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# Measuring managerial equity ownership: a comparison of sources of ownership data

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**Abstract**

This paper demonstrates that differences in managerial ownership data cannot explain contradictory empirical evidence on the relation between equity ownership and the entrenchment of managers. Three commonly used sources of managerial equity ownership data are described and contrasted. The *Value Line Investment Survey* is shown to be a relatively low-cost substitute for the data on beneficial ownership by officers and directors found in corporate proxy statements.

*Keywords:* Managerial stock ownership; Insiders; Management entrenchment

*JEL classification:* G30

## 1. Introduction

The purpose of this paper is to investigate whether contradictory results on the relation between managerial ownership and firm performance can be

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explained by different sources of ownership data. In their widely-cited paper, Morck et al., (1988) provide evidence on the entrenchment of managers through equity ownership when board members jointly own between 5 and 25 percent of the firm. Using similar methodology but larger samples and an alternate source of ownership data, McConnell and Servaes (1990) report contradictory results. These authors document a positive association between firm performance and managerial ownership of equity below 40 percent. This suggests that incentive alignment rather than entrenchment occurs when management owns between 5 and 25 percent of the firm. I examine the performance-ownership relation for a sample composed of 95 percent of the firms studied by Morck, Shleifer and Vishny, and, by interchanging ownership data constructed from commonly-used sources, show that differences in ownership data cannot explain these contradictory findings.

Much of the empirical literature on the structure of equity ownership has used ownership data for the year 1980. For example, Demsetz and Lehn (1985), Morck, Sheilfer and Vishny (1989), and Kole (1994) use 1980 ownership data published by the Corporate Data Exchange in their investigations of ownership concentration and the effects of insider holdings on firm performance. The popularity of 1980 ownership data can be explained by the Corporate Data Exchange's (CDE) one-time collection of detailed ownership information for over 1200 publicly held firms that is often considered the "cleanest" source of ownership data available. However, for analyses of time periods other than 1980, researchers rely on alternate sources for ownership data including corporate proxy statements and *Value Line Investment Surveys*. The perceived purity of the CDE data and the frequent use of data constructed from other sources raises the question of the comparability of ownership data generated from the CDE volumes and alternate sources.

Three widely-used sources for information on board and managerial equity ownership are described and contrasted for a common set of publicly traded firms: proxy materials provided by the firm, the CDE *Stock Ownership Profiles*, and *Value Line Investment Surveys*. This analytical comparison of data sources suggests that there are good substitutes for the 1980-specific CDE product. Though differences emerge in the sample properties of the three series, these properties converge when I control for known variation in the data.

Section 2 discusses the general characteristics of the three sources that are most frequently used by researchers to measure equity ownership by management. Table 1 summarizes the availability and content of the proxy statement, CDE and Value Line ownership data. Section 3 compares the series generated by the three sources for a sample of 352 large, Fortune 500 firms. A test of managerial entrenchment through equity is discussed in section 4. Section 5 summarizes the contributions of the paper.

Table 1
Comparison of three sources of equity ownership data: proxy statements; Corporate Data Exchange Volumes; and, Value Line Investment Surveys

| | Proxies | Corporate Data exchange | Value Line |
|---|---|---|---|
| 1. Availability | 1978 [a] through present | 1980 only | 1969 through present (1946) |
| 2. Universe of companies | All publicly traded firms (e.g., 9, 813 in March 1980) | 1200 + firms:<br>176 Transport<br>222 Agriculture<br>240 Bank and Fin<br>142 Energy<br>456 Fortune 500 | 1600 + firms<br>> 90% of all stock trading volume in the U.S. |
| 3. Time of measurement | End of fiscal-year or the most recent "practicable" date | End of fiscal-year with updates on 5% holders through May 1981 | Periodic updates using proxies and beneficial ownership filings. |
| 4. Ownership by whom? | Officers and directors as a group; nominees; 5% holders | All publicly identifiable owners of 0.2% or more | "Largest shareholder group or insiders" |
| 5. Included assets | All securities over which individual has: (i) voting and/or investment power, or (ii) the right to acquire within 60 days. | | |
| 6. Costs of use | Costly to employ large samples | Size biases due to 0.2% threshold | Noisy due to variation highlighted group. |

[a] In 1978, the SEC began experimenting with the microfiche format for maintaining current proxy materials. By 1980, all proxy materials filed with the SEC were routinely reproduced on microfiche. Hardcopies of proxy statements for the period 1968–1978 are preserved by the SEC at an off-site location in the Washington, D.C. area. Accessing these materials is difficult even for internal use by SEC employees. Private collections of proxy materials, such as the collection maintained by the Baker Library at Harvard University, may be preferred sources for historical proxies.

## 2. The data sources

### *2.1. Proxy solicitation materials*

The primary source of information on managerial stock ownership is the corporate proxy statement. [2] Whereas the form and content of disclosure in the proxy statement has varied over time, reporting on beneficial ownership has been not changed essentially for decades. In proxy materials, the firm, or "registrant," is required under Item 403 of Regulation S-K to report the security ownership of management and certain beneficial owners. Specifically, both the number of shares and the percentage of the class of shares beneficially owned must be presented for all owners of five or more percent

of any class of the registrant's voting securities [3], directors and nominees by name, and for all directors and officers of the registrant as a group, as of the most recent "practicable" date. Therefore, for all firms filing proxy statements, the level of beneficial ownership by management is reported as a fraction of the firm's outstanding shares, by class of security. Typically this information is tabulated as of fiscal-year end.

One common source of confusion is the exact determinants of beneficial ownership. According to Rule 13d-3(a), a "beneficial owner of a security includes any person who, directly or indirectly, through any contract, understanding, relationship, or otherwise, has or shares: (1) voting power which includes the power to vote, or to direct the voting of such security; and/or (2) investment power which includes the power to dispose, or to direct the disposition of, such security." [4] For proxy disclosure purposes, this translates into all securities currently satisfying Rule 13d-3(a) and securities for which the individual has the right to acquire beneficial ownership within sixty days. The sixty-day window applies to securities which are obtained through the exercise of an option, warrant or right, through the conversion of a security, or pursuant to either the power to revoke or the automatic termination of a trust, discretionary account or similar arrangement.

Put simply, proxy-disclosure materials provide managerial ownership data for all officers and directors as a group and individually for directors and nominees. The data aggregates currently held securities, previously restricted equity and derivative security awards, such as stock options and warrants, for which the restrictions have lapsed, and currently restricted awards for which the restrictions expire within sixty days. It should be noted that the right to acquire beneficial ownership within sixty days *does not* require that the life of the acquisition right be sixty days or less. For example, an option to purchase a share of common stock at a fixed exercise price that could be exercised between January 1, 1991, and December 31, 1995, is "exercisable" for the five year period ending December 31, 1995, and thus, would be

[2] The proxy statement is the official notification to shareholders of matters to be brought to a vote at a company's Annual Meeting. Companies are required to file proxy statements if (i) their securities are listed on national exchanges, (ii) their securities trade over the counter and are registered under Section 12(g) of the Securities Exchange Act, and (iii) they are required to file pursuant to Section 15(d) of the Securities Exchange Act as a result of having securities registered under the Securities Act of 1933. In addition to reporting beneficial ownership of the firm's key decision-makers, a considerable amount of information pertaining to corporate governance is disclosed in the corporate proxy that will not be discussed here.

[3] Section 13(d)-3 of the Exchange Act includes as such a "person" any "group" of two or more persons acting as a partnership, limited partnership, syndicate, or other group for the purpose of acquiring, holding, or disposing of securities of an issuer.

[4] "Determination of Beneficial Ownership", Code of Federal Regulations Title 17, Pt.240. 1990 ed.

included as beneficially owned stock in all proxy materials issued between November 1990 and December 1995. Only securities over which the individual has no "investment power" in the succeeding 60 days are excluded from the ownership data reported in the proxy.

Proxy statements can be obtained in a number of ways. Hardcopy documents can be ordered through Disclosure Information Inc. (1-800-638-8241) for a per document fee, copied from microfiche at the Securities and Exchange Commission's Public Reference Room (1-202-942-8090), or requested directly from firms' investor relations or public affairs office. Laser Disclosure offers a CD-ROM service that enables researchers to view proxy statements and extract user-selected sections either onto paper or computer disk. This service offers corporate filings for all publicly traded firms from 1989 onward.

### 2.2. Corporate Data Exchange

CDE produced a one-time five-volume collation of ownership data for manufacturing, energy, agribusiness, transportation, and banking and finance firms. Drawing upon public sources, predominately Securities and Exchange Commission filings, CDE produced extensive ownership profiles for over twelve-hundred publicly traded companies. The profiles rank each "publicly identifiable" stockholder who each exercised investment power over at least two-tenths of a percent of a company's common stock as of year-end 1980. [5] [6]

For research purposes, the CDE database provides a detailed, albeit dated, accounting of the distribution of stockholders in publicly traded firms. When the CDE dataset first appeared in 1983, it was considered "historical" data by Wall Street investment analysts, the segment of the market targeted for its use. Historical data have limited value for these practitioners and consequently, the CDE ownership profiles were constructed for 1980 only. Demsetz and Lehn (1985) first used the data to construct measures of equity ownership concentration for a sample of publicly traded firms. Morck, Shleifer and Vishny (1988) summarized the level of managerial equity owner-

[5] "Publicly identifiable" stockholders include all individuals who by the nature of their relationship with the firm or the size of their holdings are required to file beneficial ownership forms (Forms 3,4) with the Securities and Exchange Commission.

