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INSTITUTIONAL INVESTORS AND EQUITY PRICES

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ABSTRACT

We analyze institutional investors' preferences for stocks and the implications that these preferences have for stock-market prices and returns. We find that "large"institutional investors -- a category including all managers with greater than $100 million under discretionary control -- have nearly doubled their share of the common-stock market from 1980 to 1996, with most of this increase driven by the growth in holdings of the largest one-hundred institutions. Large institutions, when compared with other investors, prefer stocks that have greater market capitalizations, are more liquid, and have higher book-to-market ratios and lower returns for the previous year. We discuss how institutional preferences, when combined with the rising share of the market held by institutions, induce changes in the relative prices and returns of large stocks and small stocks. We provide evidence to support the in-sample implications for prices and realized returns and we derive out-of-sample predictions for expected returns.

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1. Introduction

Institutional ownership of U.S. common stocks increased dramatically over the past two decades. In this paper, we analyze how institutions differ from other investors and the implications that these differences have for stock-market prices and returns. In particular, we identify the stock characteristics preferred by institutional investors and explore the stability of these preferences over time. We then show how the changing composition of stock ownership can partially explain some recent changes in the relative stock prices of large and small companies and the contemporaneous disappearance of the small-company return premium.

"Large" institutional investors -- a category including all managers with at least $100 million under management -- nearly doubled their share of the common-stock market from 1980 to 1996. By December 1996, these large institutions held discretionary control over more than half of the U.S. equity market. Furthermore, even within this group of large institutions, ownership became more highly concentrated: the one-hundred largest institutions increased their share of the market from 19.0 percent in 1980 to 37.1 percent in 1996.

Do these large institutions invest in the same stocks as everyone else? The evidence shows that these institutions have different preferences than do other investors: institutions prefer stocks that are larger, more liquid, possess "value" characteristics, and have lower return "momentum". Despite many changes in the set of large institutions, these preferences are relatively stable over the sample period. Given these preferences, a shift of investment discretion from individuals to institutions implies changes in the preferences of the "representative" investor. For example, an increase in the institutional share of the market will result in greater demand for large, liquid stocks. If supply and demand curves for stocks are not perfectly elastic, then this demand shift will affect stock market prices and returns. In particular, we would expect the price of large stocks to rise relative to small stocks, with a contemporaneous increase in the return of large stocks relative to small stocks. The sample-period evidence is consistent with these expectations.

To quantify the impact of institutional ownership on prices and returns, we calibrate a partial-equilibrium model. We model the demand side using sample-period estimates of individual and institutional preferences; we model the supply side using sample-period changes in the quantity of large and small stocks. When calibrated to actual changes in the relative prices of large and small stocks, the model implies a downward-sloping demand curve for stocks with an elasticity point estimate of −5.3, a value similar to that estimated in other empirical studies. More generally, the analysis supports the role of investor clienteles for explaining changes in asset prices.

The growth in institutional ownership began well before our sample period and did not go unnoticed by academics. Friedman (1996) analyzes federal flow-of-funds data to show that aggregate institutional ownership increased from less than 10 percent in 1950 to over 50 percent in 1994 and uses this fact to discuss implications for capital formation, stock market volatility, and corporate governance. This striking time-series pattern motivates our firm-level study of institutional ownership.

Our data is drawn from the SEC filings required of all institutions with over $100 million under discretionary management. The primary use of this data in other studies is to analyze the role of institutional ownership as an explanatory variable for other events or firm characteristics.[1] Our analysis employs institutional ownership as a dependent variable in order to explore institutional preferences for stock characteristics. Two recent papers take a similar approach. Del Guercio (1996) examines the holdings of mutual funds and banks in 1988 and finds that banks tilt

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[1] See, for example, Arbel, Carvell, and Strebel (1983), Fields (1996), and Duggal and Millar (1994).

their portfolios more heavily towards "prudent" stocks. She also finds that overall institutional preferences for prudence characteristics were relatively stable from 1988 to 1991. Falkenstein (1996) analyzes two years of mutual funds' holdings of NYSE stocks and finds preferences for stocks with high liquidity, information flow, and volatility. Our paper extends these studies by examining the full 17-year panel and by looking at preferences over all stocks and for all types of managers. These extensions allow us to analyze the interaction of the cross-sectional preferences with the pronounced time-series patterns; it is this interaction that yields the new results and implications for prices and returns.

The rest of the paper is organized as follows. Section 2 summarizes the data and documents the time-series composition of the sample. Section 3 examines institutional ownership and its determinants at the firm level. Section 4 discusses the implications of the results for stock-market prices and returns. Section 5 concludes the paper.

2. Data

A 1978 amendment to the Securities and Exchange Act of 1934 required all institutions with greater than $100 million of securities under discretionary management to report their holdings to the SEC. Holdings are reported quarterly on the SEC's form 13F; all common-stock positions greater than 10,000 shares or $200,000 must be disclosed.[2] These reports are available in electronic form back to 1980 from CDA/Spectrum, a firm hired by the SEC to process the 13F filings. Our data include the quarterly reports from the first quarter of 1980 through the fourth

[2] Other types of security holdings – convertible bonds, stock options, preferred stock – are also required to be disclosed and count towards the $100 million limit, but only common stocks are included in our study.

quarter of 1996. Throughout this paper, we use "institution", "large institution", and "manager" as synonyms for "an institution which files a 13F". We restrict our study to common stocks listed on the Center for Research in Security Prices (CRSP) monthly tapes. We also eliminate all late-filing institutions.[3] This latter restriction affects about five percent of the data.

On the 13F, each manager must report all securities over which they exercise sole or shared investment discretion.[4] In cases where investment discretion is shared by more than one institution, care is taken to prevent double counting. Spectrum officials have told us that they believe that duplication is rare. Once an institution enters the 13F sample, it is assigned a manager type by Spectrum. The five types are (1) bank, (2) insurance company, (3) investment company (mutual fund), (4) investment advisor, and (5) other. The investment advisor category includes most of the large brokerage firms; the "other" category includes pension funds and university endowments. Unfortunately, the categorization is not always precise; for example, brokerage firms with mutual fund subsidiaries will fall into category (3) if the mutual funds are deemed by Spectrum to make up more than 50 percent of the total 13F assets for that manager and into category (4) otherwise. Spectrum does not provide information to allow more precise partitioning of the data. It is also possible for a manager to be reclassified over time if Spectrum determines that the institution's main business has changed.

We first summarize some basic facts about the 13F sample. In this part of the analysis, the

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[3] This restriction is due to the way that Spectrum updates for share splits. All institutions are required to file within 45 days of the quarter-end. When an institution misses this cutoff, Spectrum includes the late filing along with the data for other institutions in the next quarter. Spectrum adjusts this late filing from the previous quarter so as to be consistent with any corporate events that happened over the subsequent quarter; for example, a 2-for-1 stock split in April will be retroactively adjusted to March for the late filers. This adjustment makes it difficult to compare the holdings of on-time and late filers. We tried several methods to undo this adjustment, but no method solved the problem for all cases. Therefore, we dropped late filers from the analysis.

[4] United States Securities and Exchange Commission (1988).

unit of observation is the institution. Our core data consist of all on-time filers: institutions that filed their form 13F within 45 days of the quarter end. Table 1 shows the number of institutions reporting their equity holdings during the final quarter of each year from 1980 through 1996 and breaks down the reporting number of institutions by manager type. In 1980, the largest fraction of qualifying institutions was banks (41.1%), followed by investment advisors (23.2%). Over the subsequent 16 years, the number of banks reporting equity holdings declined in absolute terms, losing 44 reporting institutions. At the same time, the number of investment advisors increased more than sevenfold: 900 investment advisors reported their equity holdings in 13Fs in 1996 and represented 69.1% of 13F institutions. Mutual funds represent only a small fraction of the institutions over the entire time period, with only 9.0% of the sample in 1980 and 6.9% of the sample in 1996. The total number of 13F institutions increases from 525 to 1303 over the time period.

A portion of the growth shown in Panel A, however, might be due to institutions that became 13F filers only because a rising market pushed their portfolio across the nominal threshold level of $100 million. Because the value of the equity market increased substantially over the sample period, more institutions would be required to file without any real change in institutional holdings. To correct for this, we adjust the $100 million cutoff using an index of total stock market value, where this index includes all the stocks in CRSP that are used in our study. Using this index, our revised cutoff rises from $100 million in March 1980 to $818.6 million in December 1996. By December 1980, when Table 1 begins, this indexed cutoff had already reached $140.4 million.

Panel B tabulates the 13F institutions that exceed the indexed cutoff. Many institutions drop from the sample almost immediately. In the fourth quarter of 1980, only 368 institutions pass the indexed cutoff.[5] Overall, the indexed cutoff greatly diminishes the time-series increase in the number of qualifying institutions, with the total growing only to 441 in 1996. Clearly, many institutions enter the 13F sample because of overall stock-market appreciation. As we show below, however, this reduction in the number of institutions does not translate into a large reduction in the total holdings of the remaining sample.

Table 2 examines the total amount of institutional holdings by manager type. This provides a different perspective from Table 1, since the average holdings per institution vary significantly across manager types. We cumulate the holdings of all managers for each type in the last quarter of the year. Panel A presents the summary statistics under the SEC's constant nominal $100 million reporting cutoff. In the early part of the sample, banks represent the largest fraction of institutional holdings: 46.1% in 1980. Over time, however, banks, insurance companies, pension funds and endowments control decreasing fractions of total institutional holdings. During the same time, there is rapid growth for mutual funds and investment advisors: mutual fund and investment advisor holdings grow 3300 percent and 1800 percent, respectively, and both garner increasing fractions of the total institutional pie. Finally, the holdings in the "other" category are relatively small – only $260 billion in 1996 – this is because many pension funds and university endowments yield investment discretion to other managers.

For all institutions, holdings grew from $253 billion in March 1980 (not shown in Table 1) to $3.98 trillion in December 1996. To put these holdings in perspective, 13F institutions

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[5] Our calculation of institutional holdings includes only CRSP-listed common stocks, and thus differs from the broader classification used by the SEC to determine whether an institution is above the $100 million threshold. Some institutions fall below the indexed cutoff for this reason alone. We do not eliminate such institutions from the non-indexed sample.

controlled 26.8% of the market value of all publicly traded stocks in March 1980. In December 1996, the fraction was 51.5%, nearly double the level from the beginning of the sample.

How much of this growth is driven by the fixed nominal 13F reporting requirement coupled with a rising market? In Panel B of Table 2, we tabulate the market value of holdings using the cutoffs indexed to the level of the market. The table shows that the reporting cutoff has little effect on the fraction of the market held by qualifying institutions. In 1996, when the indexed cutoff reduces the number of reporting institutions by almost two-thirds, the percent of total market value held by qualifying institutions declines only to 48.5%. Only $240 billion out of $3.98 trillion is due to the smaller institutions that are indexed out of the sample. The remaining 441 institutions exercise discretionary control over almost half of the U.S. equity market.

