these high levels. In MSV, convergence-of-interests effect is found for the ownership ranges 0% to 5% and above 25%. MSV find entrenchment dominates from 5% to 25%. Cho approximately reproduces MSV.

McS report on results from two years; consider the comparison. McS test two single-year samples of New York and American Stock Exchange (NYSE and AMEX) firms separated by a decade, 1976 (N=1,173) and 1986 (N=1,093). They show that the Q relation with insider holdings changed between the two years. The intercepts at 0% and 70% (higher values are not reported) and extent of the curvature (peak value versus intercepts) are significantly different for 1976 than for 1986. For 1976, 0% insider holdings has a Q value of 0.93, the maximum Q value is approximately 1.25 which occurs at a level of 49% insider ownership, and Q is essentially flat above 49% falling slightly to 1.20 at the highest value of 70% holdings. The 1976 data show Q and ownership is essentially constant with Q = 1.20 +/- 0.05 over the range 20% to 70% holdings.

In contrast, McS report that the Q values for the 1986 data show greater variability for changes in insider holdings and are significantly higher than the Q values for equivalent levels of insider

[32] Comparisons to DL suffer even more because DL uses shareholder concentration.

ownership in 1976. Unlike the 1976 data, the 1986 data show a sharp rise to a clear maximum Q. There is no essentially flat region. For 1986, the Q at 0% ownership is 1.23, Q rises to approximately 1.80 at 38% insider holdings and then declines to 1.40 at 70%. Viewed separately, the two years appear to yield different results. The 1976 data are much more flat, and thus, more supportive of DL's finding of "no significant relation," than the 1986 data which are steeply curved as MSV terms "roof-shaped."[33] Unfortunately, these studies do not test DL's specific claim concerning the relation with ROE, instead offering only the Q relation.[34]

3.2 Motivation for Examination of Sequential Annual Samples

The variability in the valuation-and-ownership relation in McS motivates examination of this relation over a longer period of sequential annual samples. Ideally, the valuation and ownership relation would be examined at selected points over several business cycles.[35] A modest first step is to examine the relation over one business cycle. Sequential annual data on ownership and valuation are examined from 1986 through 1995. This period includes the end of one business cycle, a recession, and the beginning of another.[36] For a valuation ratio, M/B is used since Q is not available for this large set of firms. Medians and Means were examined. Medians are used here because they are less sensitive to outliers. This portion of the analysis of ownership and performance is limited to ownership between 0% and 31%[37] insider ownership for three reasons:

> [1] The principal difference between the claim in DL, that $\Delta\pi/\Delta\alpha = 0$ (condition 1 does not exist), and all contrary cross sectional evidence published to date, can

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[33] See their Figure 1, page 604.

[34] In the next section, evidence indicates that if McS had tested the ownership-profit relation with ROE their 1976 data might have supported DL. A re-examination of these data would be useful.

[35] Ed Leamer is thanked for this insight.

[36] According to the National Bureau of Economic Research (NBER), the trough of the prior US business cycle was November, 1982 and the peak was July, 1990. The present cycle began with a trough in March, 1991 and had not peaked by July, 1995. Thus one recession and portions of two expansions are included in these data. see http://www.nber.com/cycles.html.

[37] The impact of the 31% cut-off point is nil. Alternative limits are tested shortly. In Figure 6, the first of the 31 data points in each year is lost to indexing, leaving 30 data points for analysis.

be determined in each study[38] by examining condition 1 for some portion of a range in managerial ownership, $0 < \alpha < 31\%$. In each study, profit initially rises then falls. *It is illogical that condition 2 can exist in large samples for* $\alpha_L = 0$.

then falls. *It is illogical that condition 2 can exist in large samples for* $\alpha_L = 0$.

[2] The number of firms with less than 31% insider holdings is large, therefore, comparisons of medians across various ownership intervals are likely to be more statistically significant than those from samples taken at very high levels of ownership where fewer firms exist.

[3] This sample is biased toward larger firms because it is restricted to those with lower insider holdings, therefore, the results from using this sample are more comparable with prior work which focused on large firms.[39]

Figure 5 shows 310 median market-to-book (M/B) ratios for 31 one percent-wide intervals of D&Os' stock ownership from 0% to 31% for each annual sample from 1986 through 1995. The number of data points from which the median value was selected for each one percent-wide ownership interval varies from a minimum of 26 for the 30-to-31% interval in year 1986 to a maximum of 347 the 0-to-1% interval in both years 1987 and 1988. The average sample size of the 31 intervals for each year, 1986 to 1995, varied from a minimum of 76 firms in 1986 to a maximum of 105 firms for both 1994 and 1995. The median M/B values are contained in a band from 1.1 to 2.1 with only 4 values below this band and 5 values above it out of these 310 medians.

3.3 M/B Indices

Since conditions 1 and 2 concern only the change in profit (valuation) for a given change in ownership, and not the absolute level of profit (valuation), the M/B data can be converted to an

[38] DL, Hermalin and Weisbach (1987), MSV, McS, and Cho.
[39] Notable exceptions include Microsoft, which exceeded 31% insider holdings in 1995.

be determined in each study[38] by examining condition 1 for some portion of a range in managerial ownership, $0 < \alpha < 31\%$. In each study, profit initially rises then falls. *It is illogical that condition 2 can exist in large samples for* $\alpha_L = 0$.

[2] The number of firms with less than 31% insider holdings is large, therefore, comparisons of medians across various ownership intervals are likely to be more statistically significant than those from samples taken at very high levels of ownership where fewer firms exist.

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index and thereby the relation of M/B and ownership can be made comparable across the ten annual samples. Figure 6, Panel A shows the median market-to-book (M/B) ratios converted to indexed values by dividing each of the 31 median M/B ratios by the first median M/B ratio, that being the median value from 0% to 1% D&Os' ownership. After conversion, the M/B index for every 0-1% interval equals 1.00; there are 30 indexed values remaining. Figure 6 is dense with line plots, all ten years of data from 1986 to 1995 are shown. Close examination shows the most-arched or "roof-shaped" set of 30 points is from 1986; the least-arched set is from 1990.

Panel B shows the most-arched set, the 1986 sample, which confirms McS findings of just such a roof-shaped relation for their data also from 1986. These data conform with the non-linear findings in MSV, McS and Cho. The least-arched set, the 1990 sample, forms a slightly inverted roof-shape.[40] *This inverted roof-shape relation has not been previously reported. The interpretation of the inverted roof shape is fundamentally at odds with conditions 1 and 2 and is counter evidence to the results in MSV, McS and Cho.* Demsetz and Lehn's findings of "no relation" would constitute a middle ground, a flat relation, between the upward arching results from 1986 and the downward arching results from 1990. Data from the years 1988, 1989 and 1994 roughly match the DL flat relation. Data from 1991, 1992 and 1993 are inverted. Roof-shaped relations, supportive of MSV and McS, also occur in 1987 and 1995. (Additional figures not shown.)[41]

3.4 Comparison of Regressions

For the sake of brevity, regression analysis is limited to the two annual samples, 1986 and 1990, which demonstrate the extremes of the ownership-valuation relation. The M/B data from 1986 appears to support MSV and McS, the data from 1990 are inverted and refutes same. This

[40] The 1990 sample has 18 (12) values below (above) 1.00.

[41] Classification of a given year as being one or another of these three shapes, roof-shaped, flat, or inverted, over-simplifies the data. Classification using different sub-segments of the 0-99% range yields differing results. Four ranges of ownership percentage, which differ from the 0-31% classification range, will be tested with regression analysis in the next section.

abbreviated approach intentionally excludes analysis of data which would more likely support the DL contention that there is no relation; the reason for this will be obvious immediately. Also for conciseness, only the primary relation of valuation and profit with ownership is tested; secondary factors known to influence M/B ratios, such as SIC code, R&D expenses, capital expenditures, advertising expenses, etc., are left for future work. The point of adding these controls in MSV and McS is to show that their primary findings of conditions 1 and 2 are not spurious.[42] Counter evidence to the primary findings in DL, MSV and McS are shown following the description of the regressions.

DL uses a regression[43] of the form in equation 5a with π = ROE,

$$\pi = b + \beta_0 \alpha \qquad [5a]$$

McS uses a regression[44] of the form in equation 5b with π = Q,

$$\pi = b + \beta_1 \alpha + \beta_2 \alpha^2. \qquad [5b]$$

Empirical tests: DL predict that β_0, β_1 and β_2 are all zero. If β_0 or β_1 (β_2) is positive (negative) condition 1 (condition 2) cannot be rejected, supporting MSV, McS and JM.

Cho, which follows MSV[45], estimates a piecewise OLS linear regression with π = Q and managerial ownership of the form in equation 6.

$$\pi = b + \gamma_1 INS1(\alpha_L) + \gamma_2 INS2(\alpha_L, \alpha_U) + \gamma_3 INS3(\alpha_U) \qquad [6]$$

[42] McS are unable to reproduce results in MSV in the Q data for 1976 and 1986 even with controls for debt, R&D, advertising and replacement costs. See McS, Table 3, page 608.
[43] See DL, Table 9, page 1,175
[44] See McS, Table 1, Panels A and B, column 1, page 602.
[45] See MSV, Table 2, column 1, page 300. See Cho, equation 2, page 109.

The values of INS1, INS2, and INS3, are based on insider holdings, α, and parameters α_L and α_U as follows:

$$INS1 = \alpha \text{ if } \alpha < \alpha_L \text{ and } \alpha_L \text{ otherwise}$$

$$INS2 = 0 \text{ if } \alpha < \alpha_L \text{ and}$$

$$INS2 = \alpha - \alpha_L \text{ if } \alpha < \alpha_U \text{ and } \alpha_U - \alpha_L \text{ otherwise}$$

$$INS3 = 0 \text{ if } \alpha < \alpha_U \text{ and}$$

$$INS3 = \alpha - \alpha_U \text{ if } \alpha \geq \alpha_U$$

The grid search technique used in Cho essentially reproduces the result in MSV.[46] From condition 2, Cho found α_L = 7% and α_U = 38%; MSV use 5% and 25% for these parameters, respectively.

Empirical test: If γ_1 (γ_2) is positive (negative and γ_1 is non-negative) condition 1 (condition 2) cannot be rejected.[47] If γ_1, γ_2, or γ_3 is non-zero, DL is rejected.

Regression analysis to follow is in the form of equations 5a, 5b and 6. These regressions are called R5a, R5b and R6, respectively. The measures of profit, π, considered are M/B and ROE.

3.5 Evidence

The primary relations from MSV, McS and Cho are shown in Table 4, Panels A and B. Panel A shows the regression of Q on insider holdings reported by McS for 1,173 NYSE or AMEX firms in 1976 and 1,093 firms in 1986. McS use the 1976 and 1986 editions of the Value Line Investment Survey for insider holdings data and the Compustat data to determine Q. Their ownership data range from 0% to 70%. Coefficients are given to at least four significant digits with the p value in brackets [ ]. The inflection points, 49.4% and 37.6%, occur at the maximum value of Q based on the regression coefficients.

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[46] This technique is appropriate as Cho (1998) is only reproducing a MSV-like result, not confirming MSV.

[47] If γ_3 is positive then condition 1 dominates over condition 2 above α_U. This test is less relevant to the debate over linear and non-linear models than whether conditions 1 and 2 exist at lower levels of ownership.

McS result

> *For both years, the McS regression (R5b) yields both coefficients, β_1 and β_2, statistically different from zero with 99% confidence in large samples. These results strongly reject DL but cannot reject conditions 1 or 2.*

Table 4, Panel B shows the relation of Q (column 1) and ROA_R (column 3) with board holdings for 371 Fortune 500 firms in 1980 from MSV and Q with insider holdings (column 2) for 326 Fortune 500 firms in 1991 from Cho.[48] In MSV, the source of board holdings is Corporate Data Exchange (CDE) which provides names, board status and stakes down to a level of 0.2% ownership. In MSV, of the 456 Fortune 500 firms with ownership data available, 85 firms did not have Q data, thus 371 remained.[49] Q is from Griliches R&D master file for 1980. Cho, following McS, uses insider holdings, extending beyond MSV to include all insiders. However, the Cho measure includes shares owned, but unlike McS, does not include options held. For the insider holdings data, Cho uses an unspecified combination of the Value Line Investment Survey for 1991 and proxy statements. Inflection points occur at the maximum and minimum values of Q and ROA_R based on regression parameters, α_L and α_U, and the coefficients. The standard errors (se) are from MSV and are in parentheses ( ). Cho reports t-statistics, the absolute of which are shown below the coefficients.