[6] CDE used a definition of investment power developed by the Securities and Exchange Commission for the application of 13(f) regulations. It includes all shares over which the holder has sole or shared investment discretion. In the case of thrift and savings plans, CDE also included any shares over which the holder exercised trustee power. CDE therefore excluded all custodial holdings. Where two holders shared investment discretion over the same stock, the stock was assigned to one holder to avoid double counting the shares. However because it was not possible to do this in all cases, double-counting cannot be ruled out as potential source of error in the CDE data.

ship for a large fraction of firms in the Fortune 500 by cumulating the stockholdings of board members from CDE profiles.

The ownership data presented in the CDE volumes suffer from two reinforcing size-related biases. First, the two-tenths of a percent threshold used for the inclusion of an individual or group means that for relatively large firms, sizeable dollar holdings are not included in the profiles. In addition, the CDE data observes a larger fraction of the total management team in smaller versus larger firms. These factors suggest that managerial ownership data constructed from the CDE profiles undercount the equity stake of management teams in large firms.

A significant advantage of the CDE profiles is the time saved from manually collecting ownership data from the original SEC documents. Thus, despite the presence of size biases, both the relatively low cost of access and the extensive individual detail available in the profiles have made the CDE database attractive to researchers who study the structure of equity ownership across firms.

### 2.3. *Value Line Investment Survey*

Since at least 1969, information on inside ownership has been reported in analysts' summaries produced by Value Line. [7] Rozeff (1982) uses this data in his investigation of the determinants of dividend payout ratios. Using data extracted from *Value Line Investment Surveys*, Demsetz (1983) constructs an unweighted average of the aggregate ownership interest of corporate directors and management during 1973–1982 for a sample of manufacturing and public utility firms. More recently, McConnell and Servaes (1990) employ the Value Line count of the fraction of outstanding shares owned by corporate insiders as a measure of inside ownership for 1976 and 1986.

In its quarterly investment summary of firms Value Line reports the percentage of outstanding shares held by (a group of) key decision-makers who are most often corporate insiders, defined to include officers and members of the Board of Directors. However, the decision-making group highlighted by Value Line is not uniform across firms. There is considerable variation in the types of individuals for which ownership data are reported. For example, whereas Value Line reports only the ownership stake of directors for Colgate-Palmolive, the only shareholder group identified in the New York Times' investment survey is the Ochs family voting trust. Mean-

[7] The collection of *Value Line Investment Surveys* maintained by the Management Library at the University of Rochester begins in 1969. Having inquired at other libraries and at Value Line, I still cannot verify the format of the surveys for the 1946–1969 period.

while, Value Line reports ownership data for all officers and directors of Skyline Corp. which is Value Line's standard definition of insiders. [8] Thus, Value Line's choice of highlighted shareholder groups varies in an attempt to capture the holdings of pivotal decision makers. [9] While this is not in itself objectionable, for research purposes it is important to recognize that equity ownership data drawn from *Value Line Investment Surveys* does not constitute a consistently measured cross-section of managerial stockholdings.

### 2.4. Summary

Table 1 provides an overview of the general characteristics of these three sources of ownership data. The ability to track a firm over time potentially makes both proxy statements and the Value Line surveys viable sources for time-series work on insider ownership. The universe of firms for which proxy statements are available is significantly larger than the set of firms covered by either of the other two sources. The rules governing the reporting of beneficial ownership in proxy statements define both the securities included in the ownership data produced by CDE and Value Line and the point in time at which tabulations are made. In addition to the fiscal year-end data reported in the proxy statement, CDE and Value Line supplement their research with updates on the positions of 5 percent stockholders drawn from 13(d) filings with the Securities and Exchange Commission. The relevant variation across the series is found in the choice of the group whose ownership is being highlighted. The rules pertaining to section 16 of the Exchange Act of 1934 require the disclosure of the fraction of each class of registered securities held by officers and directors as a group, and individually for nominees and 5 percent beneficial owners. The ownership profiles produced by CDE are considerably more detailed, encompassing all publicly identifiable stockholders of 0.2 percent or more of any class of registered security. Finally, there is considerable variation in the focus group highlighted in Value Line.

[8] See Value Line issues dated November 7, 1980 (Colgate-Palmolive, 1981), December 5, 1980 (Skyline Corp., 1575), and December 19,1980 (The New York Times, 1817).

[9] Value Line defines insiders to include corporate officers and directors. In response to the more general question of 'how does Value Line determine which group's equity ownership to highlight in the "Business" section of a company's investment survey?' Rudolph Carryl, Executive Director of Research at Value Line, Inc. wrote the following to me in a letter of April 26, 1990: "We generally show the largest individual shareholder or group of shareholders, but if there is no dominant holder, we would show percentage of shares "closely" held by insiders such as corporate officers and directors."

## 3. Do these differences materialize in the data?

Because the proxy statement is the primary source of equity ownership data for both the CDE and Value Line series, I do not expect to observe wide variation across the three ownership series for a large sample of firms. In the analysis that follows, I consider a sample of firms for which ownership data can be collected from proxy statements, CDE *Stock Ownership Profiles*, and *Value Line Investment Surveys*. The distributional properties of the sample both for levels of ownership and for differences in levels across series on a firm-by-firm comparison are discussed. This sample forms the basis for a test of managerial entrenchment through equity ownership that is performed in section 4.

The sample under consideration includes 352 Fortune 500 firms drawn from the sample of 371 firms first studied by Morck, Shleifer and Vishny in their examination of the relation between firm performance and managerial equity ownership. A total of 363 of the 371 firms are found in the issues of the *Value Line Investment Survey* from October 1980 through March 1981. Of these 363 firms, no ownership information is provided in 11 cases, leaving a sample of 352 firms with complete data for the three ownership series. [10] This sample represents 95 percent of the firms in the Morck, Shleifer and Vishny sample. Fig. 1 presents the cumulative density functions for each of the three ownership series: PROXY includes officers and directors as a group; CDE, all board members that individually are beneficial owners of at least 0.2 percent of their company's equity; and, VALUE LINE reports the "largest group of shareholders or insiders".

Three interesting observations can be made from Fig. 1. First, by ignoring small percentage holdings, CDE inflates the number of firms for which management holds no equity. Using the CDE data, there are 46 firms for which board members' holdings are zero; using proxy data, Eastman Kodak is the only firm in which managerial stockholdings are below 1/1000th of a percent of the firm's outstanding common stock. The 46 firms are relatively large, with median replacement cost of assets equal to $4.9 billion – well above the sample median of $1.1 billion – suggesting a systematic under-counting of management holdings in large firms. Second, at low levels of ownership, there is a jagged pattern in the cumulative density function associated with the Value Line series that is attributable to rounding. In 85 percent of the cases where the Value Line count of inside ownership is 5 percent or less, the percentage ownership tallies are integer values whereas in the same range, only 5 percent of the proxy percentages are whole

[10] Proxy statements are available for all 371 firms.

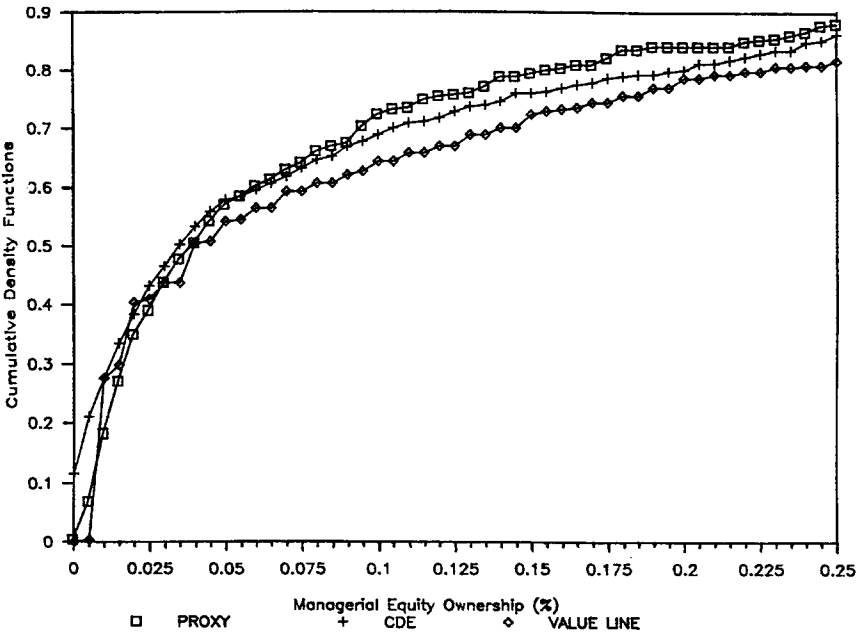


Fig. 1. Cumulative density functions of ownership series derived from proxy statements, Corporate Data Exchange profiles, and *Value Line Investment Surveys*, for a sample of 352 Fortune 500 firms in 1980.

numbers. [11] Finally, Fig. 1 demonstrates that on average the distribution of managerial ownership shifts to the right as additional information is employed to supplement the proxy statement. This suggests either that managers increase their holdings of their own firm's equity in the first quarter of 1981 (consistent with equity bonuses or the vesting of derivative securities awarded as compensation in previous years) or that double-counting of shared equity interests inflates the CDE and Value Line series.