The majority of the growth in institutional holdings was driven by the very largest institutions. This growth is illustrated in Figure 1. The figure plots indices for the levels of holdings for the largest, tenth largest, and one-hundredth largest institution at the end of each quarter. From March 1980 to the December 1996, total market capitalization rose eightfold. Over this same period, the number one, ten, and one-hundred managers saw their holdings increase by factors of over twenty-two ($11.1 to $250.8 billion), eighteen ($3.4 to $61.3 billion), and twelve ($675 million to $8.3 billion), respectively.

Figure 2 plots the fraction of the total market held by the largest manager, the ten largest managers, the one-hundred largest managers, and the whole 13F sample. We noted earlier that the entire sample grew to over half the market by 1996, and the figure shows that this growth was driven mostly by increases in the holdings of the largest managers. In March of 1980, the ten largest institutions exercised discretionary control over 5.0 percent of the common-stock market; in December 1996 this fraction was 14.6 percent. In March 1980, the one-hundred largest institutions controlled 19.0 percent of the market; in December 1996, this fraction was 37.1 percent. This is well above the percentage controlled by *all* qualifying institutions in 1980.

3. The Level of Institutional Ownership

3.1. Institutional Preferences for Stock Characteristics

Are institutions different from other investors? In this section, we answer this question through a firm-level analysis of institutional holdings. For simplicity, we refer to all other investors as "individuals", even though this group also includes investment partnerships and small institutions. Thus, the fraction of a firm held by institutions and the fraction held by individuals must sum to one. If the preferences of individuals and institutions were identical, then the fraction of institutional shareholdings would be identical across all stocks. There are reasons, however, to expect the preferences of institutions for various stock characteristics to be significantly different from those of individuals.

We begin by summing the holdings of all reporting institutions for each stock in each quarter.[6] We then express the level of institutional ownership as a percentage of the total outstanding shares for the firm. This percentage, which we call "IO", is the main object of study in this section of the paper. If a stock in CRSP is not held by any institution, then we set IO to 0. Note that the threshold reporting levels of either $200,000 or 10,000 shares will impart a downward bias to our IO calculations. This bias should be lower for large stocks than for small stocks.[7]

[6] We use the entire sample to calculate the percent institutional ownership. We do not index the reporting cutoffs. Results are similar if we repeat the analyses using an indexed sample.

[7] Our diagnostics suggest that the bias is not large enough to affect any of qualitative results of the paper. Even in a small stock, the unreported positions should rarely sum to more than five percent of its market value.

Therefore, we would expect some relationship between IO and size from this bias alone, but why else should IO differ across stocks?

One possible cause of variation in IO is the legal environment that institutions face as fiduciaries. We refer to fiduciary motives as "prudence". Del Guercio (1996) examines the issue of prudence as it relates to stock ownership by banks and mutual funds. She provides intuition and evidence to show that different types of institutions are affected by prudence restrictions to varying degrees. Banks are the only institution governed by the common-law "prudent-man rule"; a standard which is often interpreted more strictly than the written regulations governing the investment behavior of other institutions. However, empirical studies and survey evidence suggest that some non-bank institutions also consider prudence characteristics.[8] Although standards for prudence vary, Del Guercio identifies several variables that have appeared in the prudence case law. We use four of the variables that she suggests: firm age, dividend yield, S&P membership and stock-price volatility.[9] If prudence considerations are important for institutions, then we would expect IO to be positively related to age, yield, and S&P membership, and negatively related to volatility. Also, Del Guercio (1996) shows that prudence considerations are more important for banks than for mutual funds. Therefore, as banks become a smaller fraction of qualifying institutions, we expect prudence considerations to become less important.

Another source of cross-sectional variation in IO stems from liquidity and transaction-cost motives. The large positions held by institutions may lead them to demand stocks with large

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[8] See Del Guercio (1996), Longsgreth (1986), Badrinath, Gay, Kale (1989), and O'Barr and Conley (1992).

[9] See Del Guercio (1996), p.43. Her main prudence proxy, the S&P "quality" variable, is only available for part of our sample period and thus is not included in our main regressions. In section 3.2, we discuss some tests using this variable.

market capitalizations and thick markets. In addition, if institutions turn over their portfolios and trade more often than individuals do (Shapiro and Schwartz (1992)), then they would be more sensitive to the transactions costs caused by large-percentage bid-ask spreads for illiquid or low-priced stocks. We use firm size, per-share stock price, and share turnover as proxies for liquidity. If institutions prefer liquid stocks more than individuals do, then we would expect IO to be positively related to each of these characteristics.

A third set of factors that can lead to cross-sectional variation in IO are the historical return patterns for different types of stocks. Academic research has shown that small stocks, stocks with high book-to-market ratios (and other "value" factors), and stocks with high returns over the previous year ("momentum") have all enjoyed higher historical returns than stocks without those characteristics. Thus, we test whether a firm's size, book-to-market ratio, and momentum are related to the level of institutional ownership. There are two reasons why institutions may differentially invest in stocks that have these characteristics. First, institutions may have better knowledge about historical return patterns and believe them to be exploitable anomalies. Alternatively, institutions may have different preferences for risk and return and may believe that differences in historical returns across stocks are due to differences in risk.

Several other factors may also play a role in explaining the time-series and cross-sectional patterns of IO. First, costly SEC reporting requirements for investors that hold more than five percent of a firm's stock may lead to some institutional avoidance of small firms. Second, the increasing popularity of portfolio indexation may play a role. If indexation affects institutions more than individuals, then we would expect S&P 500 membership to become more important for IO over time. Finally, shifts in the 13F sample away from banks and towards mutual funds and investment managers may affect overall IO because of differences in the preferences of these groups.

3.2. *Institutional Ownership: Empirical Results*

We begin by ranking all stocks in each quarter by their IO. Table 3 reports various percentiles (5^{th}, 25^{th}, 50^{th}, 75^{th}, and 95^{th}) of this IO distribution. The median (50^{th} percentile) institutional holding increased from 0.6% in 1980 to 20.4% in 1996.[10] These medians, however, are far below the averages reported in the last column of Table 2. The difference is due to the substantially higher IO of large firms as compared to small firms, a relationship we discuss later in this section. For most of the sample period, at least 25% of the firms had no 13F institutional holdings. The level of IO at the 50^{th}, 75^{th}, and 95^{th} percentile increased significantly over the sample period: in December 1996, the 95^{th} percentile of IO was 72.8%.

We next examine bivariate relationships for IO and various firm characteristics. We use the characteristics discussed in section 3.1 as proxies for prudence, liquidity, and historical returns. All variables are in natural logarithms and are measured at the same quarter-end as the 13F filing, unless otherwise noted. We consider ten different characteristics:

1) Size (market capitalization);
2) Log of size, squared: that is, $[\log(\text{size})]^2$, not $\log(\text{size}^2)$;
3) The book-to-market ratio: book value for the fiscal year ended before the most recent June

[10] Again, it is important for us to point out that an IO level of 0 percent does not imply that no 13F institutions own the stock. Rather, it implies that no institution owns enough of the stock ($200,000 or 10,000 shares) to require reporting. Since this reporting threshold does not change over the sample period, it is possible that some of the apparent increase in IO within firms is driven by general market increases. Although this threshold effect probably plays a small role when analyzing total institutional ownership for all firms (a "value-weighted" study), it may be more important here for the cross-sectional analysis of IO (an "equally-weighted" study).

30, divided by size as of December 31 during that fiscal year;

4) Volatility: the variance of monthly returns over the previous two years;
5) Momentum: past 11-month return, lagged one-month;
6) Age: number of months since first return appears in CRSP file;
7) S&P 500: a dummy variable equal to one if the firm is included in the S&P 500, zero otherwise;
8) Turnover: volume divided by shares outstanding, measured for the month prior to the beginning of the quarter (i.e., March turnover for a June 30 13F filing);
9) Price, per share;
10) Yield: cash dividends for the fiscal year ended before the most recent June 30, divided by size as of December 31 in that fiscal year.

Table 4 summarizes the cross-sectional correlations between each pair of these variables within each of the 68 quarters. The table presents the average correlation coefficient for each pair for all 68 quarters. Our primary interest is in the second column – the correlations between IO and the other variables. These bivariate correlations, however, can sometimes give misleading intuition for the multivariate relationships among IO and all the characteristics. To see why this is so, note that the correlations of IO with the characteristics (column 2) almost always have the same sign as the correlation of size with the characteristics (column 4). Since, as we will see, size is a very important determinant of IO, any analysis that does not correct for size will face a potentially large omitted-variable bias. Even studies that attempt to control for size by forming size groupings will not eliminate within-group covariation of size with other characteristics. This bias is important for explaining the role of momentum and dividend yield in the multivariate analysis.

The important relationship between firm size and IO is illustrated in Figure 3. The figure plots the average IO within each size quintile for every quarter.[11] In every quarter, average IO increases with size quintile. In the smallest quintile of stocks, average IO increases from 2.7% in 1980 to 13.9% in 1996. At the same time, however, the largest quintile has an average IO that increases from 32.1% in 1980 to 54.9% in 1996. The monotonic relationship between size quintile and average IO implies that institutions own a much larger fraction of the value-weighted market than of the equal-weighted market.

The results of Table 4 and Figure 3 suggest the danger of relying on bivariate relationships, so we next explore the determinants of institutional ownership in a multiple-regression framework. Our regression analysis measures the marginal impact of each variable on firm-level IO. Because of time-series trends in IO and in the independent variables, we estimate separate cross-sectional regressions for each quarter.

Optimally, we would observe uncensored estimates of IO for each firm. We denote these uncensored estimates as IO*. Unfortunately, IO is left-censored at zero for about one-quarter of the observations, i.e., no 13F institution reports a holding for these firms. We observe IO = IO* when IO* > 0, and IO = 0 when IO* < 0. Thus, a censored regression is necessary. Diagnostic tests suggest that a Tobit estimation on this sample has heteroscedastic errors. A censored regression is nonlinear, so heteroscedastic errors can cause biased coefficient estimates. To adjust for this heteroscedasticity, we adopt a tractable modification of the Tobit model suggested by

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[11] Cutoffs for size quintiles are calculated using only NYSE stocks. All U.S. stocks in CRSP are then placed into

Petersen and Waldman (1981).[12]

We begin by adding 1 percent to IO, and then taking its log to form the variable "LIO". When IO = 0, our transformed LIO variable is log (IO + 1) = 0. Similarly, the unobserved "latent" IO* is transformed by LIO* = log (IO* + 1). Adding something to IO (which can be 0) is necessary in order to estimate a log-log specification. Of course, the addition of one percent makes an implicit statement about the reduced-form model. The results are robust to other choices: either a linear-log specification or a log-log specification with additions to IO of two, three, four or five percent all provide the same qualitative results as we discuss in the paper. OLS estimations or Tobit estimations without adjustments for heteroscedasticity also provide the same qualitative results.