The MSV regression of Q shown in Table 4, Panel B, column 1 cannot reject conditions 1 or 2 as γ_1 is positive with 95% confidence and γ_2 is negative with 90% confidence.

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[48] The intercepts are unreported in MSV but the Q intercept can be estimated (est.) from their Figure 1; Cho (1998) does not report the maximum percentage of insider holdings but it can be estimated from the database used in this paper.

[49] Cho had similar reduction in sample size due to missing Q values. Approximately 1 in 5 firms are excluded in MSV and Cho even among these samples of large, otherwise well-documented companies.

MSV/Cho result

Improving on the result in MSV, the Cho regression (R6) of Q shown in column 2 cannot reject condition 1 (2) as γ_1 (γ_2) is positive (negative) with 95% confidence. This strongly rejects DL.

MSV, following DL, also test profit rate in column 3 with $\pi = ROA_R$, this result rejects condition 2, but can not reject condition 1. This rejects DL as well.

3.5.1 Comparing MSV and Cho with DL

Following Cho, the MSV result is reproduced in Table 5. Panel A shows regression results on data from 1986. Panel B shows the same regressions with data from 1990. As there are 48 regressions to follow, a shorthand notation will be employed, for this first regression, that notation is R6(M/B,all,1986). Panel A, column 1, contains the results of R6 using $\alpha_L = 5\%$ and $\alpha_U = 25\%$ as in MSV[50] with π = M/B and all data available in 1986 (N = 3,354).[51] At 95% confidence, R6(M/B,all,1986) rejects conditions 1 and 2 but cannot reject DL. By removing the top and bottom 10% of M/B and ROE outliers, the 1986 sample is reduced by 1,051 firms to N = 2,303. Regression analysis of the middle 80% (Mid 80) of M/B and ROE values yields a result which improves on the MSV/Cho result.

Key result #1

Column 2 contains R6(M/B,Mid 80,1986) which matches the predicted signs in MSV at a 99%, 95%, and 99% confidence for γ_1, γ_2, and γ_3, respectively.

[50] These parameters will not be altered throughout the analysis.

[51] A description of each regression is shown in the lower half (2. Description) of each table. This description includes at least the range in insider holdings, sample size, Adjusted R-square. Where possible the description includes inflection points, F ratio with p value, and comments on inflection points.

Following DL, the first two regressions in Table 5, Panel A, columns 1 and 2 are repeated in columns 3 and 4 with π = ROE. R6(ROE,all,1986) in column 3 rejects conditions 1 and 2 but not DL. R6(ROE,Mid 80,1986) in column 4 rejects condition 1 and 2 and DL.

Key result #2

The very strong results from R6(M/B,Mid 80,1986) shown in column 2 are not confirmed in R6(ROE,Mid 80,1986) shown in column 4.

This indicates that choice of measure, Q, M/B, ROE or ROA, may be more important that previously reported. Key result #1 confirms that M/B is a good proxy for Q but Q, M/B and ROA may not be good proxies for ROE as assumed by MSV and McS. Choice of the profit rate measure may affect the results even if choice of the valuation measure does not.

Table 5, Panel B shows R6 for 1990. This table examines the "inverted data" found in 1990. As expected, the regressions shown in columns 1, 2, 3, and 4 all reject conditions 1 and 2. Furthermore, column 4 contains the results of R6(ROE,Mid 80,1990) which has the coefficient γ_1 as *negative* and significant at 99%. This rejects MSV, McS and DL.

Key result #3

A finding that profit declines with increasing ownership from 0% to 5% is new to the literature and is counter factual to agency arguments in JM, MSV and McS.

Table 6, Panel A shows R6 for M/B using just the medians from each one percent-wide interval of D&Os' percentage stock ownership for 1986. Columns 1 through 4 examine the impact of the various ownership ranges reported by MSV and McS. Each column limits the range in D&Os' percentage stock ownership to a different maximum percentage. Each column has a minimum α which rounds to 0%; reported values of zero shares owned by D&Os are removed from these

samples as these values are indistinguishable from missing data. Columns 1 through 4 use ranges 0 - 99%, 0 - 81%, 0 - 71% and 0 - 41%, respectively; these ranges correspond to: all data, the MSV range, the McS range, and a large-firm range. Columns 1 and 2 show that coefficient γ_3 is positive and significant at 99% and in column 3 γ_3 is positive and significant at 95%. These results reject DL at the highest levels of D&O ownership but column 4, which has the large-firm bias, does not reject DL. In columns 1 through 4 γ_1 and γ_2 are zero; this rejects MSV and McS.

Table 6, Panel B shows R6 for M/B using medians for 1990. Columns 1, 2, 3 and 4 show that coefficients γ_1 and γ_2 are zero but γ_3 is significant at 99%, 90%, 90%, and 95% respectively. These results reject DL as well as MSV and McS. This concludes the examination of MSV and Cho as they relate to DL. A comparison of McS with DL follows.

3.5.2 Comparing McS with DL

Table 7, Panel A and B, contains linear and quadratic regression results in pairs using R5a (DL) and R5b (McS). Panel A, columns 1 and 2 contain the results of the first pair, R5a(M/B,All,1986) and R5b(M/B,All,1986). Neither can reject DL, both reject MSV and McS. After removing the top and bottom 10% of M/B and ROE outliers, R5a(M/B,Mid 80,1986) in column 3 shows β_0 is positive and significant at 99%. R5b(M/B,Mid 80,1986) in column 4 has β_1 positive and significant at 90%. Both results support condition 1 and refute DL. Columns 5 and 6 show the results of R5a(ROE,All,1986) and R5b(ROE,All,1986). Neither reject DL; both reject MSV and McS. Columns 7 and 8 show the results of R5a(ROE,Mid 80,1986) and R5b(ROE,Mid 80,1986). Surprisingly, these results are "inverted in ROE" as each coefficient, β_0, β_1, and β_2, is significant at 99% and β_0 and β_1 are negative. In column 8, ROE declines initially, reaches a minimum at 50.1% and then rises with ownership. This rejects DL, MSV and MSV.

Table 7, Panel B contains the same regressions as Panel A, but the data are from 1990. Columns 1 through 6 cannot reject DL. Columns 7 and 8 reject DL as well as MSV and McS. R5a(ROE,Mid

80,1990) in column 7 shows β_0 is negative and significant at 99%. R5b(M/B,Mid 80,1986) in column 8 shows that β_1 is negative and β_2 is positive and both are significant at 99%.

Table 8, Panel A repeats the regressions from Table 7 but on the median M/B values from 1986. The impact of altering the range of α from 0 - 99% to 0 - 41% is again tested. The linear regressions, R5a, in columns 1, 3, and 5 show β_0 is positive and significant at 99% confidence. This rejects DL and is consistent with condition 1. Column 7 rejects condition 1. The quadratic regressions in columns 2, 4, and 6 show β_1 and β_2 are statistically equal to zero, rejecting MSV and McS and being consistent with DL. The final regression in Panel A is R5b of median M/B and those with ownership below 41%. These data have the large-firm bias; results match McS.

Key result #4

> *β_1 is positive and significant at 95% and β_2 is negative and significant at 90%. The maximum is M/B = 1.81 at 24.8% insider ownership. This result is consistent with the 1986 data being roof-shaped.*

Table 8, Panel B repeats the regressions from Panel A but on the median M/B values from 1990. Columns 1, 3, and 5 show β_0 is positive and significant at 99%, 95%, and 90% confidence levels, respectively. These results are consistent with condition 1 and inconsistent with DL. Column 7 does not reject DL.

Key result #5

> *As expected, columns 2, 4, 6, and 8 show weakly inverted M/B and insider holdings relations. These results cannot reject DL but do reject MSV and McS.*

3.6 Summary of Key Results

The five key results support three facts: [1] The non-linear relations between ownership structure and performance of the form found in MSV and McS are reproducible in very large samples. This is shown for the year 1986 using D&Os' percentage stock ownership and with M/B in place of Q. The statistical significance of the coefficients on insider holdings equaled or exceeded those in MSV and McS. [2] Those same regressions show that ROE can be a poor proxy for M/B or Q. This may indicate that measures of short term profit, such as ROE and ROA, may be less useful in accessing the relation of ownership structure and performance than are measures of valuation, such as M/B and Q. [3] In addition to reproducing the "roof-shaped" relation of ownership and valuation, an "inverted" relation is also weakly (strongly) demonstrated in M/B (ROE). This finding is new to the literature and it is inconsistent with JM, MSV and McS.

4.0 Conclusion

The primary findings in MSV and McS are reproduced here as they are in Cho. Unlike the criticisms in Cho, results here call into question the long-standing findings of MSV and McS based on their choice of data, not econometric methods. Recently, Anderson and Lee (1997a) also criticizes empirical tests of the agency hypothesis which use Value Line or Spectrum 6 data. Their criticism stems from the poor comparisons of Value Line and Spectrum 6 ownership data with SEC filings. The criticism here extends beyond the quality of the data utilized to the duration of the data analyzed. This paper shows that the choice of sample period fundamentally changes the results of a simple regression analysis. Furthermore, it is shown that, for the range of ownership which accounts for most corporations, and nearly all stock market value, the existence of roof-shaped relations of managerial ownership and valuation (of the type reported by MSV, McS and Cho) are not more common than flat or inverted relations.

These findings do not reduce the criticism of MSV and McS made in either Cho or Anderson and Lee (1997a). These findings do raise the question of whether the results in Cho and others are

dependent on which years were examined; this is in addition to the data quality issues raised in Anderson and Lee (1997a). Future work should consider both improving the econometric methods, testing the impact of control variables from DL, MSV and McS, and examining these relations over many years of consistently derived, high-quality ownership data.[52] This research agenda will likely improve the understanding of the relation between ownership structure and performance.

Examining the M/B data over a ten year period demonstrates that the relation between the separation of ownership and valuation is not constant. The relation between profit and valuation with insider ownership percentage varies significantly from convex, to flat, to concave. In total, these results may support an endogenous model as in DL. The difference between these results and DL is that these data change over time. These data are consistent with the endogenous ownership hypothesis in DL if managers adjust their absolute or relative ownership slowly in response to changing market valuations and their own needs for liquidity.

[52] Improving the data source itself is not necessary based on Anderson and Lee (1997a).

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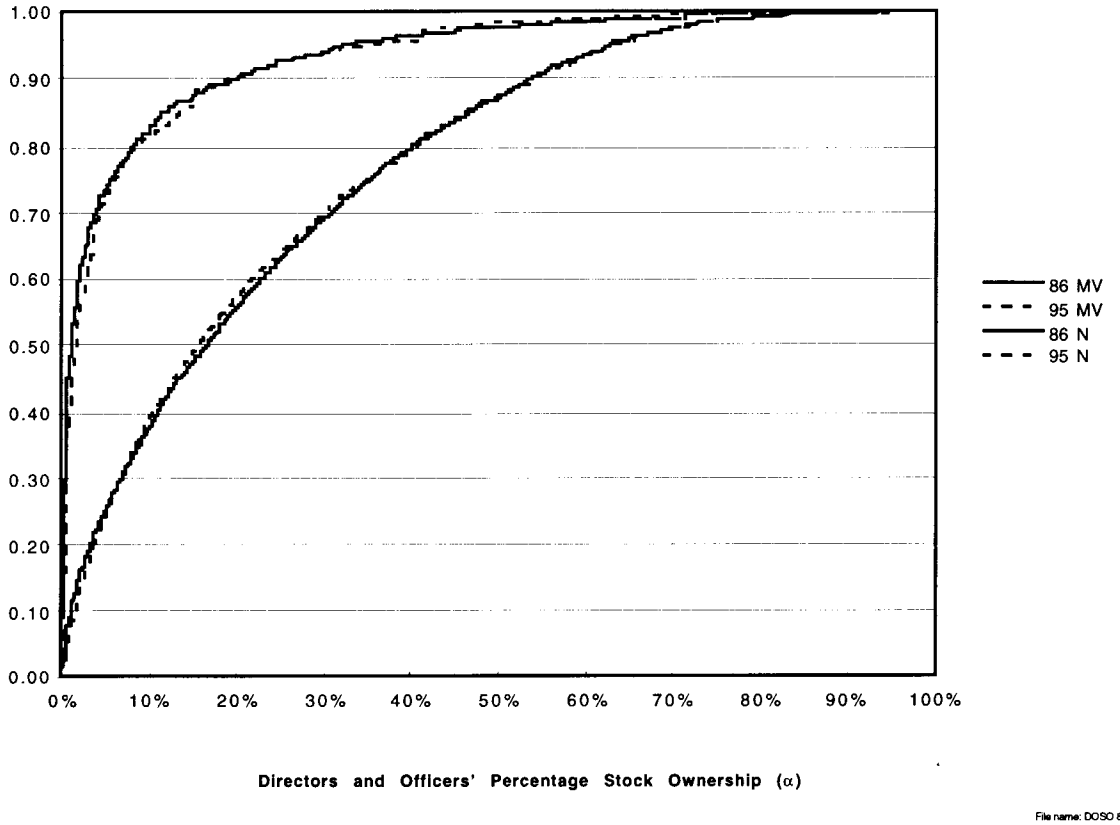
FIGURE 1

Fraction of Market Value in Firms and Fraction of the Number of Firms as a Function of Directors and Officers' Percentage Stock Ownership for 1986 and 1995.