Table 2 reports simple correlation coefficients and summary statistics on CDE, proxy statement and Value Line ownership series for subsamples of the Morck, Sheilfer, and Vishny dataset. For the sample of 352 firms representing 95 percent of the Morck, Sheilfer, and Vishny sample, the CDE and proxy data are more highly correlated ($\rho = 0.85$) than is Value Line with either CDE or proxy data ($\rho = 0.75$). The mean values of the ownership

[11] An example of the rounding of ownership stakes in this sample is CPC International. The percentage of outstanding common stock held by CPC International's officers and directors as a group is reported as 0.57 in the company's 1981 proxy statement and as 1 in the first quarter 1981 *Value Line Investment Survey*.

Table 2
Correlation coefficients and summary statistics on three ownership data series, for subsamples of the Morck, Shleifer and Vishny (1988) dataset

| A. All firms for which three series are available (N = 352) | | | | | |
|---|---|---|---|---|---|
| Correlation coefficient (p-values: $H_0$: $\rho = 0$) | | | Summary statistics | | |
| | PXYMGT [b] | VALINE | | Mean | Std Dev. | Median |
| CDEMGT [b] | 0.8427 | 0.7514 | | 0.1033 | 0.1445 | 0.0349 |
| | (0.0001) | (0.0001) | | | | |
| PXYMGT [b] | | 0.7501 | | 0.0978 | 0.1364 | 0.0389 |
| | | (0.0001) | | | | |
| VALINE [b] | | | | 0.1244 | 0.1631 | 0.0400 |
| | Kruskal-wallis or | | $\chi^2$ | 8.4198 | | 0.6895 |
| | 3-sample median test [a] | | Prob > $\chi^2$ | 0.0148 | | 0.7084 |
| B. Firms for which value line highlights the ownership of management groups (N = 313) | | | | | |
| Correlation coefficient (p-values: $H_0$: $\rho = 0$) | | | Summary statistics | | |
| | PXYMGT [b] | VALINE | | Mean | Std Dev. | Median |
| CDEMGT [b] | 0.8798 | 0.7974 | | 0.0862 | 0.1277 | 0.0301 |
| | (0.0001) | (0.0001) | | | | |
| PXYMGT [b] | | 0.7509 | | 0.0803 | 0.1181 | 0.0326 |
| | | (0.0001) | | | | |
| VALINE [b] | | | | 0.0993 | 0.1424 | 0.0400 |
| | Kruskal-wallis or | | $\chi^2$ | 5.2752 | | 0.2383 |
| | 3-sample median test [a] | | Prob > $\chi^2$ | 0.0715 | | 0.8877 |
| C. Firms for which value line highlights the ownership of other groups (N = 39) | | | | | |
| Correlation coefficient (p-values: $H_0$: $\rho = 0$) | | | Summary statistics | | |
| | PXYMGT [b] | VALINE | | Mean | Std Dev. | Median |
| CDEMGT [b] | 0.6190 | 0.3655 | | 0.2403 | 0.1933 | 0.2500 |
| | (0.0001) | (0.0221) | | | | |
| PXYMGT [b] | | 0.4981 | | 0.2387 | 0.1852 | 0.2380 |
| | | (0.0013) | | | | |
| VALINE [b] | | | | 0.3253 | 0.1805 | 0.3000 |
| | Kruskal-wallis or | | $\chi^2$ | 5.0688 | | 1.0847 |
| | 3-sample median test [a] | | Prob > $\chi^2$ | 0.0793 | | 0.5814 |

[a] Nonparametric test that the distribution of the variable has the same mean or median across the different groups.
[b] CDEMGT denotes Corporate Data Exchange, PXYMGT denotes proxy statements, and VALINE, the *Value Line Investment Surveys*.

variables generated by these three sources are significantly different from one another (prob > $\chi^2 = 0.0157$). These differences are primarily attributable to the significantly larger mean measure of inside ownership obtained from the Value Line series. That difference is reduced, however, when I control for the known variation in the Value Line data. That is, in the 313 cases where the ownership group highlighted by Value Line is a management group, neither the CDE nor the proxy series yield mean values that are

Table 3
Pairwise comparisons of the Corporate Data Exchange (CDE) and Value Line ownership data, for 352 of the 1980 Fortune 500 firms, by highlighted group as per value line

| Highlighted group | Obs | Mean ownership | | Mean difference | Std. |
|---|---|---|---|---|---|
| | | CDE | Value line | | |
| *Panel A: management* | 313 | 8.62 | 9.93 | −1.31 *** | 8.71 |
| Directors | 97 | 7.45 | 6.58 | 0.87 | 5.42 |
| Insiders [a] | 210 | 9.03 | 11.33 | −2.30 *** | 9.82 |
| Management | 6 | 13.07 | 15.17 | −2.09 | 2.99 |
| *Panel B: other key decision-makers* | 39 | 24.24 | 32.53 | −8.29 ** | 20.76 |
| Directors and family | 6 | 18.40 | 38.00 | −19.60 | 26.95 |
| Directors and other | 1 | 6.40 | 15.00 | −8.59 | . |
| Family | 13 | 40.72 | 42.77 | −2.05 | 15.29 |
| Management and family | 2 | 32.60 | 19.50 | 13.10 | 20.23 |
| Other [b] | 17 | 13.29 | 25.34 | −12.04 ** | 21.82 |
| Full sample | 352 | 10.35 | 12.44 | −2.09 | 10.90 |

[a] Value line's definition of insiders includes "corporate officers and directors".
[b] Other includes cases for which Value Line reports either the holdings of an employee group, a non-parent, or a trust or foundation. There also are a number of firms for which there is only a general statement that "x% of the firm's common stock is closely held".
*** Parameter estimate is significantly different from 0 at $\alpha = 0.01$.
** Parameter estimate is significantly different from 0 at $\alpha = 0.05$.

significantly different from Value Line at the 0.05 level. In addition, the correlation coefficients are slightly larger for each pair of data sources. [12] From this I conclude that when considering firms where the data sources report the ownership of the same decision makers, the differences in the three series is small. The series diverge in those cases where Value Line introduces the equity stakes of parties that are not obviously management groups.

These differences are further illustrated in Table 3, which reports the mean levels of the CDE and Value Line ownership series as well as the mean differences of paired comparisons of the series, grouped according to the highlighted group designated by Value Line. The directors, insiders, and management categories together comprise 313 observations for which Value Line unambiguously reports the ownership stake of the management team. The remaining categories (directors and family, directors and others, family, management and family, and, other) are groups that include decision makers that are not unambiguously management. Fig. 2 illustrates a plot of the mean levels of reported ownership obtained from the CDE and Value Line series, by group, relative to a 45 degree line.

[12] In these cases, Value Line reports the holdings of either directors, insiders or management.

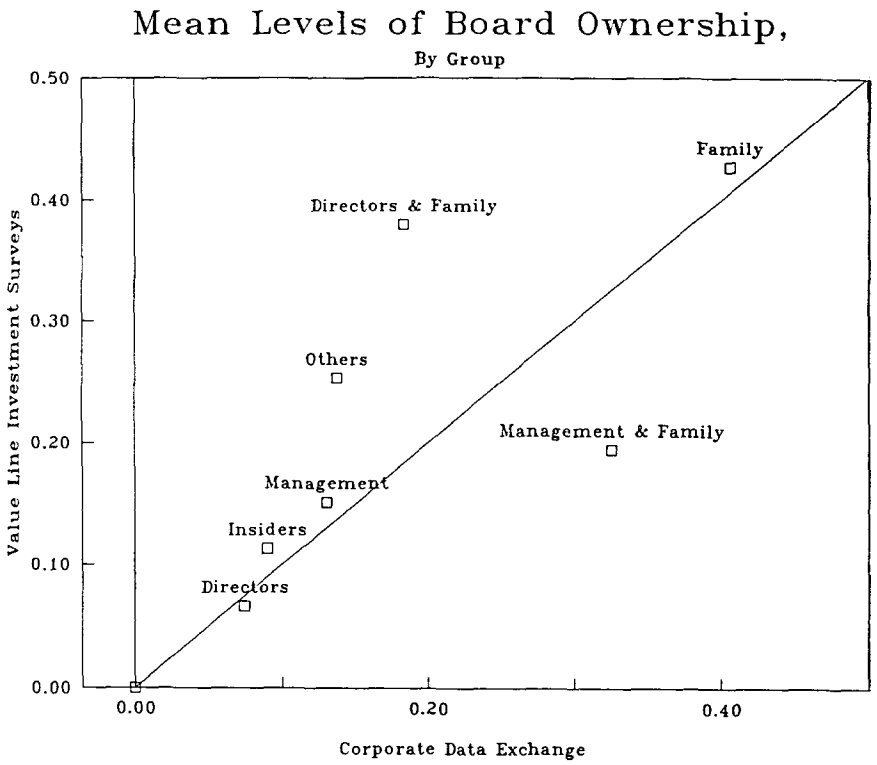


Fig. 2. A comparison of mean levels of ownership, as calculated using *Value Line Investment Surveys* and Corporate Data Exchange profiles, for groups of owners highlighted by value line.