Given the transformation to LIO*, we have a latent model of

$$LIO_i^* = \beta X_i + \varepsilon_i, \tag{1}$$

where X_i is a vector of firm characteristics and ε_i is distributed $N(0,\sigma_i^2)$. For simplicity, we omit all time subscripts. We observe data for LIO_i^* as

$$LIO_i = LIO_i^* \text{ if } LIO_i^* > 0; \tag{2}$$

and

$$LIO_i = 0 \text{ if } LIO_i^* < 0. \tag{3}$$

To account for heteroscedasticity, the variance of the error term is modeled as

$$E(\varepsilon_i^2) = \sigma_i^2 = \sigma_i^2 e^{\alpha X_i} \tag{4}$$

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one of the five quintiles. Since most Nasdaq stocks are below the cutoff for the lowest size quintile on the NYSE, this quintile has by far the largest number of stocks.

[12] This modification is discussed in Greene (1993), p. 698-699.

The system (1) – (4) can then be estimated by maximum likelihood. Because some independent variables are missing for many firms, we use three different specifications. Model 1 includes all of the variables from Table 4. CRSP does not report volume data for Nasdaq firms until November 1983, so model 2 excludes turnover (whose calculation requires volume data). Thus, model 1 has different samples before and after 1984, while model 2 is more consistent. Model 3 excludes turnover, book-to-market, and yield. The latter two variables require COMPUSTAT data, which are not available for all firms.

In Table 5, we report average coefficients, time-series standard errors of these coefficients, the number of positive and negative coefficients, and the number of significantly positive or negative coefficients. In all cases, the dependent variable is the LIO. Because the regressions are in a log-log specification, most of the coefficients can be interpreted as elasticities. Since the coefficient estimates are not independent across quarters, the time-series standard errors should be interpreted merely as descriptions and are intended only to convey a sense of the variation over time for each coefficient. We do not attempt to explicitly adjust for time-series dependence because we have no presumption of estimating the same "true coefficients" across quarters; changes in the composition of the 13F sample, instability of institutional preferences, and seasonal factors may all lead to changes in the underlying relationships.

The results show a strong and consistent institutional preference for liquidity. The coefficients on all of the liquidity variables mentioned in the previous section – size, turnover, and price – are positive and significant throughout the sample period. The relationship between size and IO is positive but concave in all quarters, with a positive elasticity for all but the largest stocks. The price coefficients are always positive and significant and show no obvious time-series pattern. The turnover coefficients are positive and significant in all but a few quarters in the early 80s. After

Nasdaq firms are added to the model 1 sample in 1984, the coefficients on all three liquidity proxies are very stable for the remaining quarters.

The evidence on the prudence proxies is mixed. The only prudence proxy with a strong supportive result is age, which has positive and significant coefficients in most quarters. The coefficients on S&P membership always have the "right" sign but are rarely significant. Also, despite the rise of index mutual funds in 1990s, there is no upward trend on the coefficient for S&P membership. If anything, this coefficient seems to dip slightly in later years, although the differences across quarters are not statistically significant. In this multivariate setting, there is no evidence to suggest that rising indexation has caused overall institutional portfolios to tilt more towards S&P stocks.

The other results do not support a strong prudence motive. The coefficients on volatility are usually negative but often insignificant in model 1, and mostly positive in models 2 and 3. The positive coefficients in models 2 and 3 may be due to omitted-variable bias, but this just demonstrates to the unimportance of volatility as compared to the dropped variables. Also, dividend yield has the "wrong" sign in most quarters, with coefficients that are significant towards the end of the sample. In unreported regressions, we extend model 1 to include dummy variables for the S&P quality ranking, a letter grade that varies from A+ to D. Data for this ranking, which Del Guercio (1996) uses as her main prudence proxy, does not begin until 1985. The results show no clear pattern to the coefficients: another failure to support the prudence motive. Later in this section, we confirm Del Guercio's prudence comparison between banks and mutual funds, and we explain how the overall prudence results may be due to time-series changes in the composition of the 13F sample.

Large institutions are *not* momentum investors, especially in the latter part of the sample period. The coefficient on momentum is negative and significant in almost all quarters and all models; the average estimate suggests an economically significant elasticity close to –0.4. This regression coefficient is of a different sign than the simple correlation between IO and momentum shown in Table 4. In fact, the simple correlation was driven by the positive correlations between size and IO and between momentum and size.[13] Once size has properly been controlled for, the remaining marginal contribution of momentum is negative. This sign is robust to many specifications – as long as size is included as a right-hand-side variable. [14]

The regressions also show that institutions have weak but growing preference for "value" stocks. Table 5 indicates an average elasticity for book-to-market of .07 in model 1 and .11 in model 2. These relatively small averages hide a time-series pattern. In both model 1 and model 2, the last negative coefficient occurs in 1983, and all the coefficients are positive and significant beginning in 1987. Although the point estimates are not large, the overall pattern suggests an increasing focus on value stocks.

Table 6 summarizes analogous regression results for each of the five manager types. Most of the patterns of Table 5 are evident for all types of managers. While the magnitude of the average coefficients may differ across types, the signs are generally the same. The exception is the coefficient on yield in the bank subsample. Here the coefficient is consistently positive – banks show a preference for yield not seen in any of the other subgroups. When total IO is used as the dependent variable, the coefficients on yield are positive and insignificant at the beginning of the

[13] The positive correlation between size and momentum does not imply a positive correlation between size and returns. Since both size and momentum are calculated at the end of the previous quarter, there is a natural correlation "built in". If size were calculated twelve months prior to momentum, then their correlation would appropriately reflect the relationship between size and returns.

[14] These results are consistent with the findings of Cohen (1998). Using Federal flow-of-funds data, he finds that institutions tend to buy stocks from individuals after market declines and sell stocks to individuals after market

sample, have mixed signs in the middle, and are negative and significant (in model 1) for the last 18 quarters. This sign change reflects the time-series decline in the share of banks in the 13F sample.

Further evidence on the difference between banks and other institutions comes from the S&P quality ranking, a variable available since 1985. In unreported regressions, we extended model 1 to include dummy variables for this letter-grade S&P ranking. Using a sample from 1988, Del Guercio found that the coefficients on the dummies increased with the quality ranking for banks and showed no pattern for mutual funds. We confirm Del Guercio's result and find that this relationship holds throughout the post-85 period: banks are the only one of the institutional subtypes to show a consistent preference for the higher-ranked stocks. Overall, the declining role played by banks in the sample may explain why prudence motives are not found to be important for aggregate institutional holdings; that is, prudence is important for banks, but not for other institutions.

Overall, we find that institutions show a strong preference for large, liquid stocks, with some evidence that they also prefer value and low-momentum stocks.

4. Implications of Institutional Ownership for Stock Market Prices and Returns

The previous sections document significant increases in aggregate institutional ownership over the sample period and relatively stable institutional preferences for large, liquid stocks. In this section, we study the implications of these patterns for the prices and returns of large stocks relative to small stocks. We define "relative price" as the price of large stocks relative to small stocks. Similarly, "premium" is defined as the excess return, possibly negative, of large stocks

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increases.

over small stocks. Section 4.1 uses both static and dynamic equilibrium reasoning to provide intuition for the relation among IO, prices, returns, and premia. Here, "static" reasoning refers to a period-by-period partial-equilibrium approach in which prices may differ from discounted future cash flows; "dynamic" reasoning refers to a standard forward-looking asset-pricing framework. Other things equal, both the static and dynamic approaches imply that the observed IO patterns should induce large stocks to have rising relative prices (in-sample), higher realized premia (in-sample compared to pre-sample), and lower expected premia (out-of-sample compared to pre-sample). Section 4.2 compares these implications with in-sample empirical evidence and makes out-of-sample predictions. Section 4.3 calibrates a static partial-equilibrium model using supply and demand estimates from the data. The goal of this calibration is to see if the estimated supply and demand changes could "reasonably" have led to the observed effect on relative prices. We calibrate a downward-sloping demand curve with an elasticity of –5.3; this is similar to the estimates made in other contexts.

4.1. Discussion

We first consider a static analysis of IO, prices, returns, and premia. The results of Section 3 show that institutions prefer large, liquid stocks more than individuals do. Given the rise in aggregate IO since 1980 as a fraction of total equity holdings, the representative investor would have increased her demand for large, liquid stocks relative to small, illiquid stocks. For now, we make the assumption that the relative supply of large stocks, defined as the supply of large stocks divided by the supply of small stocks, is held constant over the sample period.[15] Furthermore, we

[15] In section 4.3, we calibrate a partial-equilibrium model and drop the assumption of constant relative supply. In fact, the evidence suggests that the relative supply of large stocks fell during the sample period – a result that

assume that the demand curve for stocks is downward-sloping.[16] Under these conditions, the shift in demand will lead to rising relative prices for large stocks. Holding dividends constant, rising prices imply an increase in the contemporaneous return. Thus, during the sample period, large stocks would enjoy a higher *realized* premium than they would have without the price effect. Eventually, the growth of the IO share must slow down. At this time, the price effect would end as well and the higher relative prices for large stocks would imply lower *expected* premia in the future.

In a dynamic-equilibrium framework, the implications are the same, but the reasoning is different. The time-series change in the representative investor's preferences has a direct effect on expected premia. In order to have the aggregate set of stockholders own all shares in equilibrium, large stocks would require a lower expected premium over small stocks in 1996 than they did in 1979. Continuing this reasoning, the change in the expected premia would itself have an effect on *realized* premia during the sample period. This effect comes from an accounting identity: holding expected cash flows constant, a decrease in the expected return on a stock requires an increase in the stock's price. Thus, if large stocks have a lower expected premium in 1996 than they did in 1979, their relative price must have risen in the interim. Holding dividends constant, a relative price appreciation implies a higher realized premium (in-sample) than would have occurred without the price change. This result holds as long as the changes in aggregate IO were not perfectly anticipated before 1980 and the relative supply large stocks was not perfectly elastic.

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exacerbates the price and return effects discussed below.

[16] Evidence for this assumption is discussed in section 4.3.

4.2 Empirical Evidence

What did happen to the prices and returns of large and small stocks over the sample period? To answer these questions, we adopt definitions of "large" and "small" based on size-quintile breakpoints on the NYSE – the same definitions used by CRSP to calculate size-based returns and discussed above in section 2. Large stocks are all NYSE/AMEX/Nasdaq common stocks in CRSP with market values above the cutoff for the largest quintile of the NYSE. Similarly, small stocks include all NYSE/AMEX/Nasdaq common stocks in CRSP with market values below the cutoff for the smallest quintile of the NYSE.

We use its ratio of market value to book value to measure the "price" of a stock. In this setup, the "quantity" of a stock is measured by its book value and the price is then the market value per unit of book value. The price of all large stocks is calculated as the total market value for all large stocks divided by the total book value of all large stocks. A similar ratio is calculated for small stocks. We calculate these prices once per year, on December 31, and use only the subset of stocks whose fiscal year ends on that day.