Panel A: Full Distribution for all US Public Companies with data available.

Cumulative Distribution
(Fraction of US Market Value (top two lines); Fraction of firms (bottom two lines))



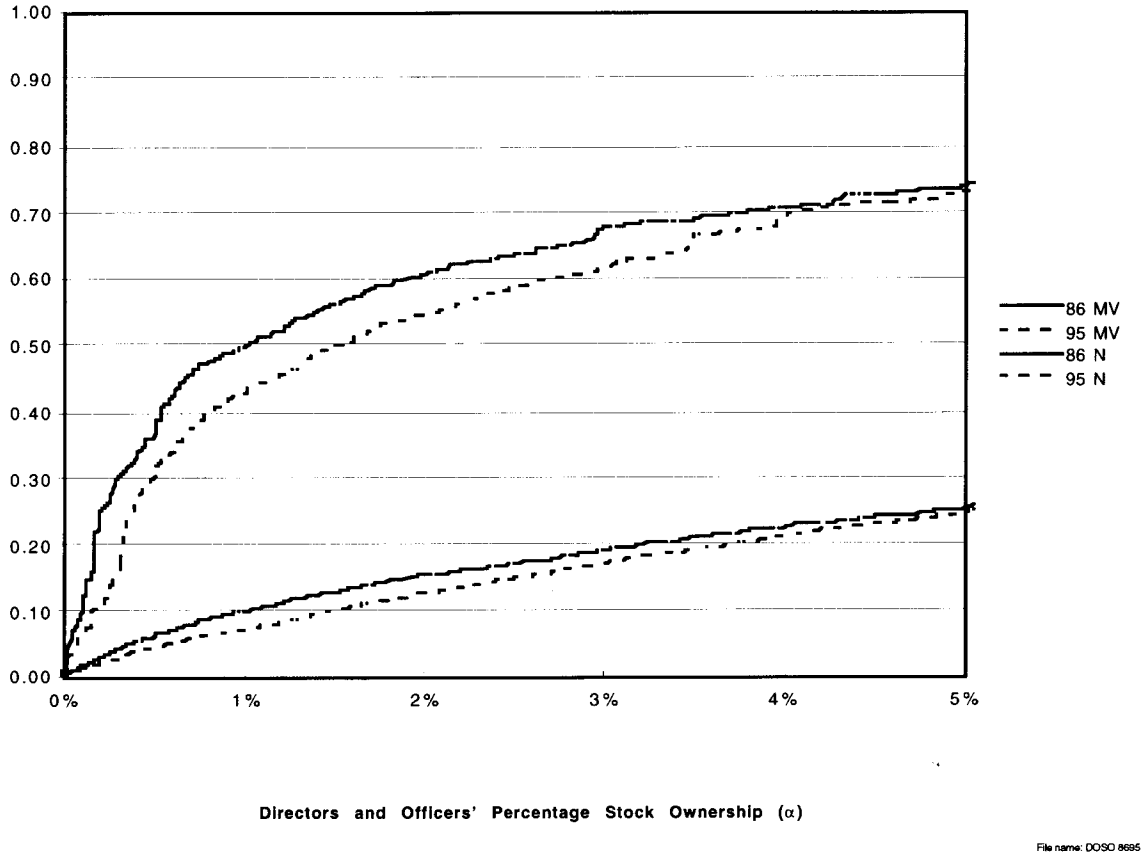
Panel A contains the cumulative frequency distribution represents the summation of market values (MV) and the number of firms (N) for all U.S. public companies with data available on the Disclosure CD ROM for July, 1986 and July, 1995. To be included here the firm must have the following data: stock ownership of directors and officers (D&Os), total common shares outstanding, and price per share. The total value of all U.S. firms for which these data were available is $1.98 trillion and $4.46 trillion for 1985 (N=3,400) and 1995 (N=3,701), respectively. As shown above approximately 90% of the market value of this large sample of publicly traded U.S. firms is accounted for by firms with 20% or less ownership by D&Os. D&Os own 50% or more of the shares outstanding in approximately 15% of firms. Median ownership is between 15% (1995) and 17% (1986).

FIGURE 1 (continued)

Fraction of Market Value in Firms and Fraction of the Number of Firms as a Function of Directors and Officers' Percentage Stock Ownership for 1986 and 1995.

Panel B: Detail showing the first 5% of Directors and Officers' Stock Ownership.

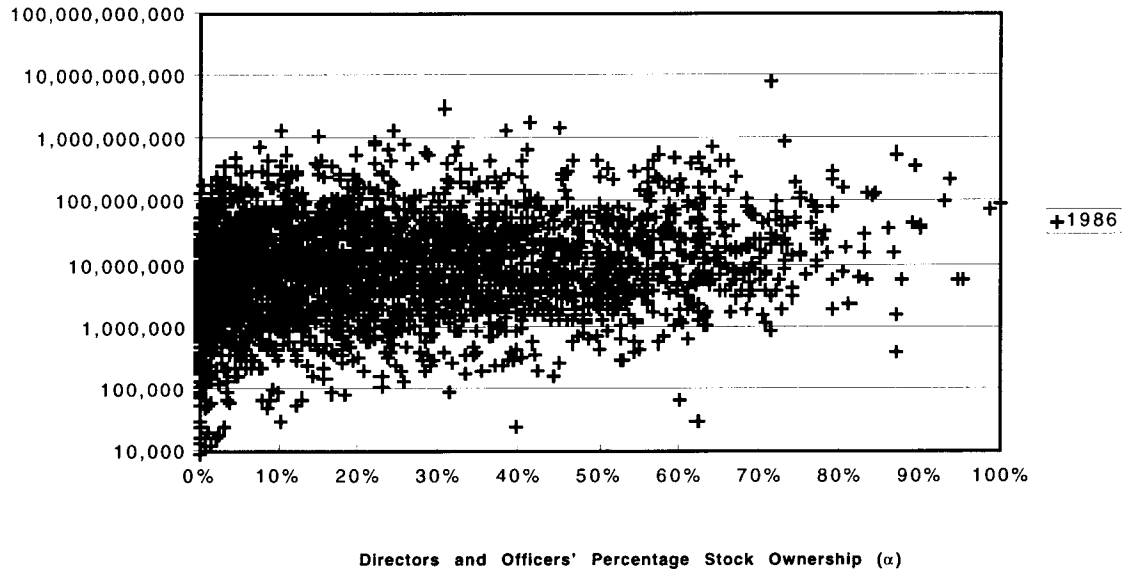
Cumulative Distribution
(Fraction of US Market Value (top two lines); Fraction of firms (bottom two lines))



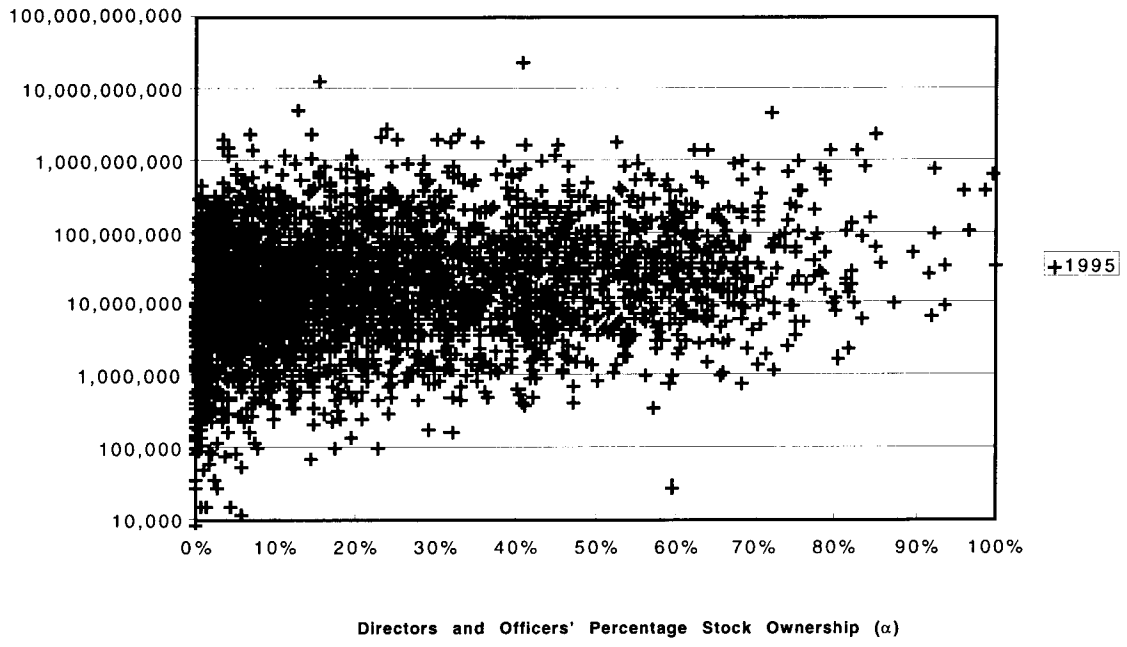
Panel B shows detail of the summation of market values (MV) and the number of firms (N) for the first 5% of directors and officers' stock ownership. In both 1986 and 1995, firms with 5% or less stock ownership by D&Os account for nearly 75% of the market value and approximately 25% of the number of US public companies. Furthermore, firms with 1% ownership by officer and directors account for approximately 50% of total market value in this sample for 1986 and over 40% for 1995. In both years these firms account for less than 10% of the number of public companies. Ownership by D&Os in this subset is slightly higher in percentage terms in 1995 than in 1986. These cumulative frequency distributions represent the summation of market values for all U.S. public companies with insider holdings data available on the Disclosure CD ROM for July, 1986 and July, 1995. These firms are the same as those in Panel A.

FIGURE 2
The Market Value of Directors and Officers' Stock Ownership for 1986 and 1995.

Panel A: 1986 D&O Investment in their Firms
($ Investment)



Panel B: 1995 D&O Investment in their Firms
($ Investment)



In Figure 2, each panel shows the dollar value of the stock owned by Directors and Officers (D&O Investment) plotted against the percentage ownership by D&O. Panel A shows data on 3,701 firms and Panel B shows 3,400 firms. The mean (median) values are $36.51 ($8.45) million and $78.47 ($17.33) million for 1986 and 1995, respectively.

FIGURE 3

The Mean and Median Market Values of Firms from 36 Sub-samples of Directors and Officer's Stock Ownership from 0% to 35% for 1995 and 1986.