Where it is clear that the sources report the holdings of the same decision makers, the pairwise difference between CDE and Value Line is, on average, −1.3% or roughly 15% of the sample mean level of managerial ownership as per the CDE. This difference is the net effect of undercounting in those cases for which Value Line highlights director holdings only and overcounting the series when management or insiders are highlighted. For the 39 firms for which the Value Line data are relatively noisy, the mean difference between CDE and Value Line is significantly higher, averaging −8.3% which is roughly 35% of the mean of the CDE series for the 39 firms. The mean pairwise comparisons for the two panels are significantly different from one another at the 0.02 level of significance.

That there are differences in the series is interesting from a methodological perspective, but my objective is to investigate whether the observed differences are important enough to induce different inferences from seemingly similar research projects. In the following section this question is

addressed in the context of conflicting evidence that has been brought to bear on the relation between managerial stock ownership and firm performance: specifically, can managers entrench themselves through equity ownership?

## 4. Managerial entrenchment through equity ownership

Morck, Shleifer and Vishny document a non-monotonic relationship between Tobin's q, the ratio of market to book asset value, and board ownership using CDE *Stock Ownership Profiles*, for a sample of 371 Fortune 500 firms in 1980. While they document a positive relation from 0 to 5 percent, the authors find a significantly negative relation between q and ownership in the range of 5 to 25 percent. Their significant coefficient estimate of $-1.60$ implies that, ceteris paribus, a 5 percent increase in board stock holdings, from say 10 to 15 percent, would *reduce* q by 10 percent of the average level of q in the sample. [13]

Using two substantially larger samples of New York and American Stock Exchange firms from 1976 and 1986, each with ownership data drawn from

[13] The piecewise-linear model of firm performance used in this analysis follows the model selected by Morck, Shleifer, and Vishny (from among competing two-breakpoint models) to most accurately illuminate the nonmonotonicity in the relation between managerial stock ownership and firm performance. That model is as follows:

$$Perf^i = \alpha \underline{D}^i + \beta_1 (R\&D/A)^i + \beta_2 (ADV/A)^i + \beta_3 (DEBT/A)^i + \beta_4 A^i + \gamma_1 MGT_5^i + \gamma_2 MGT_{25}^i + \gamma_3 MGT_{25+}^i,$$

where i denotes firm i the percentage of outstanding common equity held by all officers and directors (MGT) is represented by "pieces" defined as:

$$MGT_5^i = \begin{cases} MGT^i & \text{if } MGT^i < 0.05, \\ 0.05 & \text{if } MGT^i \geq 0.05; \end{cases}$$

$$MGT_{25}^i = \begin{cases} 0 & \text{if } MGT^i \leq 0.05, \\ (MGT^i - 0.05) & \text{if } 0.05 \leq MGT^i < 0.25, \\ 0.20 & \text{if } MGT^i \geq 0.25; \end{cases}$$

$$MGT_{25+}^i = \begin{cases} 0 & \text{if } MGT^i < 0.25, \\ (MGT^i - 0.25) & \text{if } MGT^i \geq 0.25; \end{cases}$$

So, for example, if the management team of a particular firm collectively owns 32% of that firm's outstanding common stock, the data would show $MGT_5^i = 0.05$, $MGT_{25}^i = 0.20$, and $MGT_{25+}^i = 0.07$. To control for the effects of spurious correlation between ownership and firm performance, the following control variables used in the original work are included in the regression analysis: (1) $R\&D/A^i$: 1980 R&D expenditure (Compustat) per replacement cost dollar of assets; (2) $ADV/A^i$: 1980 advertising expenditure (Compustat) per replacement cost dollar of assets; (3) $DEBT/A^i$: Debt in current liabilities (R&D Master File) per replacement cost dollar of assets; (4) $A^i$: Replacement cost of assets (Compustat) in billions of dollars. (5) $\underline{D}^i$: Vector of SIC code (3-digit) dummies, including a dummy for each of the 68 industries represented in the sample.

Value Line, McConnell and Servaes (1990) do not find evidence of entrenchment *in the range of inside ownership from 5 to 25 percent*, though they do document a decline in the ratio of market to book as inside ownership increases above 40 percent. Using the methodology of Morck, Shleifer and Vishny, McConnell and Servaes estimate that q *increases* by 8 percent, on average, for an increase in inside ownership from 10 to 15 percent, holding all else constant. The following analysis considers whether the different findings are attributable to the source of managerial stock ownership data. If I can reject that differences in ownership data are driving these contradictory findings then it suggests that the differences in the interaction between managerial stockholdings and q documented by these two sets of authors is attributable to differences in the characteristics of the sample firms. [14]

Table 4 presents the coefficient estimates obtained from a multivariate regression of firm performance on managerial ownership, decomposed into three pieces, for two overlapping subsamples of the 1980 Fortune 500 firms. [15] For the full sample of 352 firms – Subsample I – the coefficient estimates on Value Line ownership data are not significantly different from zero. This is not surprising given that the turning points of 5 and 25 percent were chosen by Morck, Shleifer and Vishny to minimize the mean squared error of the q regression using a sample of 371 Fortune 500 firms and CDE ownership data. This method of selecting the turning points biases the test against finding significant coefficient estimates for the other ownership series. What is surprising is that the coefficient estimates on ownership between 5 and 25 percent, as measured either by the CDE or by Value Line, are negative and within one standard error of the estimate obtained using the proxy data. That is, whereas McConnell and Servaes present evidence of increased firm performance as ownership increases over the range of 5 to 25 percent for samples of over 1000 firms, the "performance" of 352 of the Fortune 500 firms is shown here to decline as managerial ownership increases from 5 to 25 percent. Thus, in combination with the existing evidence on the alignment of incentives between managers and shareholders at low levels of managerial ownership, these results suggest that, on average, the positive relation between Tobin's q and managerial ownership is sustained at higher levels of ownership for small firms than it is for large firms.

The regression results using Subsample II demonstrate that the power of the empirical test of the impact of managerial equity ownership on firm

[14] An alternative explanation is that the performance-ownership relation is nonstationary. The dataset considered in the following test is drawn from 1980 which falls within the interval spanned by McConnell and Servaes' samples. Thus, I put less weight on nonstationary as an explanation of the observed results.

[15] The regression is specified in footnote 12.

Table 4
Coefficient estimates of ownership from model of firm performance, [a] for two subsamples of the 1980 Fortune 500 firms
Subsample I: Sample of 352 firms for which value line, Corporate Data Exchange (CDE), and proxy data are available.
Subsample II: Sample of 313 firms for which Value Line highlights the ownership of insiders, directors or management.

| Subsample: | | Coefficient estimate (standard error) | | | | |
|---|---|---|---|---|---|---|
| Dependent Variable | Data Source | 0–5% | 5–25% | 25%+ | Adj. $R^2$ Part. [b] $R^2$ | F-value Prob > F |
| | CDE | 5.46 *** | −1.38 *** | 0.64 | 0.4962 | 4.1880 |
| | | (1.63) | (0.51) | (0.41) | 0.0172 | 0.0064 |
| Subsample I: | Proxy | 4.82 *** | −0.94 * | 0.30 | 0.4870 | 2.4637 |
| Tobin's Q | | (1.79) | (0.55) | (0.48) | 0.0080 | 0.0627 |
| | Value | 3.12 | −0.70 | 0.43 | 0.4805 | 1.2679 |
| | Line | (1.94) | (0.49) | (0.33) | 0.0015 | 0.2857 |
| | CDE | 6.08 *** | −1.43 ** | 0.92 * | 0.5054 | 4.6463 |
| | | (1.75) | (0.59) | (0.51) | 0.0218 | 0.0035 |
| Subsample II: | Proxy | 6.58 *** | −1.16 * | 0.43 | 0.5009 | 3.8827 |
| Tobin's Q | | (1.94) | (0.64) | (0.57) | 0.0177 | 0.0098 |
| | Value | 4.35 ** | −1.06 * | 0.78 * | 0.4919 | 2.3904 |
| | Line | (2.05) | (0.57) | (0.43) | 0.0087 | 0.0694 |

[a] Each regression includes the set of control variables that include R&D/A, ADV/A, DEBT/A, and A. [b] Partial $R^2$ measures the variation in the dependent variable that is jointly attributable to the three ownership variables. * Parameter estimate is significantly different from 0 at $\alpha = 0.10$. ** Parameter estimate is significantly different from 0 at $\alpha = 0.05$. *** Parameter estimate is significantly different from 0 at $\alpha = 0.01$.

performance can be increased by eliminating the noise in the Value Line data and considering only those firms for which management holdings are measured. By omitting the 39 cases in which there are potentially confounding ownership stakes aggregated with or substituted for management holdings, the three data sources are equally successful at revealing the non-monotonic pattern between performance and equity ownership first uncovered by Morck, Shleifer and Vishny.

## 5. Conclusions

This comparison of three commonly used sources of management stock ownership data demonstrates that there are good substitutes available for the touted CDE *Stock Ownership Profiles*. For a sample of large Fortune 500 firms, the ownership series obtained from both corporate proxy statements and *Value Line Investment Surveys* approximate the statistical properties of

the ownership series generated using CDE profiles. This suggests that there is ample data available at relatively low cost for time-series work on managerial ownership and for further investigation into the stationarity of the performance-ownership relation documented by Morck, Shleifer and Vishny.