Using these definitions, the price of large stocks increased dramatically over the sample period. In December 1979, the price stood at 1.03: the market paid $1.03 for every $1 of book value for large firms. In December 1996, this ratio stood at 2.67, an increase of over 160 percent in 17 years. This price in 1996 was higher than any year since 1965. The price of small stocks also increased, but not by as much. In 1979 the price of small stocks was 0.84. In 1996 it was 1.79. Some of these increases may be due time-series changes in accounting procedures.[17] Nevertheless, such changes are less likely to affect the *relative* price of large stocks. We compute this relative price by dividing the large stock price by the small stock price. The equilibrium reasoning of section 4.1 suggests that this relative price should have increased during the sample period. Our calculations confirm this intuition: the relative price of 1.49 in 1996 was higher than for any other year during the sample period and 20 percent higher than its initial level of 1.23 in 1979.

The evidence on in-sample realized returns is also consistent with the intuition of section 4.1. The annualized return (geometric mean) from January 1926 to December 1979 for small stocks was 12.2 percent while for the large stocks it was 8.2 percent. This negative premium for large stocks, first pointed out in the academic literature by Banz (1981), has disappeared since 1980. From January 1980 to December 1996, the annualized returns for small stocks and large stocks were 13.3 percent and 15.9 percent, respectively. Of course, the relative price appreciation by large stocks would only account for about 1 percent per year in realized returns, but it does point in the right direction. There are probably several reasons for the reversal of the premium since 1979, and one must control for more factors in order to directly measure the contribution from changes in the level of institutional ownership.

More precise evidence of the effect of changing IO on realized returns comes from Brennan, Chordia, and Subramanian (1997). They study cross-sectional stock returns for NYSE firms from 1977 to 1989. After adjusting for risk, they conclude that several stock characteristics have explanatory power for returns. One of these characteristics is the log of institutional ownership (LIO), the same variable we study in section 3. In the static framework, LIO should be positively correlated with returns during a time period when total institutional ownership is increasing as a fraction of the market. If institutional preferences are relatively stable, then a high level of LIO proxies for increased demand over the following period (i.e., if preferences are

[17] See Givoly and Hayn (1998) for a discussion of these changes and their affect on reported book values.

constant, institutions will continue to buy what they already own). An alternative explanation for the positive relation between LIO and subsequent returns is that institutions are successful stock-pickers. These alternatives differ in their out-of-sample predictions. Our reasoning implies that LIO will have zero or negative predictive power for returns once the share of IO stabilizes or becomes fully anticipated. On the other hand, if institutions possess superior stock-picking skills, the positive predictive power should continue. This distinction yields a testable prediction about the future relationship between LIO and returns.

Overall, the evidence suggests a significant price appreciation for large stocks over the sample period, with the current market-to-book ratio at a record level and the relative book-to-market ratio (compared to small stocks) at its highest level in over twenty years. This price appreciation was contemporaneous with the elimination and reversal of the size premium. There is also direct evidence that the level of institutional ownership had forecasting power for excess returns during the sample period.

4.3. Calibrated Price Effects in a Static Model

Both the static and dynamic analyses imply that the relative price and premia of large stocks should rise (in-sample) and the expected premia should fall (out-of-sample). Without an explicit model, one cannot make more quantitative predictions. In this section, we calibrate a static partial-equilibrium model to explore the role of changing supply and demand on the relative price and premia of large stocks. We use a static model because a more standard dynamic model does not allow any useful calibrations.[18] Our purpose here is to ask, "how much of the change in

[18] In a dynamic model, any price or return effects could always be explained by unobservable changes in expected future cash flows. If we assume no unobservable changes, then we are essentially back to a model that, for all

the relative price of large and small stocks could reasonably be explained by straightforward changes in supply and demand?" A static model is well-suited for this purpose. We make no claims of the broad applicability of this approach. Instead we view the analysis as a tool for illustrating the potential impact that changes in stock ownership patterns can have on prices and returns. Nevertheless, considerable evidence exists that demand curves for stocks are indeed downward-sloping.[19] Also, upward-sloping supply curves, particularly for large stocks, are consistent with economic intuition. It is usually not possible to create a large, liquid stock without incurring merger or agency-related costs. In many industries, the industrial organization does not support large firms and the costs of creating them may be considerable.

In our model, as in section 4.2, we define price as the market-to-book ratio. Similarly, relative price is defined as the price of large stocks divided by the price of small stocks. This convention implies the use of book value for the units of quantity. Thus, the quantity of large stocks is the total book value for all stocks above the cutoff for the largest quintile on the NYSE. Similarly, the quantity of small stocks is the total book value for all stocks that fall below the cutoff for the smallest quintile of the NYSE. We define the *relative* quantity of large stocks as the ratio of these two totals: the quantity of large stocks divided by the quantity of small stocks. The analysis of the "relative" market, instead of each market separately, greatly simplifies the exposition and allows for intuitive explanations of the results. This simplification is appropriate as long as both goods (small stocks and large stocks) have the same (constant) elasticity of

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practical purposes, looks like a static one.

[19] For empirical evidence on downward-sloping demand, see Asquith and Mullins (1986), Harris and Gurel (1986), Shleifer (1986), Bradley, Desai and Kim (1988), Holthausen, Leftwich, and Mayers (1990), Loderer, Cooney, and Van Drunen (1991), and Wurgler and Zhuravskaya (1998). Shleifer and Vishny (1997) show how limits to arbitrage can prevent these "mispricings" from being eliminated.

demand.[20]

A graphical representation of the equilibria is given in Figure 4. Relative demand and supply curves are given by D_{79} and D_{96} (demand in 1979 and in 1996) and S_{79} and S_{96} (supply in 1979 and 1996). The arrows indicate the direction that these curves shifted during the sample period. These directions are inferred from the data and are explained below. Using CRSP and COMPUSTAT, we calculate the actual relative prices and quantities at the end of December 1979: $Q_{79} = 24.0$ and $P_{79} = 1.23$. This point is plotted as X in Figure 4. Similarly, quantities and prices at the end of December 1996 can be computed from the data as $Q_{96} = 12.5$ and $P_{96} = 1.49$. This point is plotted at Z in Figure 4. Thus, large stocks had both a lower relative quantity and a higher relative price in 1996 than they did in 1979. The "intermediate" step, given at $Y = (Q'_{96}, P_{79})$, represents the quantity that *would* have been demanded in 1996 if relative prices had stayed at their 1979 level. The key step of our calibration is to estimate Q'_{96}. The main assumption that we use to calculate Q'_{96} is that institutions and individuals maintain their 1979 budget shares on large and small stocks (i.e., they continue to have the same preferences for stock), while the absolute size of their budgets increase to 1996 levels. We describe the intuition and result of this calculation below. The details are given in the appendix.

In March 1980, institutions held 80.8 percent of their total book-value holdings in large stocks and 0.5 percent in small stocks; comparable percentages for individuals were 69.4 percent in large stocks and 3.8 percent in small stocks.[21] Next, we assume that prices stay at their 1979

[20] Please refer to the appendix for a discussion of this point.

[21] The remaining fraction of book value was held in "medium-sized" stocks; stocks from the second, third, and fourth quintiles by NYSE market-value cutoffs. We use these March 1980 fractions, the first quarter of our data, in

levels so that these "budget shares" remain constant through the sample period. During this time, institutions went from holding 23 percent to 49 percent of the total book value in the market.[22] The shift in discretion towards institutions, combined with constant budget shares on large and small stocks, yields the increase from Q_{79} to Q'_{96}. Using the March 1980 budget shares and the December 1996 percentages, we compute Q'_{96} = 34.3, this is 43 percent higher than the actual level of 24.0 in 1979. The increase implies the outward shift from D_{79} to D_{96} in Figure 4.

In addition to the outward shift in demand, the evidence also implies an inward shift in supply. We know this because the actual (relative) quantity, Q_{96}, is lower than Q_{79}. The IPO boom of the 80s and 90s, a process that created far more small firms than large ones, is partially responsible for this effect. Similarly, the bust-up takeover wave of the 1980s often led to spin-offs and divestitures, resulting in a greater number of smaller firms. Although capital appreciation and mergers led to increases in the book value of the set of large stocks, the sharp growth in the number of small firms dominates the supply effect over the sample period.[23] Using our definitions, there were 376 large firms in 1979 and 405 in 1996. In contrast, the number of small firms grew from 2656 in 1979 to 4802 in 1996. It is important to note that our reliance on NYSE cutoffs is not the driving factor in this result; other reasonable cutoffs also lead to the same conclusion.

Given the actual 1996 equilibrium at (Q_{96}, P_{96}), all that remains is to estimate the elasticity

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the calculations for December 1979.

[22] Note that these fractions are slightly different from those reported for aggregate IO in the last column of Table 2. In Table 2, IO is calculated as a market-value weighted average; here, the aggregate share is a book-value weighted average.

[23] According to Securities Data Corporation, there were 3,043 IPOs from 1992 to 1996 alone. Brav and Gompers (1997) show that only 270 firms went public between 1976 and 1980.

of demand along the demand curve from Y to Z. We do not need any assumptions about the shape of D_{79}, S_{79}, or S_{96}. If D_{96} is a constant elasticity curve of the form $D_{96} = A/P^c$, then we can solve for c as[24]

$$c = \frac{\log(Q'_{96} - Q_{96})}{\log(P_{96} - P_{79})} \qquad (5)$$

Substituting actual values for P_{79}, P_{96} and Q_{96} and the calibrated value of Q'_{96}, we obtain the solution of $c = 5.3$. This implies an elasticity of demand of -5.3. This estimate is comparable to those found for individual stocks. In a study of price reactions to new additions to the S&P 500, Wurgler and Zhuravskaya (1998) estimate a median elasticity of -7.1. Using data on the primary stock offerings of regulated firms, Loderer, Cooney, and Van Drunen (1991) estimate a mean elasticity of -4.3 and a median elasticity of -11.1.

The partial-equilibrium exercise provides some insight into the supply and demand relationships in equity markets. Our calibration implies that the relative demand for large stocks increased by 43 percent from 1979 to 1996 because of two factors. First, institutions doubled their equity holdings as a fraction of the market and this lead to increased demand for large stocks. Second, a contemporaneous increase in the number of small-firm IPOs, spin-offs, and divestitures worked to reduce the relative supply of large firms. In our model, these two changes induce a rise in the relative price of large stocks and allow a calibration of -5.3 for the elasticity of demand.

[24] Please see the appendix for details about this calculation.