Panel A: Log Scale Firm Value and Linear D&O Ownership Percentage

in $ Millions

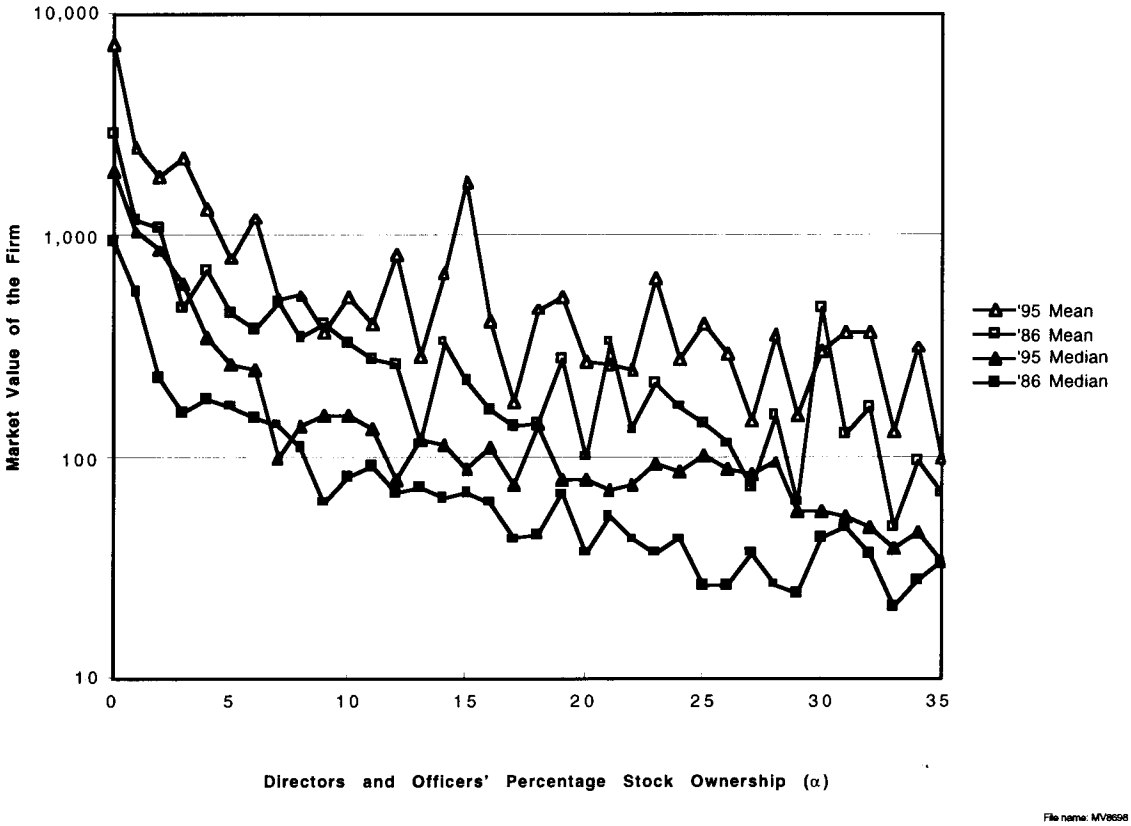


Figure 3, Panel A shows the mean and median market values (on a logarithmic scale) for sub-samples of firms plotted against the (linear) percentage ownership by their D&Os. The sub-samples are formed by examining firms in one percentage point intervals of D&Os' ownership. For firms with between 0% and 1% D&Os' ownership, the mean (median) size was $2.93 ($0.96) billion for 1986. For 1995, the mean (median) was $6.55 ($1.51) billion. Data on 3,701 and 3,400 US public firms are shown for 1995 and 1986, respectively. The size of firms measured by both mean and median market value sharply, between 7.5 to 20 fold, across the first ten percentage points of D&Os' ownership. Over the next 25 percentage points of D&O stock ownership, the decline is much less pronounced.

FIGURE 3 (continued)

The Mean and Median Market Values of Firms from 36 Sub-samples of
Directors and Officer's Stock Ownership
from 0% to 35% for 1995 and 1986.

Panel B: Log Scale Firm Value and Log Scale Ownership Percentage

in $ Millions

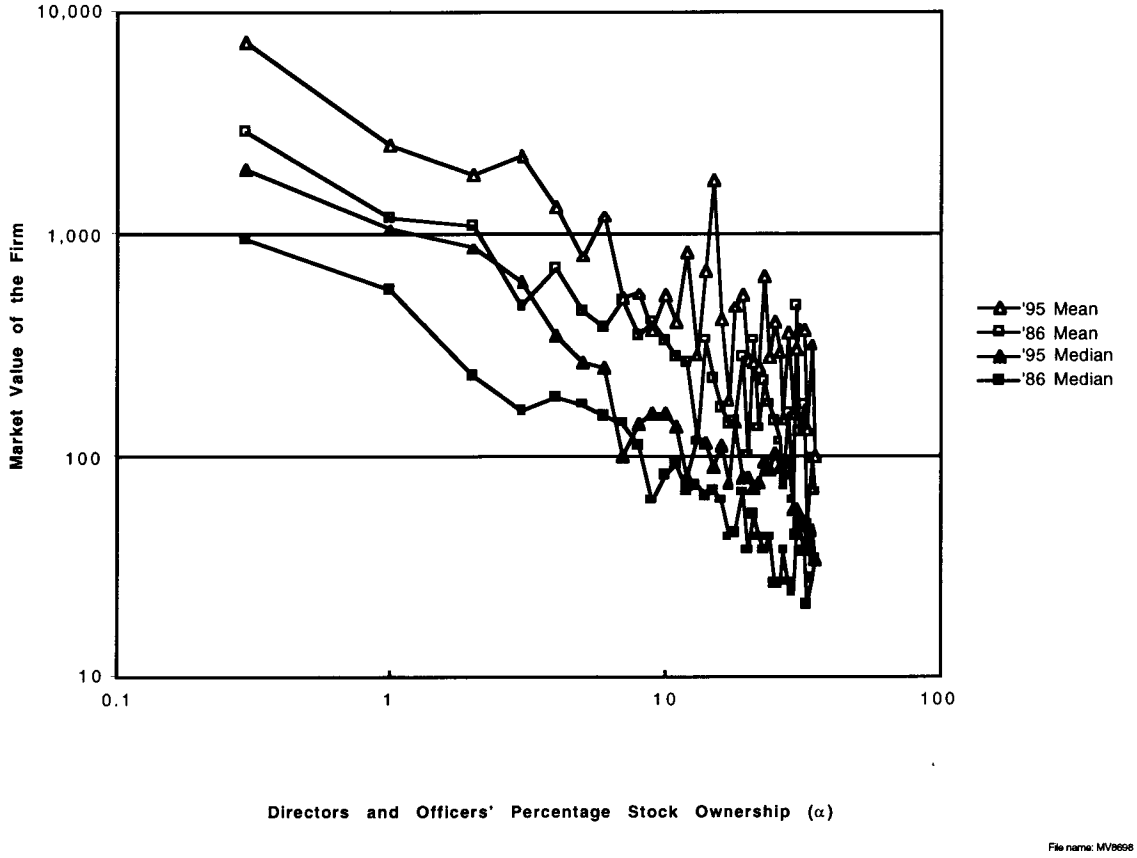


Figure 3, Panel B shows the data from Panel A with both axes in logarithmic scale. The four sets of data are the same as those in Panel A: the mean and median from both years, 1986 and 1995. Note each relation has a slope which approximates negative 1.0. If the slopes of these relations were exactly equal to negative 1.0, then the multiplication of the directors and officers' (D&Os') percentage stock ownership and the equity market value would exactly equal a constant. The slopes imply that the D&Os of widely-varying size firms, with markedly different percentage levels of ownership, have remarkably consistent mean and median wealth-at-risk. The relation is less clear above D&Os' ownership equal to 20%, where the sample sizes in each one percentage point wide interval of D&O ownership are smaller. The relation holds surprisingly well for the mean and median D&O investment over the range of D&Os' percentage ownership which accounts for the set of firms which total over 90% of the sample's market capitalization.

FIGURE 4

The Empirical Relation between Tobin's Q and Insider or Board of Directors' Stock Ownership as determined by Morck, Shleifer and Vishny (1988), McConnell and Servaes (1990) and Cho (1988).

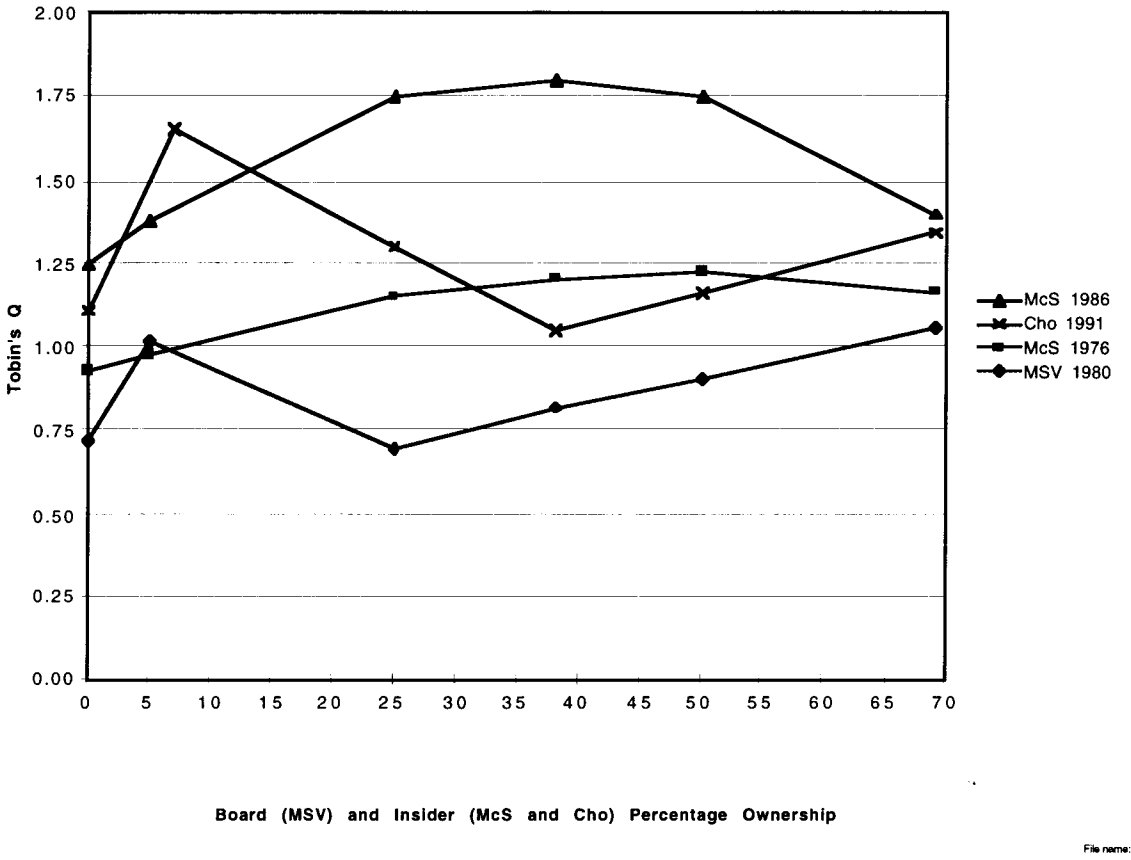


Figure 4 shows the relation of Tobin's Q board of directors' (board) or insider holdings for 1976, 1980, 1986 and 1991. The insider ownership data are used in McConnell and Servaes (1990) (McS) for 1976 and 1986 and for Cho (1998) and Morck, Shleifer, and Vishny (1988) (MSV) uses board of directors' ownership for 1980. These studies show what could be a convergence-of-interests and an entrenchment effect because valuation rises with managerial ownership and then declines. Cho (1998) reproduces the results in MSV but argues that regressions in MSV and McS are misspecified. In McS, convergence-of-interests effect is reported for the ownership range 0% to 40% in 1986 and 0% to 50% in 1976. McS report that an entrenchment effect dominates above these levels. In MSV, a convergence-of-interests effect is found for the ownership ranges 0% to 5% and above 25% in 1980. MSV report an entrenchment effect from 5% to 25%.

FIGURE 5

The Median Market-to-Book Ratios for 31 one-percent wide intervals
of Directors and Officer's Stock Ownership from 0% to 31% for 1995 and 1986.