An empirical test of the entrenchment of management through stock ownership reveals a similar pattern of estimates for each of the three ownership series. Thus I reject the hypothesis that the contradictory findings of Morck, Shleifer and Vishny and McConnell and Servaes on the relationship between the ratio of market to book asset value and managerial ownership in the range of 5 to 25 percent are induced by differences in ownership data. Rather the results presented in section 4 suggest that differences in the incentive alignment effect of ownership by a firm's key decision makers is attributable to differences in the size of sample firms.

## Appendix

1980 Managerial Ownership Data for 352 Sample Firms, Constructed from Proxy Statements (PXYMGT), Corporate Data Exchange Volumes (CDEMGT), and *Value Line Investment Surveys* (VALINE)

| Cusip # | Company Name | PXYMGT | CDEMGT | VALINE |
|---|---|---|---|---|
| 800 | ACF INDS | 0.0140 | 0.0051 | 0.0030 |
| 1688 | AMF INC | 0.0250 | 0.0024 | 0.0100 |
| 1723 | AM INTERNATIONAL INC | 0.1553 | 0.1123 | 0.1550 |
| 2824 | ABBOTT LABORATORIES | 0.0130 | 0.0328 | 0.0100 |
| 9158 | AIR PRODUCTS&CHEMICALS INC | 0.0150 | 0.0071 | 0.0150 |
| 19087 | ALLIED CHEMICAL CORP | 0.0064 | 0.0000 | 0.0099 |
| 22249 | ALUMINUM CO OF AMERICA | 0.0130 | 0.2384 | 0.0290 |
| 23551 | AMERADA HESS CORP | 0.1751 | 0.2120 | 0.2500 |
| 24069 | AMERICAN BAKERIES CO | 0.0952 | 0.0955 | 0.1000 |
| 24703 | AMERICAN BRANDS INC | 0.0031 | 0.0000 | 0.0099 |
| 25321 | AMERICAN CYANAMID CO | 0.0170 | 0.0121 | 0.0170 |
| 26573 | AMERICAN HOIST&DERRICK CO | 0.0300 | 0.0028 | 0.0090 |
| 26609 | AMERICAN HOME PRODUCTS CORP | 0.0140 | 0.0102 | 0.0100 |
| 27627 | AMERICAN MOTORS CORP | 0.0051 | 0.0000 | 0.0099 |
| 29717 | AMERICAN STANDARD INC | 0.0357 | 0.0209 | 0.0200 |
| 31897 | AMP INC | 0.0047 | 0.1448 | 0.2000 |
| 32177 | AMSTED INDUSTRIES | 0.0910 | 0.0105 | 0.0100 |
| 33047 | ANCHOR HOCKING CORP | 0.0649 | 0.0451 | 0.1000 |
| 33609 | ANDERSON,CLAYTON&CO | 0.3790 | 0.3570 | 0.3700 |
| 39483 | ARCHER-DANIELS-MIDLAND CO | 0.1800 | 0.1938 | 0.2500 |
| 42170 | ARMCO INC | 0.0120 | 0.0019 | 0.0100 |
| 43339 | ARVIN INDUSTRIES INC | 0.0405 | 0.0301 | 0.0400 |
| 44540 | ASHLAND OIL INC | 0.0284 | 0.0259 | 0.0200 |
| 53627 | AVERY INTERNATIONAL | 0.2600 | 0.2608 | 0.2200 |
| 53807 | AVNET INC | 0.0640 | 0.1224 | 0.1400 |
| 54303 | AVON PRODUCTS | 0.0690 | 0.1209 | 0.1300 |
| 57264 | BAKER INTERNATIONAL CORP | 0.0200 | 0.0116 | 0.0100 |

| | | | | |
|---|---|---|---|---|
| 58498 | BALL CORP | 0.0713 | 0.1395 | 0.0800 |
| 67806 | BARNES GROUP INC | 0.2346 | 0.3535 | 0.2600 |
| 71707 | BAUSCH&LOMB INC | 0.0300 | 0.0158 | 0.0700 |
| 71892 | BAXTER TRAVENOL LABORATORIES | 0.0480 | 0.0444 | 0.0500 |
| 75887 | BECTON, DICKINSON&CO | 0.0460 | 0.0741 | 0.0700 |
| 77851 | BELL&HOWELL CO | 0.0180 | 0.0052 | 0.0100 |
| 81437 | BEMIS CO | 0.1712 | 0.1792 | 0.1200 |
| 81689 | BENDIX CORP | 0.0139 | 0.0029 | 0.0140 |
| 87509 | BETHLEHEM STEEL CORP | 0.0121 | 0.0000 | 0.0099 |
| 89671 | BIG THREE INDUSTRIES | 0.0970 | 0.0974 | 0.1550 |
| 91797 | BLACK&DECKER MFG CO | 0.0221 | 0.0186 | 0.0200 |
| 95293 | BLUEBELL INC | 0.3535 | 0.0411 | 0.0400 |
| 97023 | BOEING CO | 0.0044 | 0.0000 | 0.0099 |
| 97383 | BOISE CASCADE CORP | 0.0211 | 0.0092 | 0.0499 |
| 109043 | BRIGGS&STRATTON | 0.0590 | 0.0559 | 0.0200 |
| 110097 | BRISTOL-MYERS CO | 0.0130 | 0.0126 | 0.0200 |
| 111853 | BROCKWAY GLASS CO | 0.0810 | 0.0735 | 0.3100 |
| 115657 | BROWN GROUP INC | 0.0503 | 0.0387 | 0.0400 |
| 117043 | BRUNSWICK CORP | 0.0154 | 0.0101 | 0.0100 |
| 118745 | BUCYRUS-ERIE CO | 0.0053 | 0.0000 | 0.0100 |
| 122781 | BURROUGHS CORP | 0.0075 | 0.0019 | 0.0050 |
| 123655 | BUTLER MFG CO | 0.0768 | 0.0636 | 0.5000 |
| 124800 | CBI INDUSTRIES INC | 0.1400 | 0.1430 | 0.2500 |
| 126149 | CPC INTERNATIONAL INC | 0.0057 | 0.0000 | 0.0100 |
| 127055 | CABOT CORP | 0.3680 | 0.4767 | 0.4500 |
| 134429 | CAMPBELL SOUP CO | 0.3292 | 0.5861 | 0.3100 |
| 134449 | CAMPBELL TAGGART INC | 0.0490 | 0.0924 | 0.1500 |
| 139861 | CAPITAL CITIES COMMUNICATION | 0.0800 | 0.0713 | 0.0950 |
| 143483 | CARNATION CO | 0.4070 | 0.4599 | 0.4400 |
| 144285 | CARPENTER TECHNOLOGY | 0.0240 | 0.0144 | 0.0220 |
| 149123 | CATERPILLAR TRACTOR CO | 0.0000 | 0.0000 | 0.0070 |
| 150033 | CECO CORP | 0.1500 | 0.2835 | 0.1300 |
| 150843 | CELANESE CORP | 0.0240 | 0.0104 | 0.0099 |
| 155177 | CENTRAL SOYA CO | 0.0310 | 0.0348 | 0.0300 |
| 156879 | CERTAIN-TEED CORP | 0.6200 | 0.0000 | 0.5400 |
| 157177 | CESSNA AIRCRAFT CO | 0.0922 | 0.0864 | 0.0900 |
| 158525 | CHAMPION INTERNATIONAL CORP | 0.0041 | 0.0000 | 0.0099 |
| 158663 | CHAMPION SPARKPLUG | 0.2209 | 0.3895 | 0.4300 |
| 161177 | CHARTER CO | 0.1771 | 0.1551 | 0.3800 |
| 165339 | CHESEBROUGH-POND'S INC | 0.0060 | 0.0107 | 0.0200 |
| 167898 | CHICAGO PNEUMATIC TOOL CO | 0.0280 | 0.0080 | 0.0200 |
| 171106 | CHROMALLOY AMERICAN CORP | 0.0686 | 0.0686 | 0.3500 |
| 171196 | CHRYSLER CORP | 0.0140 | 0.0024 | 0.0100 |
| 172172 | CINCINNATI MILACRON INC | 0.1374 | 0.0873 | 0.1400 |
| 173036 | CITIES SERVICE CO | 0.0521 | 0.0481 | 0.0099 |
| 181396 | CLARK EQUIPMENT CO | 0.0104 | 0.0070 | 0.0100 |
| 189486 | CLUETT, PEABODY&CO | 0.0164 | 0.0078 | 0.0099 |
| 191216 | COCA-COLA CO | 0.0552 | 0.2139 | 0.0200 |
| 194162 | COLGATE-PALMOLIVE CO | 0.0084 | 0.0155 | 0.0300 |
| 194828 | COLLINS&AIKMAN CORP | 0.0647 | 0.0685 | 0.2000 |
| 196864 | COLT INDUSTRIES INC | 0.0981 | 0.0326 | 0.0950 |