5. Conclusions

In this paper, we study the equity holdings of all institutional investors that have at least $100 million under management. The study uses quarterly data from 1980 to 1996 drawn from the filings of the SEC's form 13F. We find that large institutions approximately doubled their market share during the sample period; by 1996, they controlled over half of the market. Even within this set of large institutions, holdings became more concentrated: the largest one hundred of these institutions saw their share of the market rise from 19.0 percent in 1980 to 37.1 percent in 1996. We also examine the equity investment preferences of these institutions. We show that large institutions, as compared to other investors, prefer to invest in large, liquid stocks with relatively high book-to-market ratios and low past returns. Furthermore, these preferences have been relatively stable over the sample period.

The stable institutional preference for large, liquid stocks, combined with the rising share of the market held by institutions, implies that the demand for such stocks increased during the sample period. In equilibrium models with finite supply and demand elasticities, such demand shocks lead to price increases and high returns for large stocks relative to small stocks. These predictions are consistent with sample period evidence. We also calibrate a static partial-equilibrium model and obtain a point estimate of –5.3 for the elasticity of demand for stocks. This estimate is consistent with those of other studies and provides further support for the existence of downward-sloping demand curves for stocks.

More broadly, our analysis supports the importance of investor clienteles for understanding asset pricing. The demand shifts induced by compositional changes are only one manifestation of such clientele effects; others can be observed in dual-class or dual-country shares, calendar-time anomalies, and financial market liberalizations. As evidence mounts that most assets do not have perfect substitutes and cannot be perfectly arbitraged, clientele effects and demand shifts should not be ignored.

Appendix

A.1. Calculation of Q'_{96}

To calculate Q'_{96}, we begin by writing Q_{79}, the relative quantity of large stocks, in terms of its two components: Q^{L}_{79}, the total book value of large stocks and Q^{S}_{79}, the total book value of small stocks. The subscript "79" indicates that all these quantities are for 1979.

$$Q_{79} = \frac{Q^{L}_{79}}{Q^{S}_{79}} \qquad (6)$$

In equilibrium, all large stocks must be held by either institutions or by individuals. Denoting $Q^{L,I}_{79}$ as the quantity of large stocks held by institutions and $Q^{L,NI}_{79}$ as the quantity held by individuals (NI = "non-institutions", our synonym for "individuals") we write the numerator of (6) as:

$$Q^{L}_{79} = Q^{L,I}_{79} + Q^{L,NI}_{79} \qquad (7)$$

Let Q^{I}_{79} be the total book value of all stocks held by institutions. Then, consider the following factorization for $Q^{L,I}_{79}$ the first term on the right-hand side of (7):

$$Q^{L,I}_{79} = Q^{I}_{79} * \frac{Q^{L,I}_{79}}{Q^{I}_{79}} \qquad (8)$$

This representation breaks $Q^{L,I}_{79}$ into two pieces. The first piece is the total book value held by institutions. The second piece, $Q_{79}^{L,I}/Q_{79}^{I}$, is the fraction of the total book value of institutional holdings that is made up by large stocks. We think of this component as the institutional "book-value budget share" for large stocks at 1979 prices.

A method for estimating Q'_{96} is suggested by this factorization. Suppose we want to know how much large-stock book value *would* have been held by institutions in 1996 if prices had stayed at 1979 levels. We denote this total as $Q'^{L,I}_{96}$. To estimate this amount, we hold constant the fraction spent on large stocks in 1979, $Q_{79}^{L,I}/Q_{79}^{L}$, while changing the total institutional budget to its 1996 level of Q_{96}^{I}. That is:

$$Q'^{L,I}_{96} = Q_{96}^{I} * \frac{Q_{79}^{L,I}}{Q_{79}^{I}} \tag{9}$$

By extending this technique to individual ownership and to small stocks, we can complete a calculation for Q'_{96}. We write Q'_{96} as:

$$Q'_{96} = \frac{Q'^{L}_{96}}{Q'^{S}_{96}} = \frac{Q'^{L,I}_{96} + Q'^{L,NI}_{96}}{Q'^{S,I}_{96} + Q'^{S,NI}_{96}} \tag{10}$$

Using notation analogous to equation (9), these components are:

$$Q'^{L,NI}_{96} = Q_{96}^{NI} * \frac{Q_{79}^{L,NI}}{Q_{79}^{NI}} \tag{11}$$

$$Q'^{S,I}_{96} = Q^{I}_{96} * \frac{Q^{S,I}_{79}}{Q^{I}_{79}} \qquad (12)$$

$$Q'^{S,NI}_{96} = Q^{NI}_{96} * \frac{Q^{S,NI}_{79}}{Q^{NI}_{79}} \qquad (13)$$

Substituting into (10) yields:

$$Q'_{96} = \frac{Q^{I}_{96} * \frac{Q^{L,I}_{79}}{Q^{I}_{79}} + Q^{NI}_{96} * \frac{Q^{L,NI}_{79}}{Q^{NI}_{79}}}{Q^{I}_{96} * \frac{Q^{S,I}_{79}}{Q^{I}_{79}} + Q^{NI}_{96} * \frac{Q^{S,NI}_{79}}{Q^{NI}_{79}}} \qquad (14)$$

All of the terms in (14) are observable, and we can then compute $Q'_{96} = 34.3$.

A.2 Calculation of Elasticity

Suppose that the demand function for large stocks is given by:

$$D^L = Q^L = \frac{A^L}{(P^L)^c} \qquad (15)$$

and the demand function for small stocks is given by:

$$D^S = Q^S = \frac{A^S}{(P^S)^b} \qquad (16)$$

Then, if c = b, we can write a relative demand function of

$$\frac{D^L}{D^S} = D = \frac{Q^L}{Q^S} = Q = \frac{\frac{A^L}{A^S}}{(\frac{P^L}{P^S})^c} = \frac{A}{P^c} \qquad (17)$$

Thus, our "relative" analysis requires that large and small stocks have the same elasticity of demand, an assumption we make in order to simplify the analysis. In section 4.3, we obtain two price-quantity pairs, (P_{96}, Q_{96}) and (P_{79}, Q'_{96}), for the demand function D_{96}. Substituting these two pairs into (17) yields two equations and two unknowns, which we then solve as equation (5) in the text.

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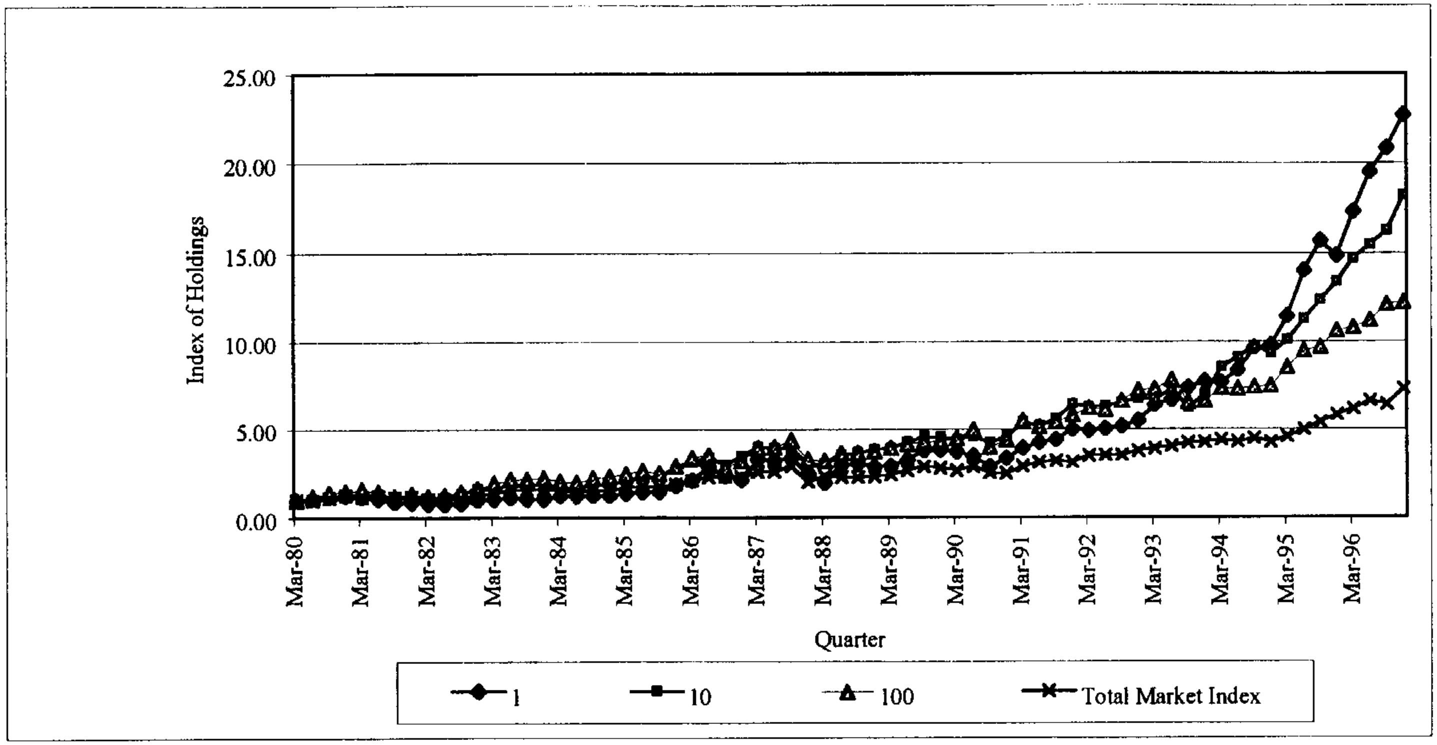

Figure 1 Equity Portfolio Value for the Number One, Number Ten, and Number 100 Institution Ranked by Size and the Total Market Index. The sample is all 13F institutions from the first quarter of 1980 through the fourth quarter of 1996. The holdings of the number one, number ten, and number 100 institution ranked by size are plotted along with the total market index. March 1980 is set to 1 for all the series.