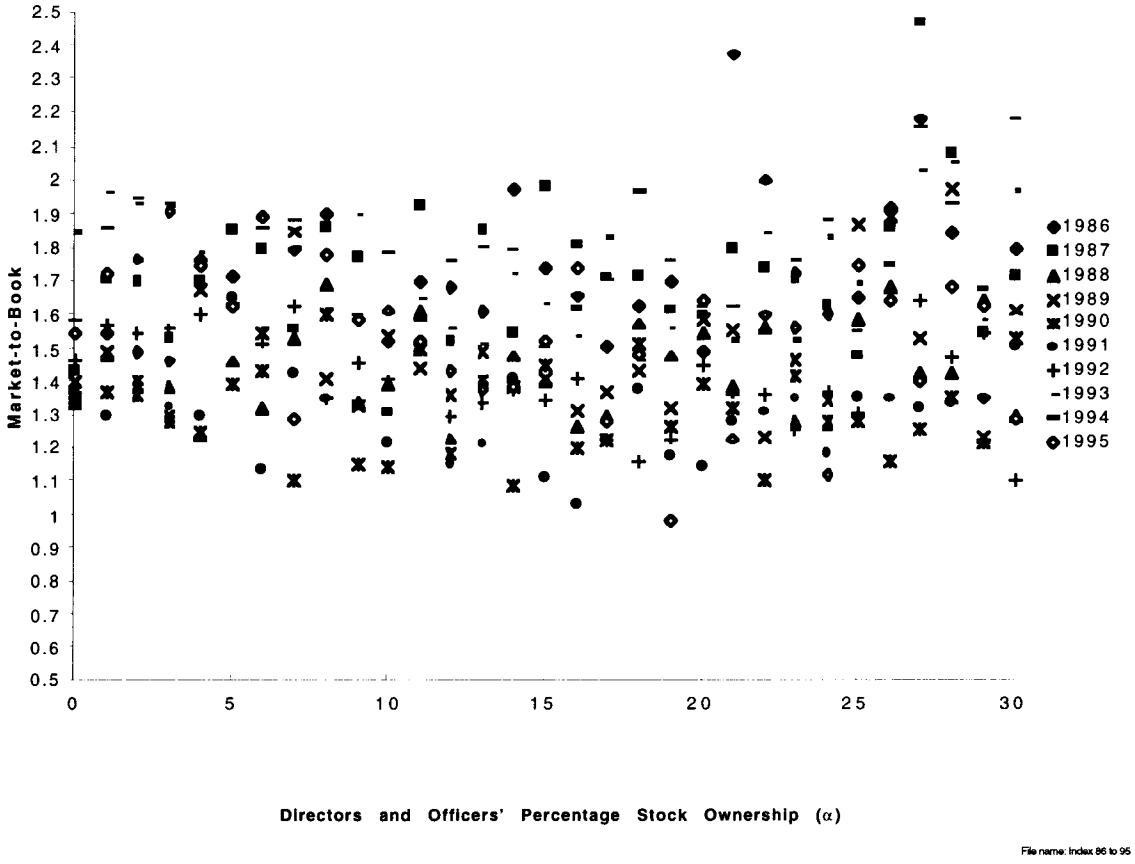


Figure 5 shows the median market-to-book (M/B) ratios for 31 one-percent wide intervals of directors and officer's stock ownership from 0% to 31% for 1986 through 1995. The number of data points from which the median value was selected for each one-percent wide ownership interval varies from a minimum of 26 for the 30-to-31% interval in year 1986 to a maximum of 347 the 0-to-1% interval in both years 1987 and 1988. The average sample size of the 31 intervals for each year, 1986 to 1995, varied from a minimum of 76 firms in 1986 to maximum of 105 firms for both 1994 and 1995. The median M/B values are contained in a band from 1.1 to 2.1 with only 4 values below this band and 5 values above it out of 310 medians.

FIGURE 6

The Indexed Median Market-to-Book Ratios for 30 one-percent wide intervals of Directors and Officer's Stock Ownership from 1% to 31% for 1995 and 1986.

Panel A: All ten years, 1986 to 1995

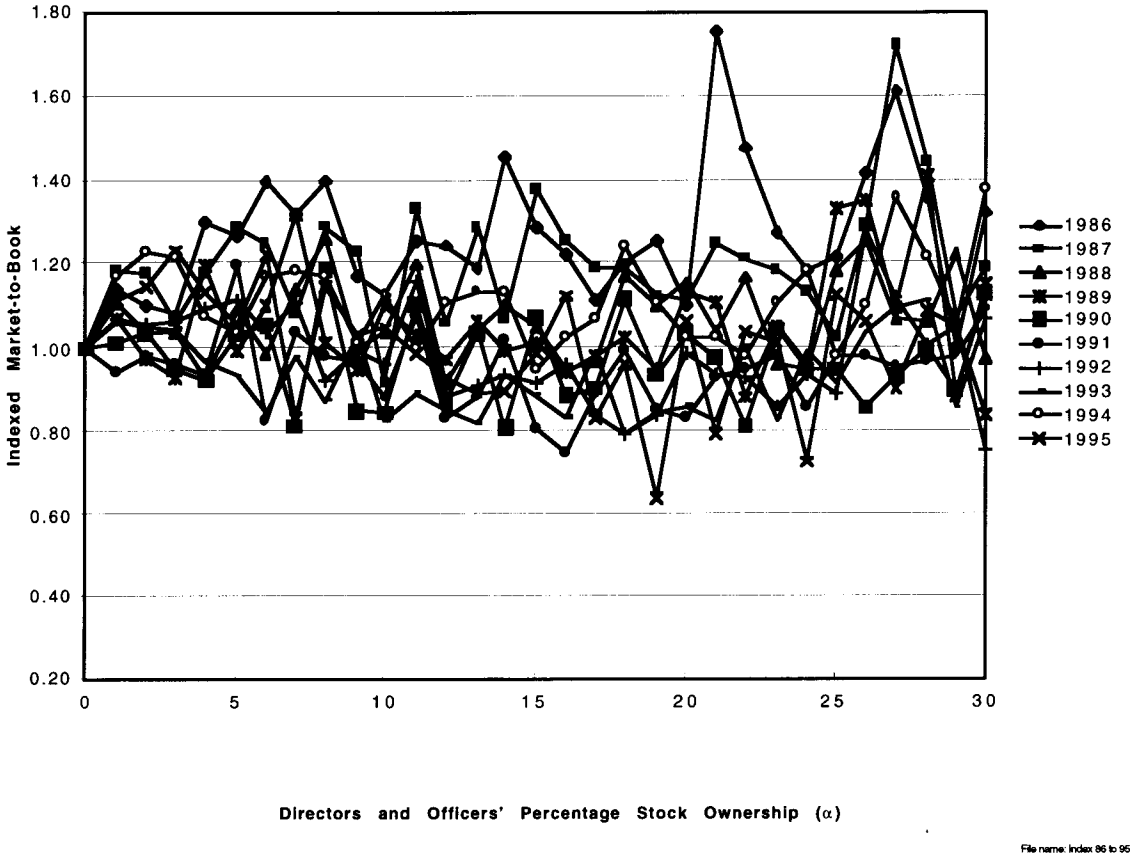


Figure 6 Panel A shows the median market-to-book (M/B) ratios converted to indexed values by dividing each of the 31 median M/B ratios by the first median M/B ratio, that being the median value from 0% to 1%. All ten years of data are plotted. Although this figure is dense with line plots, the most arched or "roof-shaped" set of 30 points is found for 1986; the least arched set is from 1990. (See Panel B) The most arched set would conform with McConnell and Servaes findings of a roof-shaped relation and the non-linear findings in MSV and Cho (1998). The least arched set is an inverted roof-shape. This inverted roof-shape relation has not been previously reported. Demsetz and Lehn's findings of "no relation" would constitute a middle ground between the upward arching and the downward arching results or a more flat relation.

FIGURE 6 (continued)

The Indexed Median Market-to-Book Ratios for 30 one-percent wide intervals of Directors and Officer's Stock Ownership from 1% to 31% for 1995 and 1986.

Panel B: Two years, 1986 to 1990, emphasize roof-shaped and inverted relations

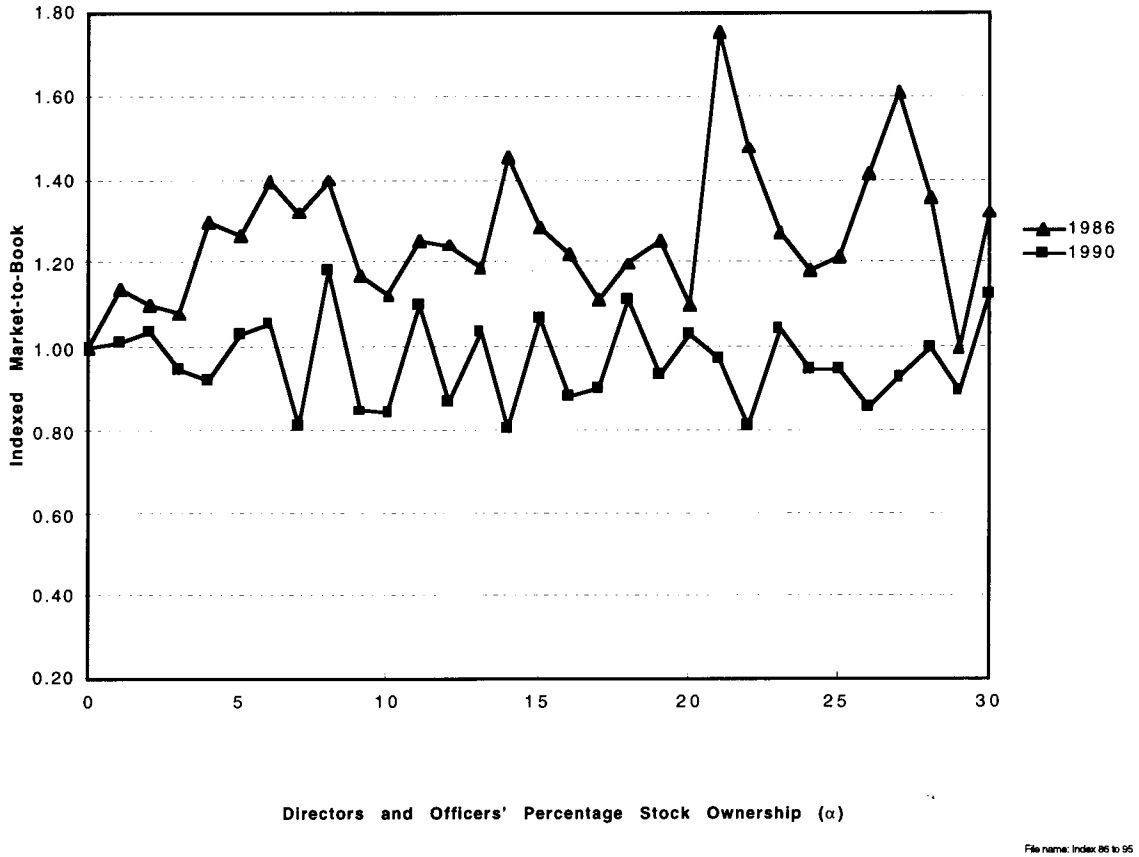


Figure 6, Panel B shows the median market-to-book (M/B) ratios converted to indexed values of dividing each of the 31 median M/B ratios by the first median M/B ratio, that being the median value from 0% to 1%. Two years of data, 1986 and 1990, are plotted. This figure is included to show details of the 1986 and 1990 data not clear in Panel A.

TABLE 1

Directors and Officers' Investment Levels for 1986 and 1995

D&O Investment	Number of Firms in 1986 of 3,400	Number of Firms in 1995 of 3,701
less than $0.5 Million	192 (5.6%)	118 (3.1%)
less than $1.0 Million	351 (10.3%)	227 (6.1%)
more than $10 Million	1,559 (45.9%)	2,332 (63.0%)
more than $100 Million	220 (6.5%)	535 (14.5%)
more than $ 500 Million	26 (0.8%)	89 (2.4%)
more than $ 1 Billion	8 (0.2%)	29 (0.8%)

File name: DO8695

Table 1 shows directors and officers' (D&Os') investment levels for 3,400 firm in 1986 and for 3,701 firms in 1995. This is the total number of shares of common stock owned by D&Os multiplied by the average price per share for July of either 1986 or 1995. Approximately 46% of firms in 1986 had D&Os' investment of more than $10 million. For this level of investment the fraction grew to 63% by 1995. The two extremes are worth noting. D&O investment was less than $1.0 million for 10.3% and 6.1% of firms in 1986 and 1995, respectively. Over $100 million in D&O investment occurred in 6.5% and 14.4% of firms for 1986 and 1995, respectively.