| | | | | |
|---|---|---|---|---|
| 200273 | COMBUSTION ENGINEERING INC | 0.0120 | 0.0029 | 0.0100 |
| 205887 | CONAGRA INC | 0.1100 | 0.0928 | 0.1100 |
| 206813 | CONEMILLS CORP | 0.0698 | 0.2479 | 0.2600 |
| 209759 | CONSOLIDATED PAPERS INC | 0.4340 | 0.4387 | 0.4700 |
| 211452 | CONTINENTAL GROUP | 0.0125 | 0.0000 | 0.0100 |
| 212363 | CONTROL DATA CORP | 0.0250 | 0.0204 | 0.0300 |
| 216669 | COOPER INDS INC | 0.0128 | 0.0118 | 0.0140 |
| 217687 | COPPERWELD CORP | 0.6904 | 0.6702 | 0.6700 |
| 219327 | CORNING GLASSWORKS | 0.1472 | 0.1737 | 0.3100 |
| 224399 | CRANE CO | 0.2410 | 0.2472 | 0.1300 |
| 228255 | CROWN CORK&SEAL CO INC | 0.1770 | 0.2044 | 0.5000 |
| 228669 | CROWN ZELLERBACH | 0.0232 | 0.0107 | 0.0099 |
| 231021 | CUMMINS ENGINE | 0.2634 | 0.2648 | 0.2700 |
| 232525 | CYCLOPS CORP | 0.0810 | 0.0723 | 0.0200 |
| 235773 | DAN RIVER INC | 0.0264 | 0.0210 | 0.0300 |
| 235811 | DANA CORP | 0.0100 | 0.0019 | 0.1300 |
| 237688 | DATA GENERAL CORP | 0.0911 | 0.0803 | 0.1000 |
| 239577 | DAYCO CORP | 0.0580 | 0.0568 | 0.1100 |
| 244199 | DEERE&CO | 0.0069 | 0.0370 | 0.0070 |
| 248631 | DENNISON MFG CO | 0.0413 | 0.0278 | 0.0900 |
| 252165 | DEXTER CORP | 0.3000 | 0.2961 | 0.4600 |
| 252669 | DIAMOND INTERNATIONAL CORP | 0.0840 | 0.3128 | 0.0560 |
| 252741 | DIAMOND SHAMROCK CORP | 0.0084 | 0.0028 | 0.0160 |
| 253849 | DIGITAL EQUIPMENT | 0.0753 | 0.0650 | 0.0900 |
| 257867 | DONNELLEY(R.R.)&SONS CO | 0.1380 | 0.2555 | 0.2500 |
| 258435 | DORSEY CORP | 0.1730 | 0.4584 | 0.1800 |
| 260003 | DOVER CORP | 0.1395 | 0.1354 | 0.2500 |
| 260543 | DOW CHEMICAL | 0.0189 | 0.1003 | 0.0200 |
| 260561 | DOW JONES&CO INC | 0.4730 | 0.6455 | 0.7000 |
| 261597 | DRESSER INDUSTRIES INC | 0.0104 | 0.0073 | 0.0200 |
| 263534 | DUPONT (E.I.) DE NEMOURS | 0.0670 | 0.3500 | 0.3000 |
| 268457 | EG&G INC | 0.0715 | 0.0405 | 0.0600 |
| 269803 | EAGLE-PICHER INDS | 0.0300 | 0.0207 | 0.0500 |
| 277461 | EASTMAN KODAK CO | 0.0000 | 0.0000 | 0.0099 |
| 279029 | ECONOMICS LABORATORY INC | 0.0350 | 0.0883 | 0.1000 |
| 291011 | EMERSON ELECTRIC CO | 0.0085 | 0.0228 | 0.0400 |
| 291210 | EMHART CORP | 0.0151 | 0.0045 | 0.0100 |
| 296470 | ESMARK INC | 0.0800 | 0.1184 | 0.0400 |
| 297659 | ETHYL CORP | 0.1900 | 0.1560 | 0.1650 |
| 302290 | EXXON CORP | 0.0032 | 0.0000 | 0.0099 |
| 302491 | FMC CORP | 0.0940 | 0.0023 | 0.0100 |
| 303711 | FAIRCHILD INDUSTRIES INC | 0.0300 | 0.0645 | 0.0360 |
| 313225 | FEDERAL CO | 0.0628 | 0.0991 | 0.0800 |
| 313549 | FEDERAL-MOGUL CORP | 0.0304 | 0.0182 | 0.0099 |
| 313693 | FEDERAL PAPERBOARD CO | 0.0946 | 0.1405 | 0.1500 |
| 315405 | FERRO CORP | 0.0480 | 0.0242 | 0.0200 |
| 316549 | FIELDCREST MILLS | 0.4345 | 0.4172 | 0.4100 |
| 318315 | FIRESTONE TIRE&RUBBER CO | 0.1650 | 0.2200 | 0.1800 |
| 339099 | FLEETWOOD ENTERPRISES | 0.2470 | 0.2359 | 0.3000 |
| 345370 | FORD MOTOR CO | 0.4148 | 0.4040 | 0.1300 |
| 351604 | FOXBORO CO | 0.2380 | 0.2500 | 0.0440 |

| | | | | |
|---|---|---|---|---|
| 359370 | FRUEHAUF CORP | 0.0195 | 0.0071 | 0.0100 |
| 361428 | GAF CORP | 0.0563 | 0.0230 | 0.0199 |
| 364730 | GANNETT CO | 0.0390 | 0.0641 | 0.1500 |
| 369352 | GENERAL CINEMA CORP | 0.3220 | 0.3517 | 0.3200 |
| 369550 | GENERAL DYNAMICS CORP | 0.2280 | 0.2234 | 0.2200 |
| 369604 | GENERAL ELECTRIC CO | 0.0080 | 0.0149 | 0.0100 |
| 369856 | GENERAL FOODS CORP | 0.0079 | 0.0000 | 0.0100 |
| 370064 | GENERAL HOST CORP | 0.1540 | 0.1226 | 0.1200 |
| 370118 | GENERAL INSTRUMENT CORP | 0.0279 | 0.0209 | 0.0400 |
| 370334 | GENERAL MILLS INC | 0.0156 | 0.0130 | 0.0100 |
| 370442 | GENERAL MOTORS CORP | 0.0030 | 0.0000 | 0.0100 |
| 370622 | GENERAL REFRACTORIES CO | 0.0051 | 0.0000 | 0.2600 |
| 370838 | GENERAL SIGNAL CORP | 0.0260 | 0.0327 | 0.2100 |
| 371352 | GENERAL TIRE&RUBBER CO | 0.0760 | 0.0757 | 0.0400 |
| 373298 | GEORGIA-PACIFIC CORP | 0.0220 | 0.0178 | 0.0200 |
| 373712 | GERBER PRODUCTS CO | 0.0997 | 0.1720 | 0.0400 |
| 375766 | GILLETTE CO | 0.0103 | 0.0000 | 0.0099 |
| 382388 | GOODRICH (B.F.) CO | 0.0306 | 0.0145 | 0.0200 |
| 383492 | GOULD INC | 0.0100 | 0.0090 | 0.0150 |
| 383883 | GRACE (W.R.)&CO | 0.3100 | 0.3118 | 0.2800 |
| 391090 | GREAT NORTHERN NEKOOSA CORP | 0.0230 | 0.0240 | 0.0200 |
| 398028 | GREYHOUND CORP | 0.0054 | 0.0000 | 0.0100 |
| 400181 | GRUMMAN CORP | 0.0170 | 0.0101 | 0.0190 |
| 402064 | GULF&WESTERN INDS INC | 0.1024 | 0.0885 | 0.0900 |
| 402460 | GULF OIL CORP | 0.0062 | 0.1100 | 0.0099 |
| 408306 | HAMMERMILL PAPER CO | 0.0207 | 0.0184 | 0.0080 |
| 410306 | HANDY&HARMAN | 0.1130 | 0.0778 | 0.1100 |
| 411631 | HARCOURT BRACE JOVANOVICH | 0.0928 | 0.1299 | 0.1500 |
| 413342 | HARNISCHFEGER CORP | 0.1030 | 0.0860 | 0.1000 |
| 413875 | HARRIS CORP | 0.0380 | 0.0352 | 0.0050 |
| 415864 | HARSCO CORP | 0.0178 | 0.0165 | 0.0200 |
| 416162 | HART SCHAFFNER&MARX CO | 0.0580 | 0.0636 | 0.0500 |
| 422884 | HEILEMAN (G.) BREWING INC | 0.0430 | 0.0389 | 0.0500 |
| 427056 | HERCULES INC | 0.0034 | 0.0000 | 0.0099 |
| 427866 | HERSHEY FOODS CORP | 0.5580 | 0.0033 | 0.5800 |
| 428182 | HEUBLEIN INC | 0.1120 | 0.1081 | 0.3000 |
| 428236 | HEWLETT-PACKARD CO | 0.3800 | 0.3843 | 0.4000 |
| 438506 | HONEYWELL INC | 0.0047 | 0.0000 | 0.0030 |
| 439272 | HOOVER CO | 0.0970 | 0.2209 | 0.4500 |
| 439316 | HOOVER UNIVERSAL INC | 0.0460 | 0.1210 | 0.1100 |
| 440452 | HORMEL (GEO.A.)&CO | 0.4670 | 0.4554 | 0.4600 |
| 444492 | HUGHES TOOL CO | 0.0253 | 0.0090 | 0.0200 |
| 451542 | IDEAL BASIC INDUSTRIES INC | 0.2436 | 0.1928 | 0.2000 |
| 456866 | INGERSOLL-RAND CO | 0.0319 | 0.0262 | 0.0099 |
| 457470 | INLAND STEEL CO | 0.0068 | 0.0166 | 0.0100 |
| 457659 | INSILCO CORP | 0.0060 | 0.0021 | 0.0400 |
| 458140 | INTEL CORP | 0.1720 | 0.1645 | 0.3600 |
| 458506 | INTERCO INC | 0.0460 | 0.0439 | 0.0600 |
| 458702 | INTERLAKE INC | 0.0304 | 0.0149 | 0.0100 |
| 459200 | INTL BUSINESS MACHINES CORP | 0.0099 | 0.0000 | 0.0030 |
| 459578 | INTL HARVESTER CO | 0.0099 | 0.0094 | 0.0130 |
| 459884 | INTL MINERALS&CHEMICAL | 0.0180 | 0.0021 | 0.0099 |