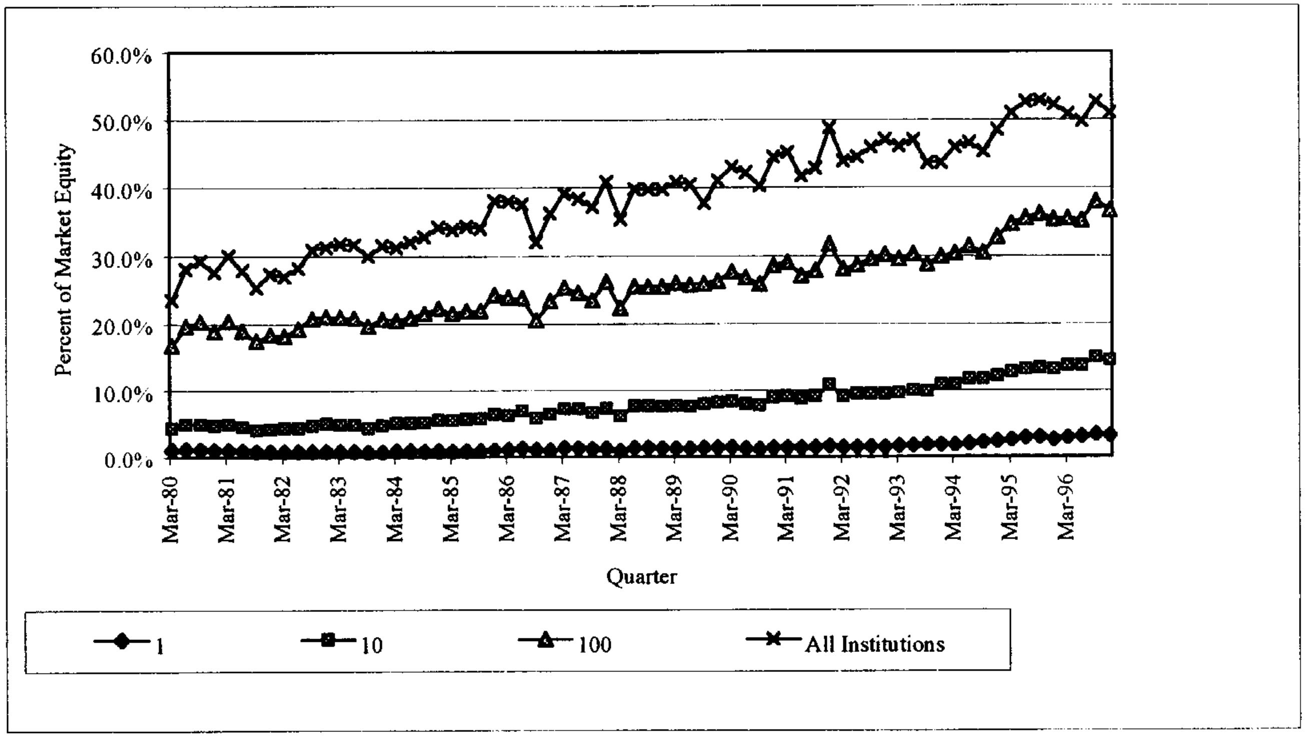

Figure 2 Percent of Market Owned by the First, First Ten, and First 100 Institutions Ranked by Size and Total Institutional Ownership. The sample is all 13F institutions from the first quarter of 1980 through the fourth quarter of 1996. The percent of total market value of equities held by the first, first ten, and first 100 institutions ranked by size as well as the fraction of the market value of public equities held by all institutions is plotted.

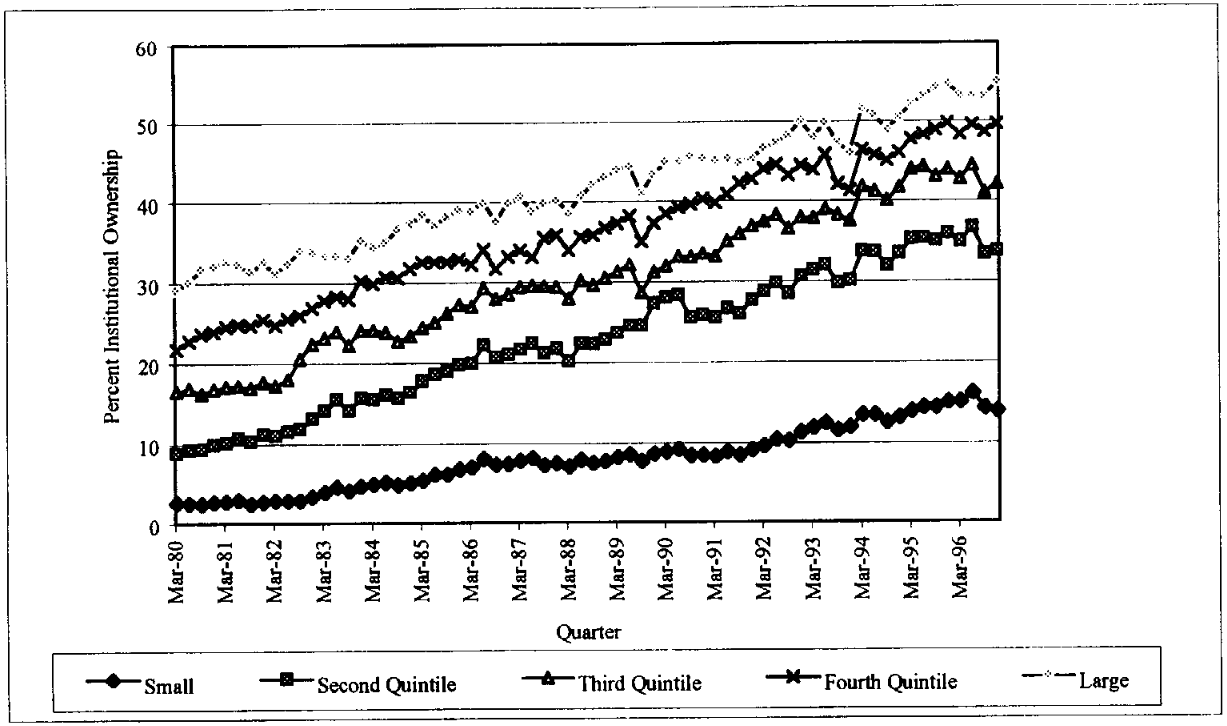

Figure 3 Institutional Ownership by Size Quintile. The sample is all 13F institutions from the first quarter of 1980 through the fourth quarter of 1996. Size quintiles are determined by the market value of common stock at the end of the previous quarter. Cutoffs for size quintiles are calculated using only NYSE stocks. All U.S. stocks in CRSP are then placed into one of the five quintiles. The average institutional ownership in each size quintile is graphed for each quarter of the sample period.

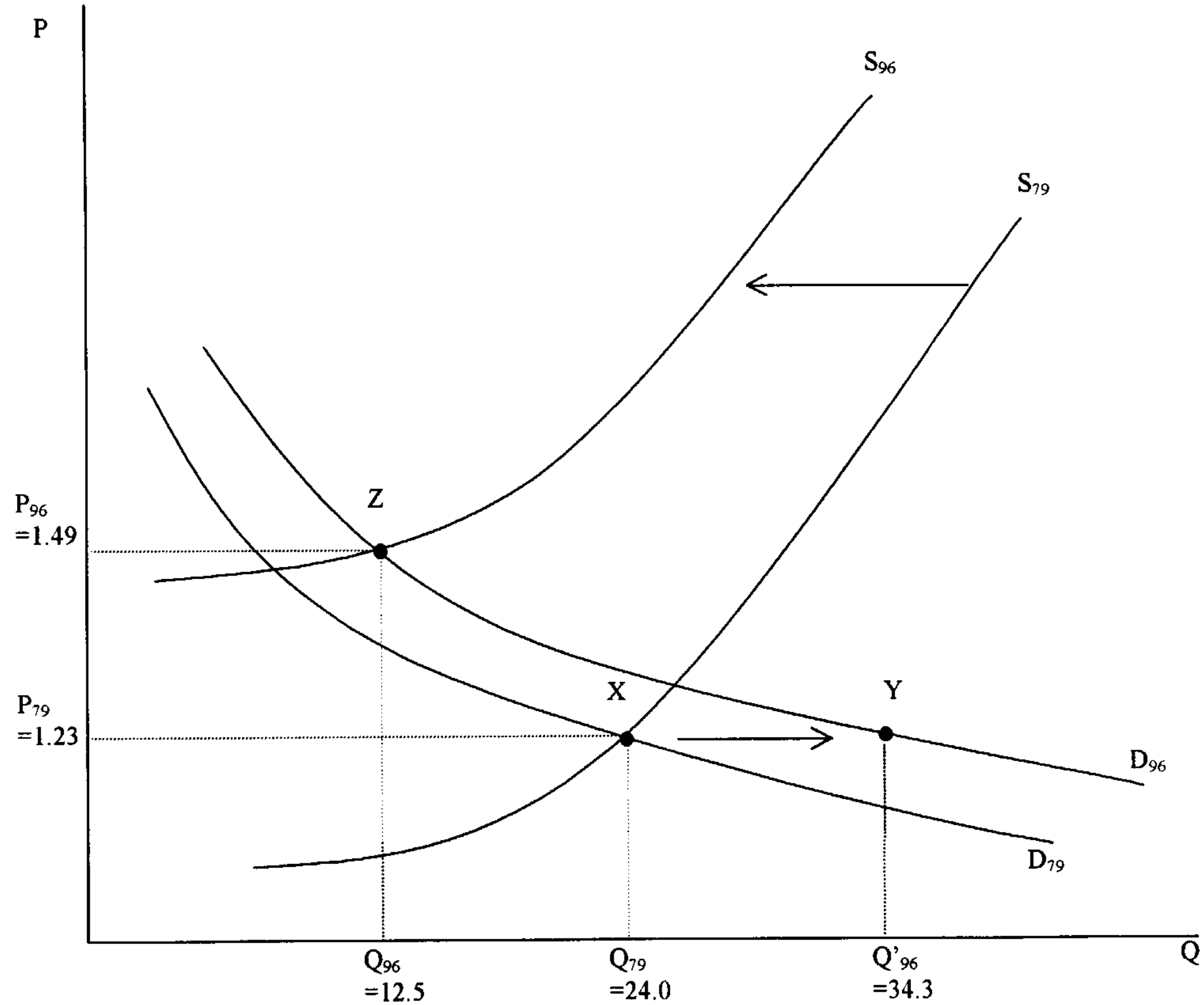

Figure 4 Relative Supply and Demand in 1979 and 1996 This figure gives a graphical illustration for the partial-equilibrium model described in section 4.3 and the appendix. In December 1979, demand and supply are initially at D_{79} and S_{79}, respectively, with an equilibrium price and quantity at (P_{79}, Q_{79}). The changing share of institutional ownership causes demand to shift to D_{96} by December 1996. The supply shift to S_{96} can then be inferred from the observed equilibrium pair at (P_{96}, Q_{96}). Please see the appendix for details.

Table 1

Time Series of the Number of Institutions by Manager Type. The sample is all 13F institutions from the first quarter of 1980 through the fourth quarter of 1996. The total number of institutions reporting their holdings by manager type and the total number of institutions are presented at for fourth quarter of each year. Panel A uses all 13F data. Panel B presents results indexing the 13F filing requirement by the total level of market capitalization

Panel A: Using constant nominal dollar cutoff.