TABLE 2

Mean and Median Firm Size for eleven levels of
Directors and Officers' Percentage Stock Ownership
for 1986 and 1995

D&O Ownership (α)	1986 Mean Market Value $Millions	1986 Median Market Value $Millions	1995 Mean Market Value $Millions	1995 Median Market Value $Millions
0 - 1%	$2,931	$959	$6,548	$1,512
1 - 2%	1,185	548	2,252	810
2 - 3%	1,085	230	1,657	696
3 - 4%	478	162	1,961	342
4 - 5%	705	185	1,121	228
5 - 6%	*451*	*172*	*674*	*169*
6 - 7%	381	152	1,035	187
7 - 8%	491	141	418	70
8 - 9%	355	112	436	75
9 - 10%	392	59	319	106
10 - 11%	339	83	422	112

File name: DO18695

Table 2 shows the mean and median market values for firms with directors and officers' (D&Os') percentage stock ownership levels within the lowest eleven one percentage point-wide intervals over the range of ownership from 0% to 11% for the years 1995 and 1986. Supporting Demsetz and Lehn (1985) the mean and median market values of firms for both 1986 and 1995 drop very dramatically across the first five one-percent-wide intervals and by comparison very little across the next five. The 1986 mean (median) for 0-to-1% interval is $2.93 ($0.96) billion which is 6.50 (5.58) times the mean (median) of $0.45 ($0.17) billion for the 5-to-6% interval. For 1986 for the 5-to-6% interval to the 10-to-11% interval the decrease is 1.33 (2.07) fold. The 1995 mean (median) for 0-to-1% is 9.72 (8.95) times the mean (median) for the 5-to-6% interval (in italics). The 1995 mean (median) for 5-to-6% is 1.60 (1.51) times the mean (median) for the 10-to-11% interval. The sample sizes in each of these interval ranges were large, from a maximum of 335 firms to a minimum of 83 firms for the eleven intervals in 1986 and from 293 to 110 firms for 1995.

TABLE 3

Directors and Officers' Investment for selected levels
of Directors and Officers' Percentage Stock Ownership
for 1986 and 1995

D&O Ownership (α)	1986 Mean D&O Investment $ Million	1986 Median D&O Investment $ Million	1995 Mean D&O Investment $ Million	1995 Median D&O Investment $ Million
0 - 1%	17.7	5.8	43.6	11.9
1 - 2%	18.0	8.3	38.4	15.8
10 - 11%	34.7	8.6	56.0	16.3
20 - 21%	20.8	7.6	56.1	16.6

Table 3 shows selected samples of mean and median directors and officers' (D&Os') investment amounts for firms at selected levels of D&Os' percentage stock ownership for the years 1986 and 1995. Despite wide ranges of market values and D&O percentage ownership for these firms, mean and median D&O dollar investment changes little, rising slightly for all four measures. While D&O percentage ownership varies 20 fold or greater over the range 0-1% to 20-21%, the mean (median) wealth-at-risk increases 1.2 (1.3) fold and 1.3 (1.4) fold for 1986 and 1995, respectively.

TABLE 4

Regression analysis of Tobin's Q on insider ownership from McConnell and Servaes (1990)
and of Tobin's Q and profit rate from Morck, Shleifer and Vishny (1988)
and of Tobin's Q and insider holdings from Cho (1998)

Panel A: McConnell and Servaes (1990)

Panel A	1976 Tobin's Q	1986 Tobin's Q
1. Regression	column 1	column 2
Intercept p	**0.9302** [0.00]	**1.2413** [0.00]
α p	**1.2145** [0.01]	**3.0644** [0.00]
α^2 p	**-1.2304** [0.01]	**-4.0740** [0.00]
2. Description	NYSE/AMEX	NYSE/AMEX
Range	0 - 70%	0 - 70%
N	1,173	1,093
Adj. R^2	0.027	0.060
Inflection Point (Max or Min)	49.4% (Max)	37.6% (Max)

Table 4, Panel A shows the relation of Tobin's Q (Q) with insider holdings for 1,173 NYSE or AMEX firms in 1976 and 1,093 firms in 1986 as reported in McConnell and Servaes (1990) (McS). Coefficients are given to at least four significant digits where possible and the p value shown in brackets [ ]. Inflection points occur at the maximum value of Q based on the regression coefficients. In order to make results easier to compare between Panel A and B, regression results in bold have significance of 95% or higher.

TABLE 4 (continued)

Regression analysis of Tobin's Q on insider ownership from McConnell and Servaes (1990)
and of Tobin's Q and profit rate from Morck, Shleifer and Vishny (1988)
and of Tobin's Q and insider holdings from Cho (1998)

Panel B: Morck, Shleifer and Vishny (1988) and Cho (1998)

Panel B	1980 MSV Tobin's Q	1991 Cho Tobin's Q	1980 MSV Profit rate (ROA_B)
1. Regression	column 1	column 2	column 3
Intercept t	0.72 est.	**1.1101** 9.68	n.a.
INS1 se t	**5.74**[b] (2.41)	**7.766** 2.65	**0.298**[b] (0.131)
INS2 se t	-1.40[c] (0.727)	**-1.949** 2.18	-0.0582 (0.0398)
INS3 se t	-0.0494 (0.458)	0.959 0.94	-0.0100 (0.0442)
2. Description	Fortune 500	Fortune 500	Fortune 500
Range	0 - 80%	0 - 80 est. %	0 - 80%
N	371	326	371
Adj. R^2	0.0196	0.014	0.060
Inflection Points	5% and 25%	7% and 38%	5% and 25%

Table 4, Panel B shows the relation of Tobin's Q and profit rate with board of directors holdings for 371 Fortune 500 firms as reported in Morck, Shleifer and Vishny (1988) (MSV) and Tobin's Q and insider holdings for 326 Fortune 500 firms as reported in Cho (1998). The intercepts are unreported in MSV but the Tobin's Q intercept can be estimated (est.) from their Figure 1; Cho (1998) does not report the upper end of his insider holdings data but it can be estimated from the database used in this paper. Inflection points occur at the maximum and minimum value of Tobin's Q and ROA_R based on each paper. The standard errors (se) appear in MSV and are shown in parentheses ( ) and superscripts indicate significance as reported in the original work. MSV use superscripts a, b, and c refer to significance at 99%, 95%, and 90% levels, respectively. Cho reports t-statistics and the absolute values are below the coefficients. In order to make results easier to compare between Panel A and B, results in bold have significance of 95% or higher.

TABLE 5

Regression analysis of 1986 Market-to-Book and ROE on insider holdings
for comparison with Morck, Shleifer and Vishny (1988)

Panel A: Comparison with MSV	1986 M/B	1986 M/B	1986 ROE	1986 ROE
1. Regression	col. 1	col. 2	col. 3	col. 4
Intercept	5.001	1.613	0.1835	0.09982
t	4.58	33.0	0.69	22.0
p	[0.00]	[0.00]	[0.49]	[0.00]
INS1	-0.5438	0.07529	-0.1184	-9.400E-4
t	1.69	5.20	1.52	0.70
p	[0.09]	[0.00]	[0.13]	[0.49]
INS2	0.03094	-0.00734	0.02059	-.001133
t	0.40	2.02	1.11	3.35
p	[0.69]	[0.04]	[0.27]	[0.00]
INS3	0.03382	.008120	.0005611	2.110E-5
t	0.83	3.95	0.06	0.11
p	[0.41]	[0.00]	[0.95]	[0.91]
2. Description	All	Mid 80	All	Mid 80
Range	0 - 99%	0 - 99%	0 - 99%	0 - 99%
N	3,354	2,303	3,353	2,302
Adj. R^2	0.000	0.022	0.000	0.013
F ratio	1.36	18.2	0.88	11.2
	[0.25]	[0.00]	[0.45]	[0.00]
Inflections match Morck et al.?	no	yes	no	no

Panel A shows a regression analysis of 1986 market-to-book and ROE on insider holdings for comparison with Morck, Shleifer and Vishny (1988). Column 2 reproduces the primary result from MSV matching their signs and exceeding the statistical significance in the original work. The other regressions do not conform to the findings in MSV.

The t statistics are shown in absolute value below the coefficients and p values are in brackets [ ]. Inflections match MSV if the signs on INS1, INS2, and INS3 are positive, negative and positive, respectively.

TABLE 5 (continued)

Regression analysis of 1990 Market-to-Book and ROE on insider holdings
for comparison with Morck, Shleifer and Vishny (1988)

Panel B: Comparison with MSV	1990 M/B	1990 M/B	1990 ROE	1990 ROE
1. Regression	col. 1	col. 2	col. 3	col. 4
Intercept	2.263	1.519	0.1386	0.1051
t	3.10	31.7	0.59	20.4
p	[0.00]	[0.00]	[0.56]	[0.00]
INS1	0.04088	.01893	0.01753	-.004370
t	0.20	1.36	0.26	2.91
p	[0.84]	[0.18]	[0.79]	[0.00]
INS2	0.02153	-.003048	-0.01803	-6.870E-4
t	0.46	0.93	1.19	1.94
p	0.65	[0.35]	[0.23]	[0.05]
INS3	-.03352	.0005408	-.001120	-1.080E-4
t	1.41	0.32	0.15	0.59
p	[0.16]	[0.75]	[0.88]	[0.56]
2. Description	All	Mid 80	All	Mid 80
Range	0 - 99%	0 - 99%	0 - 99%	0 - 99%
N	3,851	2,665	3,851	2,665
Adj. R^2	0.000	0.000	0.000	0.015
F ratio	0.73	0.62	1.04	14.5
	[0.53]	[0.60]	[0.37]	[0.00]
Inflections match Morck et al.?	no	yes	no	no

Panel B shows a regression analysis of 1990 market-to-book and ROE on insider holdings for comparison with Morck, Shleifer and Vishny (1988). Column 2 reproduces the signs suggested in MSV but without the statistical significance. The other regressions do not conform to the findings in MSV. Column 4 shows results which are "inverted in ROE."

The t statistics are shown in absolute value below the coefficients and p values are in brackets [ ]. Inflections match MSV if the signs on INS1, INS2, and INS3 are positive, negative and positive, respectively.

TABLE 6

Regression analysis of 1986 Median Market-to-Book and insider holdings
for comparison with Morck, Shleifer and Vishny (1988)

Panel A: Comparison with MSV	1986 M/B	1986 M/B	1986 M/B	1986 M/B
1. Regression	col. 1	col. 2	col. 3	col. 4
Intercept	1.353	1.370	1.385	1.394
t	1.92	3.02	4.56	9.24
p	[0.06]	[0.00]	[0.00]	[0.00]
INS1	0.09194	0.07931	0.06800	0.06101
t	0.54	0.72	0.92	1.64
p	[0.59]	[0.48]	[0.36]	[0.11]
INS2	-0.01355	-.005604	0.001512	.005908
t	0.58	0.36	0.14	0.92
p	[0.57]	[0.72]	[0.89]	[0.36]
INS3	0.02138	0.01600	0.008718	-.007272
t	3.92	3.25	2.00	0.78
p	[0.00]	[0.00]	[0.05]	[0.44]
2. Description	Medians	Medians	Medians	Medians
Range	0 - 99%	0 - 81%	0 - 71%	0 - 41%
N	95	81	71	41
Adj. R^2	0.155	0.140	0.088	0.091
F ratio	6.75	5.35	3.26	2.33
	[0.00]	[0.00]	[0.03]	[0.09]
Inflections match Morck et al.?	yes	yes	no	no

Panel A shows a regression analysis of 1986 median market-to-book and insider holdings for comparison with Morck, Shleifer and Vishny (1988). Columns 1 through 4 fail to produce results which match MSV although the signs match in columns 1 and 2. The coefficient on INS3 is significant for columns 1 and 2 at 99% and at 95% for column 3. This rejects DL.

The t statistics are shown in absolute value below the coefficients and p values are in brackets [ ]. Inflections match MSV if the signs on INS1, INS2, and INS3 are positive, negative and positive, respectively.

TABLE 6 (continued)

Regression analysis of Median 1990 Market-to-Book and insider holdings
for comparison with Morck, Shleifer and Vishny (1988)

Panel B: Comparison with MSV	1990 M/B	1990 M/B	1990 M/B	1990 M/B
1. Regression	col. 1	col. 2	col. 3	col. 4
Intercept	1.353	1.368	1.365	1.363
t	2.70	4.90	5.16	12.52
p	[0.01]	[0.00]	[0.00]	[0.00]
INS1	-.000867	-0.01211	-.009758	-.008940
t	0.01	0.18	0.15	0.33
p	[0.99]	[0.86]	[0.88]	[0.74]
INS2	-.007100	-.000030	-.001507	-.002022
t	0.42	0.00	0.16	0.44
p	[0.67]	[1.00]	[0.87]	[0.66]
INS3	0.009969	0.005263	0.006680	0.01470
t	2.52	1.74	1.76	21.7
p	[0.01]	[0.09]	[0.08]	[0.04]
2. Description	Medians	Medians	Medians	Medians
Range	0 - 99%	0 - 81%	0 - 71%	0 - 41%
N	94	81	71	41
Adj. R^2	0.048	0.018	0.017	0.067
F ratio	2.56	1.49	1.41	1.96
	[0.06]	[0.22]	[0.25]	[0.14]
Inflections match Morck et al.?	no	no	no	no

Panel B shows a regression analysis of 1990 median market-to-book and insider holdings for comparison with Morck, Shleifer and Vishny (1988). Columns 1 through 4 fail to produce results which match MSV. The coefficient on INS3 is significant for columns 1, 2, 3 and 4 at 90% or higher. This rejects DL.