| | | | | |
|---|---|---|---|---|
| 460043 | INTL MULTIFOODS CORP | 0.1350 | 0.1315 | 0.1400 |
| 460146 | INTL PAPER CO | 0.0024 | 0.0000 | 0.0010 |
| 478160 | JOHNSON&JOHNSON | 0.0160 | 0.0157 | 0.1500 |
| 479898 | JONATHAN LOGAN INC | 0.2440 | 0.2384 | 0.2400 |
| 481196 | JOY MFG CO | 0.0192 | 0.0097 | 0.0190 |
| 483008 | KAISER ALUMINUM&CHEM CORP | 0.0220 | 0.0084 | 0.0100 |
| 483098 | KAISER STEEL CORP | 0.2380 | 0.0440 | 0.2000 |
| 484098 | KANE-MILLER CORP | 0.4140 | 0.5122 | 0.2800 |
| 487836 | KELLOGG CO | 0.0074 | 0.0022 | 0.4730 |
| 488044 | KELLWOOD CO | 0.0315 | 0.0256 | 0.0200 |
| 492386 | KERR-MCGEE CORP | 0.0388 | 0.0550 | 0.0800 |
| 493422 | KEYSTONE CONS INDUSTRIES INC | 0.3150 | 0.3281 | 0.2500 |
| 494368 | KIMBERLY-CLARK CORP | 0.0071 | 0.0000 | 0.0050 |
| 499040 | KNIGHT-RIDDER NEWSPAPERS INC | 0.3997 | 0.3842 | 0.6600 |
| 500602 | KOPPERS CO | 0.0670 | 0.2024 | 0.0099 |
| 502210 | LTV CORP | 0.0420 | 0.0428 | 0.0099 |
| 527364 | LEVI STRAUSS&CO | 0.4590 | 0.4472 | 0.4900 |
| 530000 | LIBBEY-OWENS-FORD CO | 0.0170 | 0.0102 | 0.0099 |
| 532457 | LILLY (ELI)&CO | 0.0063 | 0.0000 | 0.2000 |
| 538021 | LITTON INDUSTRIES INC | 0.0470 | 0.0371 | 0.0540 |
| 539821 | LOCKHEED CORP | 0.0140 | 0.0123 | 0.0400 |
| 542290 | LONESTAR INDUSTRIES | 0.1372 | 0.1426 | 0.1300 |
| 547779 | LOWENSTEIN (M) CORP | 0.4820 | 0.4975 | 0.5000 |
| 549271 | LUBRIZOL CORP | 0.0435 | 0.0319 | 0.0400 |
| 554790 | MACMILLAN INC | 0.2113 | 0.2003 | 0.1700 |
| 559108 | MAGIC CHEF INC | 0.0930 | 0.3124 | 0.1900 |
| 573275 | MARTIN MARIETTA CORP | 0.0179 | 0.0034 | 0.0100 |
| 574055 | MARYLAND CUP CORP | 0.3267 | 0.5845 | 0.5600 |
| 574599 | MASCO CORP | 0.1510 | 0.1602 | 0.1700 |
| 575379 | MASONITE CORP | 0.0928 | 0.0892 | 0.1500 |
| 577081 | MATTEL INC | 0.0202 | 0.0085 | 0.0100 |
| 579780 | MCCORMICK&CO | 0.1489 | 0.2179 | 0.1200 |
| 580169 | MCDONNELL DOUGLAS CORP | 0.3929 | 0.2264 | 0.4100 |
| 580628 | MCGRAW-EDISON CO | 0.0510 | 0.0475 | 0.0170 |
| 580645 | MCGRAW-HILL INC | 0.1050 | 0.2000 | 0.1100 |
| 582273 | MCLOUTH STEEL CORP | 0.0760 | 0.0670 | 0.0300 |
| 582834 | MEAD CORP | 0.0556 | 0.0493 | 0.3000 |
| 589331 | MERCK&CO | 0.0077 | 0.0054 | 0.0100 |
| 597715 | MIDLAND-ROSS CORP | 0.0080 | 0.0000 | 0.0099 |
| 604059 | MINNESOTA MINING&MFG CO | 0.0263 | 0.0400 | 0.0900 |
| 607059 | MOBIL CORP | 0.0039 | 0.0000 | 0.0099 |
| 608030 | MOHASCO CORP | 0.0187 | 0.0194 | 0.0100 |
| 611662 | MONSANTO CO | 0.0033 | 0.0000 | 0.0099 |
| 619356 | MORTON-NORWICH PRODUCTS | 0.0070 | 0.0204 | 0.2300 |
| 620076 | MOTOROLA INC | 0.0954 | 0.0952 | 0.1700 |
| 626717 | MURPHY OIL CORP | 0.3550 | 0.4029 | 0.5500 |
| 628862 | NCR CORP | 0.0166 | 0.0090 | 0.0040 |
| 629156 | NL INDUSTRIES | 0.0145 | 0.0177 | 0.0100 |
| 629449 | NVF CORP | 0.4350 | 0.4204 | 0.1900 |
| 629853 | NALCO CHEMICAL CO | 0.0117 | 0.0024 | 0.0100 |
| 635128 | NATIONAL CAN CORP | 0.0401 | 0.0324 | 0.0700 |

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|---|---|---|---|---|
| 636316 | NATIONAL GYPSUM CO | 0.0136 | 0.0136 | 0.0200 |
| 637844 | NATIONAL STEEL CORP | 0.0420 | 0.0348 | 0.0200 |
| 650111 | NEW YORK TIMES CO | 0.3324 | 0.3902 | 0.7300 |
| 657045 | NORTH AMERICAN PHILIPS CORP | 0.0030 | 0.0000 | 0.0100 |
| 666807 | NORTHROP CORP | 0.0386 | 0.0279 | 0.0200 |
| 668367 | NORTHWESTERN STEEL&WIRE CO | 0.6347 | 0.6715 | 0.6500 |
| 668605 | NORTON CO | 0.0260 | 0.1154 | 0.6000 |
| 668707 | NORTON SIMON INC | 0.0330 | 0.0310 | 0.0099 |
| 680665 | OLIN CORP | 0.0874 | 0.0842 | 0.0800 |
| 690020 | OUTBOARD MARINE CORP | 0.1724 | 0.2615 | 0.2100 |
| 690734 | OWENS-CORNING FIBERGLAS CORP | 0.0254 | 0.0085 | 0.0100 |
| 690768 | OWENS-ILLINOIS INC | 0.0140 | 0.0192 | 0.0120 |
| 693506 | PPG INDUSTRIES INC | 0.0061 | 0.0000 | 0.1500 |
| 693715 | PABST BREWING CO | 0.0187 | 0.0275 | 0.0400 |
| 701094 | PARKER-HANNIFIN CORP | 0.1110 | 0.1685 | 0.3000 |
| 704562 | PEABODY INTERNATIONAL CORP | 0.0360 | 0.0286 | 0.0400 |
| 709317 | PENNWALT CORP | 0.0107 | 0.0043 | 0.0099 |
| 709903 | PENNZOIL CO | 0.0326 | 0.0250 | 0.0700 |
| 713448 | PEPSICO INC | 0.0023 | 0.0236 | 0.0200 |
| 714041 | PERKIN-ELMER CORP | 0.0111 | 0.0022 | 0.0100 |
| 717081 | PFIZER INC | 0.0097 | 0.0000 | 0.0100 |
| 718167 | PHILIP MORRIS INC | 0.0185 | 0.0054 | 0.0100 |
| 718507 | PHILLIPS PETROLEUM CO | 0.0780 | 0.0000 | 0.0099 |
| 724479 | PITNEY-BOWES INC | 0.0103 | 0.0029 | 0.0099 |
| 731095 | POLAROID CORP | 0.1286 | 0.1276 | 0.1300 |
| 737628 | POTLATCH CORP | 0.1388 | 0.0905 | 0.4000 |
| 746252 | PUREX INDUSTRIES INC | 0.0420 | 0.0454 | 0.0500 |
| 747402 | QUAKER OATS CO | 0.0420 | 0.0259 | 0.0400 |
| 747419 | QUAKER STATE OIL REFINING | 0.0344 | 0.0415 | 0.0500 |
| 748369 | QUESTOR CORP | 0.5100 | 0.5409 | 0.4900 |
| 749285 | RCA CORP | 0.0065 | 0.0000 | 0.0200 |
| 751277 | RALSTON PURINA CO | 0.1333 | 0.1018 | 0.0200 |
| 755111 | RAYTHEON CO | 0.0340 | 0.0318 | 0.0660 |
| 759200 | REICHHOLD CHEMICALS INC | 0.0669 | 0.0453 | 0.0500 |
| 760779 | REPUBLIC STEEL CORP | 0.0162 | 0.0033 | 0.0100 |
| 761406 | REVERE COPPER&BRASS INC | 0.0070 | 0.0039 | 0.0100 |
| 761525 | REVLON INC | 0.1190 | 0.0795 | 0.1190 |
| 761688 | REXNORD INC | 0.0380 | 0.0325 | 0.0200 |
| 761753 | REYNOLDS (R.J.) INDS | 0.0029 | 0.0022 | 0.0800 |
| 761763 | REYNOLDS METALS CO | 0.1163 | 0.1298 | 0.1760 |
| 774347 | ROCKWELL INTL CORP | 0.0470 | 0.0471 | 0.0600 |
| 775371 | ROHM&HAAS CO | 0.4780 | 0.4738 | 0.4800 |
| 780240 | ROYAL CROWN COS INC | 0.1133 | 0.0592 | 0.0400 |
| 784015 | SCM CORP | 0.0262 | 0.0170 | 0.0099 |
| 793453 | STREGIS PAPER CO | 0.0088 | 0.0023 | 0.0099 |
| 806605 | SCHERING-PLOUGH | 0.0050 | 0.0023 | 0.0099 |
| 809367 | SCOTT&FETZER CO | 0.0188 | 0.0214 | 0.0140 |
| 809877 | SCOTT PAPER CO | 0.0247 | 0.0351 | 0.0400 |
| 810640 | SCOVILL INC | 0.0120 | 0.0220 | 0.0250 |
| 812302 | SEARLE (G.D.)&CO | 0.4099 | 0.3760 | 0.3300 |
| 822635 | SHELL OIL CO | 0.0027 | 0.0000 | 0.6900 |
| 822737 | SHELLER-GLOBE | 0.0408 | 0.0373 | 0.0400 |