	Banks		**Insurance Companies**		**Mutual Fund Companies**		**Investment Advisors**		**Other (University Endowments)**		**Total**
	Number of Institutions	*Percent of Total*	*Number of Institutions*	*Percent of Total*	*Number of Institutions*	*Percent of Total*	*Number of Institutions*	*Percent of Total*	*Number of Institutions*	*Percent of Total*	*Number of Institutions*
Dec-80	216	41.1%	65	12.4%	47	9.0%	122	23.2%	75	14.3%	525
Dec-81	215	38.5%	60	10.8%	51	9.1%	150	26.9%	82	14.7%	558
Dec-82	216	37.4%	60	10.4%	52	9.0%	172	29.8%	78	13.5%	578
Dec-83	226	35.4%	63	9.9%	52	8.1%	218	34.1%	80	12.5%	639
Dec-84	225	32.5%	63	9.1%	51	7.4%	266	38.4%	88	12.7%	693
Dec-85	224	29.2%	69	9.0%	54	7.0%	332	43.3%	87	11.4%	766
Dec-86	208	25.8%	65	8.1%	60	7.4%	379	47.0%	94	11.7%	806
Dec-87	211	24.0%	72	8.2%	58	6.6%	441	50.1%	99	11.2%	881
Dec-88	214	24.3%	62	7.0%	58	6.6%	454	51.6%	92	10.5%	880
Dec-89	218	23.3%	69	7.4%	54	5.8%	506	54.0%	90	9.6%	937
Dec-90	216	22.1%	73	7.5%	57	5.8%	541	55.4%	89	9.1%	976
Dec-91	212	21.1%	70	7.0%	56	5.6%	584	58.1%	83	8.3%	1005
Dec-92	216	19.7%	70	6.4%	63	5.7%	666	60.7%	83	7.6%	1098
Dec-93	191	18.5%	64	6.2%	61	5.9%	649	62.8%	69	6.7%	1034
Dec-94	195	17.2%	75	6.6%	54	4.8%	740	65.2%	71	6.3%	1135
Dec-95	202	15.5%	78	6.0%	96	7.4%	845	65.0%	79	6.1%	1300
Dec-96	172	13.2%	69	5.3%	90	6.9%	900	69.1%	72	5.5%	1303

Table 1 (continued)

Panel B: Indexed Cutoff.

	Banks		Insurance Companies		Mutual Fund Companies		Investment Advisors		Other (University Endowments)		Total
	Number of Institutions	*Percent of Total*	*Number of Institutions*	*Percent of Total*	*Number of Institutions*	*Percent of Total*	*Number of Institutions*	*Percent of Total*	*Number of Institutions*	*Percent of Total*	*Number of Institutions*
Dec-80	139	37.8%	48	13.0%	40	10.9%	88	23.9%	53	14.4%	368
Dec-81	131	35.8%	47	12.8%	41	11.2%	97	26.5%	50	13.7%	366
Dec-82	139	35.6%	45	11.5%	39	10.0%	118	30.3%	49	12.6%	390
Dec-83	138	33.7%	43	10.5%	39	9.5%	142	34.6%	48	11.7%	410
Dec-84	147	33.9%	42	9.7%	35	8.1%	159	36.6%	51	11.8%	434
Dec-85	144	31.0%	44	9.5%	35	7.5%	190	40.9%	51	11.0%	464
Dec-86	136	30.0%	41	9.0%	34	7.5%	194	42.7%	49	10.8%	454
Dec-87	136	29.1%	43	9.2%	30	6.4%	200	42.8%	58	12.4%	467
Dec-88	126	26.7%	43	9.1%	33	7.0%	212	44.9%	58	12.3%	472
Dec-89	124	25.8%	44	9.1%	33	6.9%	224	46.6%	56	11.6%	481
Dec-90	123	25.3%	46	9.4%	38	7.8%	235	48.3%	45	9.2%	487
Dec-91	116	24.9%	43	9.2%	35	7.5%	225	48.3%	47	10.1%	466
Dec-92	105	21.3%	47	9.5%	40	8.1%	254	51.4%	48	9.7%	494
Dec-93	87	20.0%	41	9.4%	36	8.3%	231	53.1%	40	9.2%	435
Dec-94	87	18.8%	43	9.3%	36	7.8%	256	55.3%	41	8.9%	463
Dec-95	85	17.9%	41	8.6%	60	12.6%	248	52.2%	41	8.6%	475
Dec-96	70	15.9%	37	8.4%	56	12.7%	245	55.6%	33	7.5%	441

Table 2

Time Series of the Market Value of Institutional Holdings by Manager Type. The sample is all 13F institutions from the first quarter of 1980 through the fourth quarter of 1996. The total market value of equity held by manager type and the total market value of institutional ownership are presented for year-end values fourth quarter of each year. All figures are nominal dollar amounts. Panel A uses all 13F data. Panel B presents results indexing the 13F filing requirement by the total level of market capitalization All amounts are in billions of dollars.

Panel A: Using constant nominal dollar cutoff.

	Banks		**Insurance Companies**		**Mutual Fund Companies**		**Investment Advisors**		**Other (University Endowments)**		**Total**	
	Market Value	*Percent of Total*	*Market Value*	*Percent of Total*	*Market Value*	*Percent of Total*	*Market Value*	*Percent of Total*	*Market Value*	*Percent of Total*	*Market Value*	*Percent of Market Cap*
Dec-80	$172.93	46.1%	$44.67	11.9%	$30.76	8.2%	$79.63	21.2%	$47.34	12.6%	$375.33	27.6%
Dec-81	$146.49	42.3%	$41.64	12.0%	$27.28	7.9%	$89.06	25.7%	$41.82	12.1%	$346.29	27.4%
Dec-82	$170.60	39.3%	$52.85	12.2%	$36.05	8.3%	$125.89	29.0%	$48.35	11.1%	$433.75	31.3%
Dec-83	$213.20	38.6%	$57.70	10.4%	$47.56	8.6%	$175.43	31.7%	$58.97	10.7%	$552.87	31.5%
Dec-84	$215.11	38.1%	$51.33	9.1%	$41.75	7.4%	$189.60	33.6%	$66.25	11.7%	$564.04	34.2%
Dec-85	$278.62	36.6%	$64.69	8.5%	$50.82	6.7%	$270.61	35.5%	$96.82	12.7%	$761.56	38.1%
Dec-86	$317.30	36.0%	$71.04	8.1%	$50.09	5.7%	$328.88	37.3%	$114.12	12.9%	$881.43	36.3%
Dec-87	$298.89	33.8%	$71.24	8.1%	$53.18	6.0%	$346.97	39.2%	$114.31	12.9%	$884.58	40.9%
Dec-88	$325.05	32.7%	$79.23	8.0%	$56.95	5.7%	$394.37	39.7%	$138.59	13.9%	$994.19	39.8%
Dec-89	$399.28	32.4%	$99.23	8.0%	$69.12	5.6%	$514.40	41.7%	$151.34	12.3%	$1,233.37	41.1%
Dec-90	$356.97	30.0%	$92.81	7.8%	$75.86	6.4%	$522.56	43.9%	$143.24	12.0%	$1,191.43	44.5%
Dec-91	$480.43	29.6%	$121.44	7.5%	$151.07	9.3%	$691.94	42.6%	$179.75	11.1%	$1,624.64	48.8%
Dec-92	$510.79	27.0%	$139.07	7.4%	$202.93	10.7%	$819.61	43.3%	$219.14	11.6%	$1,891.54	47.0%
Dec-93	$506.82	25.5%	$180.50	9.1%	$251.66	12.7%	$848.77	42.7%	$201.33	10.1%	$1,989.09	43.7%
Dec-94	$556.67	25.1%	$215.20	9.7%	$292.24	13.2%	$942.29	42.6%	$207.60	9.4%	$2,214.00	48.5%
Dec-95	$727.79	22.4%	$324.50	10.0%	$719.53	22.2%	$1,174.08	36.2%	$295.97	9.1%	$3,241.86	52.2%
Dec-96	$860.93	21.6%	$372.79	9.4%	$1,008.87	25.3%	$1,479.37	37.2%	$259.93	6.5%	$3,981.89	51.0%

Table 2 (continued)

Panel B: Indexed Cutoff.

	Banks		Insurance Companies		Mutual Fund Companies		Investment Advisors		Other (University Endowments)		Total	
	Market Value	*Percent of Total*	*Market Value*	*Percent of Total*	*Market Value*	*Percent of Total*	*Market Value*	*Percent of Total*	*Market Value*	*Percent of Total*	*Market Value*	*Percent of Market Cap*
Dec-80	$166.55	46.0%	$43.08	11.9%	$30.02	8.3%	$76.83	21.2%	$45.42	12.6%	$361.91	27.3%
Dec-81	$139.64	42.2%	$40.57	12.2%	$26.54	8.0%	$84.88	25.6%	$39.59	12.0%	$331.22	26.9%
Dec-82	$163.62	39.2%	$51.38	12.3%	$34.84	8.4%	$120.89	29.0%	$46.38	11.1%	$417.11	29.6%
Dec-83	$203.59	38.5%	$55.33	10.5%	$46.01	8.7%	$167.84	31.7%	$56.18	10.6%	$528.96	30.4%
Dec-84	$207.25	38.4%	$49.00	9.1%	$40.11	7.4%	$179.51	33.3%	$63.40	11.8%	$539.27	32.0%
Dec-85	$268.62	36.9%	$61.81	8.5%	$48.64	6.7%	$256.36	35.2%	$92.59	12.7%	$728.01	34.8%
Dec-86	$307.10	36.6%	$67.88	8.1%	$46.83	5.6%	$308.73	36.8%	$108.58	12.9%	$839.12	35.7%
Dec-87	$289.26	34.5%	$67.61	8.1%	$50.32	6.0%	$322.79	38.4%	$109.66	13.1%	$839.63	36.3%
Dec-88	$313.08	33.2%	$76.29	8.1%	$54.55	5.8%	$365.77	38.7%	$134.47	14.2%	$944.17	37.6%
Dec-89	$384.67	32.9%	$94.96	8.1%	$66.75	5.7%	$476.57	40.7%	$146.99	12.6%	$1,169.93	38.3%
Dec-90	$344.63	30.4%	$89.24	7.9%	$73.79	6.5%	$486.74	43.0%	$137.74	12.2%	$1,132.14	41.2%
Dec-91	$464.74	30.2%	$116.28	7.6%	$147.48	9.6%	$634.70	41.3%	$174.45	11.3%	$1,537.64	41.4%
Dec-92	$489.99	27.4%	$133.77	7.5%	$199.08	11.1%	$751.87	42.1%	$213.20	11.9%	$1,787.91	43.5%
Dec-93	$486.98	26.0%	$175.00	9.3%	$246.64	13.2%	$771.49	41.2%	$194.59	10.4%	$1,874.69	40.1%
Dec-94	$535.76	25.6%	$208.80	10.0%	$289.02	13.8%	$857.09	41.0%	$200.65	9.6%	$2,091.31	45.2%
Dec-95	$700.24	23.0%	$314.28	10.3%	$709.30	23.3%	$1,038.44	34.1%	$286.26	9.4%	$3,048.52	48.2%
Dec-96	$828.77	22.1%	$360.51	9.6%	$997.16	26.7%	$1,307.16	34.9%	$248.04	6.6%	$3,741.64	48.5%

Table 3

Percentile Values of Institutional Holdings. The sample is all 13F institutions from the first quarter of 1980 through the fourth quarter of 1996. The IO for the 5th, 25th, 50th, 75th, and 95th percentile stocks (as ranked by IO) are given for the last quarter of each year.