The t statistics are shown in absolute value below the coefficients and p values are in brackets [ ]. Inflections match MSV if the signs on INS1, INS2, and INS3 are positive, negative and positive, respectively.

TABLE 7

Regression analysis of 1986 Market-to-Book and ROE on insider holdings
for comparison with McConnell and Servaes (1990)

Panel A: Comparison with McS	1986 M/B	1986 M/B	1986 M/B	1986 M/B	1986 ROE	1986 ROE	1986 ROE	1986 ROE
	col. 1	col. 2	col. 3	col. 4	col. 5	col. 6	col. 7	col. 8
1. Regression	Linear	Quad	Linear	Quad	Linear	Quad	Linear	Quad
Intercept	3.227	3.731	1.779	1.778	-0.1341	-.09267	.09479	0.1006
t	5.18	4.81	61.7	50.0	0.89	0.49	35.5	30.6
p	[0.00]	[0.00]	[0.00]	[0.00]	[0.38]	[0.62]	[0.00]	[0.00]
α	0.5694	-5.764	0.5602	0.5695	0.2471	-0.2738	-.04647	-0.1250
t	0.28	0.94	5.52	1.92	0.49	0.18	4.94	4.55
p	[0.78]	[0.35]	[0.00]	[0.06]	[0.62]	[0.86]	[0.00]	[0.00]
α^2		9.878		-.01477		0.8125		0.1248
t		1.09		0.03		0.37		3.04
p		[0.28]		[0.97]		[0.71]		[0.00]
2. Description	All	All	Mid 80	Mid 80	All	All	Mid 80	Mid 80
Range	0 - 99%	0 - 99%	0 - 99%	0 - 99%	0 - 99%	0 - 99%	0 - 99%	0 - 99%
N	3,354	3,354	2,303	2,303	3,354	3,354	2,303	2,303
Adj. R^2	0.000	0.000	0.013	0.012	0.000	0.000	0.010	0.014
F ratio	0.08	0.63	30.4	15.2	0.24	0.19	24.4	16.9
p	[0.78]	[0.53]	[0.00]	[0.00]	[0.62]	[0.83]	[0.00]	[0.00]
Inflection Point (Max or Min)		Min of 2.89 at 29.1%		Max of 2.33 at 99%		Min of -.116 at 16.8%		Min of .0693 at 50.1%
Inflection matches McS?		no		no		no		no

Panel A shows a linear and quadratic (quad) regression analysis of 1986 Market-to-Book and ROE on insider holdings, α, for comparison with McConnell and Servaes (1990). The ranges in ownership examined are 0-99%, 0-81%, 0-71%, and 0-41%. These ranges correspond to all data available, a range as reported in MSV, a range as reported in McS, and a large-firm sample.

Columns 3, 4, 7 and 8 refute DL. The signs in column 4 match McS but without statistical significance. Surprisingly, columns 7 and 8 show results which are "inverted in ROE." This rejects MSV and McS.

The t statistics are shown in absolute value below the coefficients and p values are in brackets [ ]. The inflection matches McS if the sign on α is positive and α^2 is negative and there is an interior maximum. The inflection point is calculated based on the coefficients.

TABLE 7 (continued)

Regression analysis of 1990 Market-to-Book and ROE on insider holdings
for comparison with McConnell and Servaes (1990)

Panel B: Comparison with McS	1990 M/B	1990 M/B	1990 M/B	1990 M/B	1990 ROE	1990 ROE	1990 ROE	1990 ROE
	col. 1	col. 2	col. 3	col. 4	col. 5	col. 6	col. 7	col. 8
1. Regression	Linear	Quad	Linear	Quad	Linear	Quad	Linear	Quad
Intercept	2.672	2.289	1.567	1.567	0.1540	0.2600	.09051	.09734
t	6.80	4.60	58.6	46.9	1.22	1.62	31.3	27.0
p	[0.00]	[0.00]	[0.00]	[0.00]	[0.22]	[0.10]	[0.00]	[0.00]
α	-1.141	3.333	.00688	0.0156	-0.6268	-1.865	-.05023	-0.1343
t	0.91	0.88	0.08	0.06	1.56	1.53	5.33	4.76
p	[0.36]	[0.38]	[0.94]	[0.95]	[0.12]	[0.13]	[0.00]	[0.00]
α^2		-6.684		-0.0134		1.850		0.1286
t		1.26		0.04		1.08		3.16
p		[0.21]		[0.97]		[0.28]		[0.00]
2. Description	All	All	Mid 80	Mid 80	All	All	Mid 80	Mid 80
Range	0 - 99%	0 - 99%	0 - 99%	0 - 99%	0 - 99%	0 - 99%	0 - 99%	0 - 99%
N	3,851	3,851	2,665	2,665	3,851	3,851	2,665	2,665
Adj. R^2	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.014
F ratio	0.84	0.78	0.01	0.00	2.43	2.35	28.4	22.7
p	[0.36]	[0.38]	[0.94]	[0.95]	[0.12]	[0.13]	[0.00]	[0.00]
Inflection Point (Max or Min)		Min of 2.70 at 24.9%		Min of 1.57 at 58.2%		Min of -.210 at 50.4%		Min of .0623 at 52.2%
Inflection matches McS?		no		no		no		no

Panel B shows a linear and quadratic (quad) regression analysis of 1990 market-to-book and ROE on insider holdings, α, for comparison with McConnell and Servaes (1990). The ranges in ownership examined are 0-99%, 0-81%, 0-71%, and 0-41%. These ranges correspond to all data available, a range as reported in MSV, a range as reported in McS, and a large-firm sample.

Columns 1, 2, 3, 4, 5, and 6 reject McS and MSV. Columns 7 and 8 are statistically significant and "inverted in ROE" rejecting DL, McS and MSV. Each quadratic shown has an interior minimum.

The t statistics are shown in absolute value below the coefficients and p values are in brackets [ ]. The inflection matches McS if the sign on α is positive and α^2 is negative and there is an interior maximum. The inflection point is calculated based on the coefficients.

TABLE 8

Regression analysis of 1986 Median Market-to-Book on insider holdings
for comparison with McConnell and Servaes (1990)

Panel A: Comparison with McS	1986 M/B	1986 M/B	1986 M/B	1986 M/B	1986 M/B	1986 M/B	1986 M/B	1986 M/B
	col. 1	col. 2	col. 3	col. 4	col. 5	col. 6	col. 7	col. 8
1. Regression	Linear	Quad	Linear	Quad	Linear	Quad	Linear	Quad
Intercept	1.342	1.798	1.478	1.718	1.587	1.608	1.640	1.498
t	6.42	5.88	10.12	7.90	15.26	10.23	23.1	14.49
p	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
α	1.630	-1.189	1.204	-0.5758	0.7723	0.5965	0.4371	2.505
t	4.31	0.82	3.85	0.46	3.04	0.58	1.46	2.15
p	[0.00]	[0.41]	[0.00]	[0.64]	[0.00]	[0.56]	[0.15]	[0.04]
α^2		2.916		2.197		0.2477		-5.044
t		2.01		1.48		0.18		1.83
p		[0.05]		[0.14]		[0.86]		[0.07]
2. Description	Medians	Medians	Medians	Medians	Medians	Medians	Medians	Medians
Range	0 - 99%	0 - 99%	0 - 81%	0 - 81%	0 - 71%	0 - 71%	0 - 41%	0 - 41%
N	95	95	81	81	71	71	41	41
Adj. R^2	0.157	0.184	0.148	0.160	0.106	0.093	0.027	0.083
F ratio	18.6	11.6	14.9	8.64	9.27	4.59	2.13	2.81
p	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.15]	[0.07]
Inflection Point (Max or Min)		Min of 1.68 at 20.4%		Min of 1.68 at 13.1%		n.a.		Max of 1.81 at 24.8%
Inflection matches McS?		no		no		no		yes

Panel A shows a linear and quadratic (quad) regression analysis of 1986 median market-to-book on insider holdings, α, for comparison with McConnell and Servaes (1990). The ranges in ownership examined are 0-99%, 0-81%, 0-71%, and 0-41%. These ranges correspond to all data available, a range as reported in MSV, a range as reported in McS, and a large-firm sample.

Column 8 reproduces the primary result in McS and produces an interior maximum with M/B equal to 1.81 at insider holdings of 24.8%. The other quadratic regressions in columns 2, 4 and 6 do not show this result. The linear regressions in columns 1, 3 and 5 reject DL.

The t statistics are shown in absolute value below the coefficients and p values are in brackets [ ]. The inflection matches McS if the sign on α is positive and α^2 is negative and there is an interior maximum. The inflection point is calculated based on the coefficients.

TABLE 8 (continued)

Regression analysis of 1990 Market-to-Book on insider holdings
for comparison with McConnell and Servaes (1990)

Panel B: Comparison with McS	1990 M/B	1990 M/B	1990 M/B	1990 M/B	1990 M/B	1990 M/B	1990 M/B	1990 M/B
	col. 1	col. 2	col. 3	col. 4	col. 5	col. 6	col. 7	col. 8
1. Regression	Linear	Quad	Linear	Quad	Linear	Quad	Linear	Quad
Intercept	1.150	1.450	1.253	1.316	1.245	1.370	1.279	1.382
t	7.73	6.62	14.02	9.78	13.7	10.11	25.27	18.77
p	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
α	0.7009	-1.172	0.3862	-.08311	0.4131	-0.6435	0.3000	-1.207
t	2.57	1.12	2.02	0.11	1.87	0.73	1.40	1.45
p	[0.01]	[0.27]	[0.05]	[0.91]	[0.07]	[0.47]	[0.17]	[0.15]
α^2		1.959		0.5794		1.488		3.676
t		1.84		0.63		1.24		1.88
p		[0.07]		[0.53]		[0.22]		[0.07]
2. Description	Medians	Medians	Medians	Medians	Medians	Medians	Medians	Medians
Range	0 - 99%	0 - 99%	0 - 81%	0 - 81%	0 - 71%	0 - 71%	0 - 41%	0 - 41%
N	94	94	81	81	71	71	41	41
Adj. R^2	0.057	0.081	0.037	0.030	0.034	0.042	0.024	0.083
F ratio	6.63	5.10	4.09	2.23	3.49	2.52	1.97	2.81
p	[0.01]	[0.01]	[0.05]	[0.11]	[0.06]	[0.09]	[0.17]	[0.07]
Inflection Point (Max or Min)		Min of 1.27 at 29.9%		Min of 1.31 at 7.2%		Min of 1.30 at 21.6%		Min of 1.29 at 16.4%
Inflection matches McS?		no		no		no		no

Panel B shows a linear and quadratic (quad) regression analysis of 1990 median market-to-book on insider holdings, α, for comparison with McConnell and Servaes (1990). The ranges in ownership examined are 0-99%, 0-81%, 0-71%, and 0-41%. These ranges correspond to all data available, a range as reported in MSV, a range as reported in McS, and a large-firm sample.

Columns 2, 4, 6 and 8 show inverted results. None are statistically significant but all have interior minimums. Columns 1, 3 and 5 reject DL. This panel provides no support for McS and MSV.

The t statistics are shown in absolute value below the coefficients and p values are in brackets [ ]. The inflection matches McS if the sign on α is positive and α^2 is negative and there is an interior maximum. The inflection point is calculated based on the coefficients.

Appendix A: Details on the Database

A 1.0 Data quality

The data used in this study are from company filings sent to the Securities and Exchange Commission (SEC) as compiled by Disclosure Incorporated (Disclosure). Recently, Anderson and Lee (1997a, 1997b) tested the four most common sources of ownership and found the source used here to be perfectly acceptable. Anderson and Lee presents evidence that results based on the most common source of ownership data in scholarly work, Value Line, could be misleading.