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|---|---|---|---|---|
| 824348 | SHERWIN-WILLIAMS CO | 0.0126 | 0.0288 | 0.3000 |
| 826622 | SIGNAL COS | 0.0070 | 0.0111 | 0.0100 |
| 829302 | SINGER CO | 0.0155 | 0.0025 | 0.0170 |
| 830830 | SKYLINE CORP | 0.1760 | 0.1842 | 0.1800 |
| 831865 | SMITH (A.O.) CORP | 0.7073 | 0.5405 | 0.7200 |
| 832110 | SMITH INTERNATIONAL INC | 0.0516 | 0.0721 | 0.2500 |
| 832377 | SMITH KLINE CORP | 0.0240 | 0.0350 | 0.0100 |
| 844861 | SOUTHWEST FOREST INDUSTRIES | 0.2340 | 0.2400 | 0.1900 |
| 848355 | SPERRY CORP | 0.0010 | 0.0000 | 0.0010 |
| 851783 | SPRINGS MILLS INC | 0.6028 | 0.5928 | 0.6000 |
| 852206 | SQUARED CO | 0.0103 | 0.0050 | 0.0100 |
| 852245 | SQUIBB CORP | 0.0295 | 0.0234 | 0.0500 |
| 852864 | STANADYNE INC | 0.3437 | 0.3433 | 0.0199 |
| 853683 | STANDARD OIL CO (CALIF) | 0.0010 | 0.0000 | 0.0099 |
| 853700 | STANDARD OIL CO (INDIANA) | 0.0059 | 0.0000 | 0.0300 |
| 853734 | STANDARD OIL CO (OHIO) | 0.0047 | 0.0046 | 0.0100 |
| 854616 | STANLEYWORKS | 0.0191 | 0.0072 | 0.0700 |
| 857721 | STAUFFER CHEMICAL CO | 0.0050 | 0.0170 | 0.0290 |
| 859264 | STERLING DRUG INC | 0.0078 | 0.0000 | 0.0099 |
| 860163 | STEVENS (J.P.)&CO | 0.0150 | 0.0000 | 0.0160 |
| 862111 | STORAGE TECHNOLOGY CORP | 0.0550 | 0.0415 | 0.0500 |
| 866645 | SUN CHEMICAL CORP | 0.4239 | 0.3849 | 0.4100 |
| 866762 | SUN CO | 0.3920 | 0.3759 | 0.0400 |
| 867323 | SUNDSTRAND CORP | 0.0181 | 0.0061 | 0.0170 |
| 871140 | SYBRON CORP | 0.0430 | 0.0338 | 0.2300 |
| 874687 | TALLEY INDUSTRIES INC | 0.0707 | 0.1022 | 0.0200 |
| 879131 | TEKTRONIX INC | 0.2192 | 0.2264 | 0.3000 |
| 879335 | TELEDYNE INC | 0.1350 | 0.1005 | 0.1000 |
| 881694 | TEXACO INC | 0.0024 | 0.0009 | 0.0050 |
| 882508 | TEXAS INSTRUMENTS INC | 0.0350 | 0.0392 | 0.1900 |
| 883203 | TEXTRON INC | 0.0198 | 0.0156 | 0.0700 |
| 884102 | THIOKOL CORP | 0.0133 | 0.0070 | 0.0099 |
| 887360 | TIMES MIRROR CO | 0.3300 | 0.3250 | 0.3400 |
| 887389 | TIMKEN CO | 0.2410 | 0.2432 | 0.2000 |
| 891490 | TOSCO CORP | 0.0910 | 0.0775 | 0.0200 |
| 892892 | TRANE CO | 0.0710 | 0.1429 | 0.0600 |
| 902182 | TYLER CORP | 0.1230 | 0.1068 | 0.3500 |
| 905530 | UNION CAMP CORP | 0.0109 | 0.0058 | 0.0299 |
| 905581 | UNION CARBIDE CORP | 0.0027 | 0.0000 | 0.0100 |
| 907770 | UNION OILCO OF CALIFORNIA | 0.0063 | 0.0034 | 0.0099 |
| 909160 | UNIROYAL INC | 0.0107 | 0.0022 | 0.0099 |
| 912027 | US GYPSUM CO | 0.0160 | 0.0027 | 0.0100 |
| 912078 | US INDUSTRIES | 0.0080 | 0.0213 | 0.0600 |
| 912656 | US STEEL CORP | 0.0020 | 0.0044 | 0.0099 |
| 915302 | UPJOHN CO | 0.1090 | 0.2500 | 0.3000 |
| 918204 | V.F. CORP | 0.0250 | 0.2044 | 0.1500 |
| 922204 | VARIAN ASSOCIATES INC | 0.0340 | 0.0283 | 0.0400 |
| 929160 | VULCAN MATERIALS CO | 0.1640 | 0.2502 | 0.5000 |
| 933169 | WALTER (JIM) CORP | 0.0436 | 0.0394 | 0.1600 |
| 934391 | WARNACO INC | 0.0557 | 0.0763 | 0.0500 |
| 934436 | WARNER COMMUNICATIONS INC | 0.0440 | 0.0520 | 0.0700 |
| 934488 | WARNER-LAMBERT CO | 0.0110 | 0.0161 | 0.0300 |

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|---|---|---|---|---|
| 939640 | WASHINGTON POST CO-CL B | 0.5040 | 0.2351 | 0.1400 |
| 960402 | WESTINGHOUSE ELECTRIC CORP | 0.0085 | 0.0000 | 0.0099 |
| 961548 | WESTVACO CORP | 0.0160 | 0.0232 | 0.0400 |
| 962166 | WEYERHAEUSER CO | 0.0920 | 0.1735 | 0.0400 |
| 962898 | WHEELABRATOR-FRYE | 0.0852 | 0.0300 | 0.0670 |
| 963150 | WHEELING-PITTSBURGH STEEL | 0.0299 | 0.0137 | 0.0200 |
| 963320 | WHIRLPOOL CORP | 0.0370 | 0.0264 | 0.0600 |
| 963626 | WHITE CONSOLIDATED INDS INC | 0.0265 | 0.0357 | 0.0400 |
| 966680 | WHITTAKER CORP | 0.0330 | 0.0440 | 0.0400 |
| 969133 | WILLAMETTE INDUSTRIES | 0.2577 | 0.2624 | 0.2300 |
| 969457 | WILLIAMS COS | 0.0500 | 0.0553 | 0.0700 |
| 977385 | WITCO CHEMICAL CORP | 0.0980 | 0.1506 | 0.1900 |
| 982526 | WRIGLEY (WM.) JR CO | 0.3605 | 0.3537 | 0.3300 |
| 983085 | WYMAN-GORDON CO | 0.0470 | 0.6109 | 0.6100 |
| 984121 | XEROX CORP | 0.0100 | 0.0000 | 0.0100 |
| 989399 | ZENITH RADIO CORP | 0.0398 | 0.0179 | 0.0500 |

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