	Institutional Ownership				
	5th Percentile	**25th Percentile**	**50th percentile**	**75th Percentile**	**95th Percentile**
Dec-80	0.0%	0.0%	0.6%	12.6%	46.0%
Dec-81	0.0%	0.0%	0.6%	12.6%	45.8%
Dec-82	0.0%	0.0%	1.0%	16.4%	48.4%
Dec-83	0.0%	0.0%	2.0%	18.9%	49.8%
Dec-84	0.0%	0.0%	2.7%	20.1%	50.6%
Dec-85	0.0%	0.0%	5.3%	23.9%	54.6%
Dec-86	0.0%	0.0%	5.5%	25.2%	55.7%
Dec-87	0.0%	0.0%	6.1%	25.2%	56.8%
Dec-88	0.0%	0.0%	7.0%	26.6%	59.0%
Dec-89	0.0%	0.0%	8.6%	29.8%	60.1%
Dec-90	0.0%	0.0%	9.3%	31.1%	62.9%
Dec-91	0.0%	0.0%	11.1%	34.3%	64.7%
Dec-92	0.0%	0.8%	15.0%	38.6%	68.5%
Dec-93	0.0%	1.4%	15.3%	37.3%	64.7%
Dec-94	0.0%	2.2%	17.2%	40.9%	70.0%
Dec-95	0.0%	5.2%	21.1%	44.9%	74.1%
Dec-96	0.0%	5.1%	20.4%	44.1%	72.8%

Table 4

Cross-sectional correlations between institutional ownership and firm characteristics. The table tabulates the average cross-sectional correlation between institutional ownership and various proxies for prudence and return measures, and also for all pairs of these proxies. The average is taken over the 68 quarters starting with the first quarter in 1980 through the last quarter of 1996.

	Log of Institutional Ownership	Log of Book-to-Market	Log of Market Equity	Log of Market Equity Squared	Log of Volatility	Log of Turnover	Log of Price	S&P 500 Membership	Log of Momentum	Log of Age	Log of Yield
Log of Institutional Ownership	1.000	0.051	0.588	0.572	-0.317	0.216	0.542	0.290	0.161	0.285	0.297
Log of Book-to-Market	0.051	1.000	-0.064	-0.056	-0.256	-0.202	0.064	0.033	0.126	0.314	0.288
Log of Market Equity	0.588	-0.064	1.000	0.993	-0.476	0.242	0.778	0.543	0.308	0.248	0.464
Log of Market Equity Squared	0.572	-0.056	0.993	1.000	-0.470	0.228	0.748	0.589	0.283	0.258	0.464
Log of Volatility	-0.317	-0.256	-0.476	-0.470	1.000	0.223	-0.607	-0.238	-0.134	-0.296	-0.612
Log of Turnover	0.216	-0.202	0.242	0.228	0.223	1.000	0.156	0.117	0.086	-0.088	0.120
Log of Price	0.542	0.064	0.778	0.748	-0.607	0.156	1.000	0.315	0.442	0.206	0.468
S&P 500 Membership	0.290	0.033	0.543	0.589	-0.238	0.117	0.315	1.000	0.060	0.215	0.299
Log of Momentum	0.161	0.126	0.308	0.283	-0.134	0.086	0.442	0.060	1.000	0.112	0.107
Log of Age	0.285	0.314	0.248	0.258	-0.296	-0.088	0.206	0.215	0.112	1.000	0.357
Log of Yield	0.297	0.288	0.464	0.464	-0.612	-0.120	0.468	0.299	0.107	0.357	1.000

Table 5

Tobit Regressions of Log Institutional Ownership. The sample is all 13F institutions from the first quarter of 1980 through the fourth quarter of 1996. The dependent variable is the logarithm of one plus institutional ownership (with 10% expressed as 10.0). The table presents the average coefficients and time-series standard errors from 68 quarterly (cross-sectional) regressions for the sample period. The number of positive coefficients, number of negative coefficients, the number of significantly positive coefficients, and the number of significantly negative coefficients are tabulated.

	Model 1			Model 2			Model 3		
Variable	Coefficient [stand. error]	Number Negative [Significant]	Number Positive [Significant]	Coefficient [stand. error]	Number Negative [Significant]	Number Positive [Significant]	Coefficient [stand. error]	Number Negative [Significant]	Number Positive [Significant]
Constant	-12.1543 [3.5275]	68 [66]	0 [0]	-12.7592 [3.1883]	68 [68]	0 [0]	-12.3533 [4.1124]	68 [68]	0 [0]
Log of Market Equity	1.7383 [0.5209]	0 [0]	68 [68]	1.8680 [0.4521]	0 [0]	68 [68]	1.8525 [0.5020]	0 [0]	68 [68]
Log of Market Equity Squared	-0.0648 [0.0198]	68 [68]	0 [0]	-0.0683 [0.0164]	68 [68]	0 [0]	-0.0663 [0.0184]	68 [68]	0 [0]
Log of Firm Age	0.1730 [0.5801]	3 [0]	65 [55]	0.2351 [0.1210]	0 [0]	68 [53]	0.3618 [0.2067]	0 [0]	68 [60]
Log of Momentum	-0.3957 [0.1624]	67 [64]	1 [0]	-0.4193 [0.1578]	67 [66]	1 [0]	-0.4042 [0.1626]	67 [65]	1 [0]
Log of Price	0.4535 [0.1292]	0 [0]	68 [68]	0.4490 [0.1087]	0 [0]	68 [68]	0.4202 [0.1040]	0 [0]	68 [68]
Log of Volatility	-0.0440 [0.0865]	46 [22]	22 [3]	0.0404 [0.0759]	20 [3]	48 [18]	0.0972 [0.0696]	5 [0]	63 [49]
S&P Membership	0.2783 [0.1270]	0 [0]	68 [4]	0.3014 [0.1035]	0 [0]	68 [3]	0.2314 [0998]	0 [0]	68 [1]
Log of Yield	-0.0492 [0.1143]	44 [19]	24 [1]	-0.0781 [0.1161]	48 [26]	20 [1]			
Log of Book-to-Market	0.0709 [0.1640]	15 [12]	53 [46]	0.1108 [0.0877]	11 [0]	57 [46]			
Log of Turnover	0.1441 [0.0723]	4 [0]	64 [56]						

Table 6

Tobit Regressions of Log Institutional Ownership by Manager Type. The sample is all 13F institutions from the first quarter of 1980 through the fourth quarter of 1996. The dependent variable is the logarithm of one plus institutional ownership (with 10% entered as 10.0), for each of the five subtypes of institution. The table presents the average coefficients and time-series standard errors from 68 quarterly (cross-sectional) regressions for the sample period. The number of positive coefficients, number of negative coefficients, the number of significantly positive coefficients, and the number of significantly negative coefficients are tabulated.

	Banks			*Insurance Companies*			*Mutual Funds*			*Investment Advisors*			*Other*		
	Coefficient [stand. error]	Number Negative [Sign.]	Number Positive [Sign]	Coefficient [stand. error]	Number Negative [Sign.]	Number Positive [Sign.]	Coefficient [stand. error]	Number Negative [Sign.]	Number Positive [Sign.]	Coefficient [stand. error]	Number Negative [Sign.]	Number Positive [Sign.]	Coefficient [stand. error]	Number Negative [Sign.]	Number Positive [Sign.]
Constant	-8.8488 [4.1775]	68 [66]	0 [0]	-19.8732 [4.8402]	68 [67]	0 [0]	-21.4460 [3.2636]	68 [67]	0 [0]	-13.5233 [3.2044]	68 [66]	0 [0]	-17.8826 [7.2256]	68 [67]	0 [0]
Log of Market Equity	1.2213 [0.6532]	0 [0]	68 [68]	2.7078 [0.6875]	0 [0]	68 [68]	2.7698 [0.4654]	0 [0]	68 [68]	1.8338 [0.4970]	0 [0]	68 [68]	2.3809 [1.0671]	0 [0]	68 [68]
Log of Market Equity Squared	-0.0412 [0.0251]	68 [65]	0 [0]	-0.0930 [0.0254]	68 [68]	0 [0]	-0.0967 [0.0158]	68 [68]	0 [0]	-0.0709 [0.0184]	68 [68]	0 [0]	-0.0798 [0.0362]	68 [68]	0 [0]
Log of Firm Age	0.1784 [0.4573]	3 [0]	65 [53]	0.0798 [0.4773]	4 [0]	64 [48]	0.0706 [0.2383]	28 [10]	40 [13]	0.0975 [0.5668]	6 [0]	62 [52]	-0.0092 [0.4376]	16 [1]	52 [40]
Log of Momentum	-0.2865 [0.1235]	67 [64]	1 [0]	-0.3829 [0.1868]	67 [64]	1 [0]	-0.1489 [0.2183]	47 [34]	21 [1]	-0.3412 [0.1790]	68 [57]	0 [0]	-0.4560 [0.1733]	68 [66]	0 [0]
Log of Price	0.2426 [0.1336]	0 [0]	68 [66]	0.1798 [0.1401]	10 [3]	58 [55]	0.3578 [0.0894]	0 [0]	68 [68]	0.5206 [0.1397]	0 [0]	68 [68]	0.2381 [0.1326]	0 [0]	68 [66]
Log of Volatility	-0.0717 [0.0722]	60 [32]	8 [0]	-0.0015 [0.0889]	41 [17]	27 [12]	-0.0381 [0.0845]	46 [22]	22 [5]	-0.0232 [0.1031]	36 [27]	32 [9]	-0.0211 [0.0948]	33 [13]	35 [10]
S&P Membership	0.2457 [0.0871]	0 [0]	68 [45]	0.1353 [0.0742]	0 [0]	68 [26]	0.0612 [0.0736]	14 [0]	54 [5]	0.1966 [0.0840]	0 [0]	68 [11]	0.4280 [0.1370]	0 [0]	68 [68]
Log of Yield	0.1236 [0.0675]	1 [0]	67 [57]	-0.0061 [0.0960]	40 [20]	28 [6]	-0.0821 [0.0937]	54 [33]	14 [0]	-0.1441 [0.0984]	63 [46]	5 [0]	-0.0246 [0.0695]	54 [27]	14 [1]
Log of Book-to-Market	-0.0082 [0.1381]	22 [15]	46 [45]	-0.0275 [0.1223]	27 [17]	41 [31]	0.0198 [0.1465]	24 [13]	44 [30]	0.0797 [0.1581]	15 [13]	53 [48]	-0.0477 [0.1422]	32 [26]	36 [30]
Log of Turnover	0.0715 [0.0586]	10 [0]	58 [49]	0.1463 [0.0408]	0 [0]	68 [63]	0.2409 [0.0618]	0 [0]	68 [68]	0.2229 [0.0486]	0 [0]	68 [68]	0.1189 [0.0479]	1 [0]	67 [57]