> Two models relate management ownership to Tobin's Q (McConnell and Servaes (1990) and Morck, Shleifer, and Vishny (1988)). The third model relates management ownership to unsystematic risk (Bagnani, Milonas, Saunders, and Travlos (1994)). Reporting discrepancies in the Compact Disclosure data do not significantly influence any of the regressions that we consider. In contrast, all regression models are significantly influenced by the reporting discrepancies in the Value Line and Spectrum ownership data.

Anderson and Lee (1997a) makes a strong case for using D&Os' percentage stock ownership. Perhaps their most compelling reason is SEC rule 13d-3(d) which specifies exactly how each firm must report D&Os' ownership data. The value of the uniformity caused by the SEC rules is demonstrated when Value Line data compares so poorly. Anderson and Lee show how the results of econometric tests are dependent upon the data source.

A 1.1 Data usage

The SEC filings encoded by Disclosure and utilized in this paper are the SEC Form 10-Q (10-Q), SEC Form 10-K (10-K) and the firm's Proxy Statements (Proxy).[53] These data are provided on a

[53] The SEC filings data come in several machine readable forms. The form used here is the Disclosure/SEC CD ROMs (d/SEC CDs). The d/SEC CDs are published monthly and contain the SEC filings received through the end of the prior month. At the suggestion of Disclosure's technical support staff, the July month d/SEC

Disclosure CD-ROM product, Compact Disclosure d/SEC. From this monthly cross-sectional source of ownership data, a new database was constructed containing ten annual cross sections of roughly 4,000 firms each. For each firm, in each year, abbreviated financial statements, stock market trading and shares data, and company ownership data are collected. The new database has exactly 43,093 firm-years of ownership data and extends over the period from 1986 through 1995. The principal variable of interest is α which is the directors and officers' (D&Os') percentage stock ownership. This is the ratio of common shares owned by D&Os' divided by total common shares outstanding expressed as a percentage. The distribution of α for each year from 1986 to 1995 is shown in Appendix Table A1. The sample size varies form 3,597 to 4,879 firms and totals 43,093 firm-years of data over the ten year period. The distribution of α in public firms varied from 90.6% for the upper 0.5% to nearly zero for the lower 0.5% over the ten year period. The median (mean) values ranged from 15.8% (21.7%) to 18.3% (24.4%). The largest fluctuation in α occurs during the period 1986 to 1988 and is the subject of another paper.

The total shares outstanding are reported as in the SEC filings, 10-Q and 10-K, unrounded to the single share, even if the total number of shares exceeds hundreds of millions. Table A2 shows fifteen well-known example firms selected from 1995 to represent a wide range in α and industry group. The sources of the information are the proxy and 10-Q in each of these fifteen firms but 10-K were also used when a more recent 10-Q was not available. Total shares outstanding are taken most often from the latest 10-Q and less frequently from the 10-K. D&Os' common stock

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CDs were used as the most complete and current annual summary of ownership and financial data. The d/SEC CDs for the months of January, October and May in five of the ten years of this study were checked and the results support the use of the July d/SEC CDs as the annual summary. The July d/SEC CDs hold data from the most recent SEC filings made from July 1 of the prior year through June 30 of the current year; ten July d/SEC CDs were used, one from each year 1986 through 1995. The procedure used to record information at Disclosure was to twice key punch the data (in order to verify it) while entering the data directly from copies of SEC filings. The SEC filings are processed at Disclosure the day after the original filings have arrived at the SEC in Washington, D.C.

holdings are taken from the Proxy and are also reported to the single share.[54] Shares data equal to zero (none were negative) are missing data also sometimes coded by a "N/A." In a sub-sample of 100 such firms showing zero ownership on d/SEC (marked 0 or N/A), there was not a single example where an entire group of D&Os in a public company was void of stock ownership as determined by cross checking in other sources of ownership information: Proxies, 5% Shareholder lists, Value Line, and Spectrum 6.

There are many examples of individual directors, particularly newly-named directors and outside directors, who do not own a single share of stock in the firm. However, there are essentially no U.S. firms for which the true value for α is equal to zero.[55] The sample of 43,093 firm-years of ownership data used here is net of these exclusions. Before exclusions, the sample of public firms listed on the NYSE, AMEX and NASDAQ which file with the SEC includes approximately 60,000 firm-years of data. Most excluded firms are small firms, as larger firms tend to have more complete data. Since small firms are excluded more often than large firms, and small firms tend to have higher insider holdings, it is likely that the true values of the insider ownership in all modern public companies are higher than these estimates; said differently, α is biased low.[56] These data are D&Os' ownership percentage. D&Os' stock ownership understates ownership by persons

[54] While the dates of these two documents are rarely exactly the same, they are usually filed with the SEC within a few business days. In the extremely uncommon circumstance that the stock is split between the filing of the 10-Q (or 10-K) and the filing of the Proxy, or an error is made in data entry by the firm or Disclosure, it is mathematically possible for a to reach a value greater than one. Since values of a greater than or equal to one are illogical, such values of a have been excluded. Small changes in total shares outstanding are common in the time between proxy and 10-Q filing and are caused by buy backs, option exercises, and issuance. These smaller changes cannot be controlled for using Disclosure data. See Anderson and Lee (1997) for a complete description.

[55] Ownership data by firm on each individual director and officer is public information reported to the SEC via SEC Forms 3 and 4. SEC Forms 3 and 4 are available semi-annually in Spectrum 6 from CDA Investment Technologies.

[56] Morck, Shleifer, and Vishny (1988) comment that they were surprised at the high level of concentration of ownership among the five top shareholders in their sample and state that they expect even higher concentration among smaller firms. I confirm their expectation and I too expect even higher concentration in ownership when complete databases of all public firms are built and analyzed.

who may reduce agency costs. Stock ownership by non-D&O employees is not included in α, but obviously, stock ownership by employees may effect the separation of ownership and control.

A 1.2 Other datasets

Studies which utilize large samples to describe the time series properties of insider holdings in U.S. public firms are sparse.[57] With the notable exceptions of Eckbo and Verma (1994) and Brennan and Franks (1997), there is little empirical work with large datasets of management ownership from outside the U.S. Large samples, those where the number of firms approaches an exhaustive set, are superior to "small random samples" because inference about a population characteristic from a study utilizing a small sample is always a joint test of the true inference and the randomization technique. This is more important in ownership studies than elsewhere in corporate finance. Randomization techniques used with insider holdings data are particularly challenging because higher insider holdings tends to reduce the float available for public ownership. Therefore, higher insider holdings reduce the interest of securities firms and others to track and report on these firms.

Sources such as Value Line, in addition to the errors reported by Anderson and Lee (1997a), have non-obvious bias since these reporting services, other non-academic publications, and stock analysts, select their securities in part based on the public's interest in following them. Furthermore, historical data on insider holdings is so time-consuming and difficult to collect from original SEC filings that many studies which use the non-biased SEC data often rely on 0.1% to 5% samples.[58] These samples are so small (relative to the population) that the sample selection

[57] For example see Denis and Sarin (1996). Their sample ranges from 368 to 204 firms in any given year compared with 4,879 to 3,597 firms in this paper.

[58] Mehran (1995) uses a random sample of 153 firms. The importance of the selection technique including firms of all sizes is emphasized by the author on page 164, "An important feature of the sample is that it focuses on small as well as large firms, thus providing the variation necessary to conduct statistical tests."

technique itself may influence the results. In contrast, this study uses a 70% sample of all NASDAQ, NYSE, and AMEX firms. While d/SEC offers monthly-updated ownership data, many researchers are unaware of Disclosure, and those familiar with it know that d/SEC is not designed with researchers in mind. The d/SEC data is not currently available in a times series format, other than that which has been developed for this study.

TABLE A1

Frequency Distribution of α from 1986 to 1995.

Panel A. D & O Holdings Distribution	1995 α	1994 α	1993 α	1992 α	1991 α	1990 α	1989 α	1988 α	1987 α	1986 α
99.5%	90.6	88.8	88.5	86.9	86.2	89.6	89.4	86.7	83.0	84.2
97.5%	73.8	73.8	72.1	72.5	74.5	76.2	76.3	75.5	71.7	70.4
90.0%	56.7	55.1	54.2	54.1	55.7	56.3	57.6	57.5	53.3	53.5
75.0%	37.9	35.8	35.7	35.8	36.6	38.0	38.4	37.8	33.8	34.9
median	17.6	17.2	17.2	17.4	18.0	18.0	18.2	18.3	15.8	16.4
25.0%	6.1	5.8	5.8	5.7	5.7	5.7	6.0	5.6	4.3	4.8
10.0%	1.8	1.6	1.5	1.5	1.3	1.4	1.5	1.3	0.9	1.0
2.5%	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.2
0.5%	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Panel B. Summary	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986
N	4,762	4,879	4,630	4,214	3,933	4,317	4,537	4,466	3,758	3,597
Mean	23.9	23.2	23.0	23.1	23.7	24.1	24.4	24.2	21.7	22.1
Std Dev	21.3	20.9	20.6	20.6	21.2	21.6	21.8	21.7	20.6	20.5
Upper 95% mean	24.5	23.8	23.6	23.7	24.4	24.8	25.0	24.8	22.4	22.8
Lower 95% mean	23.3	22.6	22.4	22.5	23.1	23.5	23.7	23.5	21.1	21.5
Skewness	0.95	1.00	0.98	0.96	0.95	0.94	0.92	0.91	1.01	0.96
Kurtosis	0.13	0.33	0.29	0.17	0.20	0.11	0.04	-0.00	0.25	0.14

Table A1 Panel A shows the cross sectional and time series frequency distribution of α, which is the directors and officers' (D&Os') stock holdings in public firms traded on NYSE, AMEX and NASDAQ expressed as a percentage of current shares outstanding. Panel B shows selected statistics. D&Os' stock holdings are taken from documents filed with the Securities and Exchange Commission for each of the ten years from 1986 to 1995. The sample size varies form 3,597 to 4,879 firms and totals 43,093 firm-years of data over the ten year period. The distribution of D&Os' stock ownership of public firms varied from 90.6% for the upper 0.5% to nearly zero for the lower 0.5% over the ten year period. The median (mean) values ranged from 15.8% (21.7%) to 18.3% (24.4%). The Upper (Lower) 95% mean is a simple arithmetic mean which excludes the lower (upper) 5% of observations. Skewness and Kurtosis are expressed as decimals whereas the means, standard deviation and the distribution are in percentages (decimal values times 100).

TABLE A2

Shares Outstanding and Directors and Officers' Shares
from example firms for 1995

Observation Number	Company	Total Shares Outstanding	Source	Directors and Officers' Shares	Source	α
1959	General Motors	612,183,066	10-Q	385,949	Proxy	0.000630
2113	Eli Lilly	292,442,744	10-Q	1,248,602	Proxy	0.004270
2271	Dow Chemical	270,166,264	10-Q	2,890,576	Proxy	0.010699
2909	Maytag	105,719,793	10-Q	5,715,088	Proxy	0.054059
3351	Wendy's	96,976,000	10-Q	9,712,481	Proxy	0.100153
3832	Morgan Stanley	36,497,882	10-Q	6,000,567	Proxy	0.164409
4214	Crown Books	5,135,850	10-Q	1,145,121	Proxy	0.222966
4712	Mail Boxes Etc.	4,245,920	10-Q	1,338,001	Proxy	0.315126
5167	Times Mirror	128,509,324	10-Q	54,923,021	Proxy	0.427385
5585	Campbell Soup	126,592,599	10-Q	71,917,802	Proxy	0.568104
5762	Summit Health	31,250,700	10-Q	20,908,941	Proxy	0.669071
5873	Chris Craft	25,524,939	10-Q	20,227,596	Proxy	0.792464
5900	MGM Grand	24,983,335	10-Q	20,655,651	Proxy	0.826777
5930	Spelling Entertainment	33,092,856	10-Q	30,428,671	Proxy	0.919494
5935	Great American Management	11,093,106	10-Q	10,615,225	Proxy	0.956921

Table 3 shows fifteen example well-known firms selected to represent a wide range in α and industry group. The raw data provided by the SEC filings includes share information down to the single share even if hundreds of millions of shares are reported. The sources of the information are the proxy and 10-Q in each of these fifteen firms but 10-K were also used when a more recent 10-Q was not available.