Greener Pastures and the Impact of Dynamic Institutional Preferences

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Abstract

Although institutional investors have a strong preference for large capitalization stocks, over time they have begun to shift their preferences toward smaller, riskier securities. Over the 1983-1997 period, financial markets have experienced dramatic changes in the dominance of different types of institutional investors, but these changes in aggregate institutional preferences have arisen primarily from changes in the preferences of each class of investor, rather than changes in the importance of different classes of institutions. Moreover, the combination of institutional growth and the shift in preferences helps explain why markets in general, and smaller stocks in particular, have exhibited greater firm-specific risk and liquidity in recent years. Additional analyses suggest that institutional investors may have moved toward smaller securities because such securities offer "greener pastures." Specifically, institutional demand shocks appear to have driven valuations of large capitalization securities to less attractive levels compared to small stocks, which provide greater opportunities for institutions to exploit their informational advantages.

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Institutional investors are now a dominant force in financial markets, representing a large fraction of equity ownership and an even larger proportion of trading volume. For example, in 1999 institutional investors accounted for more than 50 percent of total U.S. equity ownership, up from 7 percent in 1950 and 28 percent in 1970. Moreover, Schwartz and Shapiro (1992) estimate that institutions account for 70 percent of trading volume. This institutionalization of equity holdings almost certainly means that, for most firms, the price-setting marginal investor is now an institution.

While institutional investors are a far-from-homogenous group, they do have important common features that distinguish them from individual investors. For example, they typically hold much larger portfolios, leading to economies of scale in areas such as investment research and trade execution. In addition, institutional investors are usually evaluated and compensated based on investment performance, leading to similarities in incentives faced. Finally, institutions face regulatory constraints that can affect their investment decisions (e.g., prudent man regulations). Consistent with the hypothesis that these common factors affect their portfolio decisions, extant work documents substantial correlations between institutional ownership and share characteristics, e.g., capitalization, liquidity, share price (Falkenstein, 1996; Del Guercio, 1996; Gompers and Metrick, 2001).

Although previous research has examined the relations between institutional holdings and firm characteristics ("institutional preferences") on a cross-sectional basis, studies have not examined whether these relations change over time, how changes occur, how changes in institutional preferences impact security markets, or what may motivate such changes. In this study, we address four important economic questions: (1) Do aggregate institutional preferences change over time? (2) Do shifts in institutional preferences result from changes in the preferences of each type of institutional investor or from changes in the relative importance of different types of institutional investors? (3) Do shifts in institutional preferences affect security markets? And, (4) why do institutional investors' preferences change?

Our results reveal that institutional investors' preference for large, safe stocks has declined over time in favor of smaller, riskier stocks. This shift in preferences has two potential explanations. The first is that aggregate institutional preferences have changed simply because the relative importance of the different types of institutional investors has changed. Because different types of institutional investors display heterogeneous preferences, disproportionate growth by one or more particular classes of institutional investor will lead to changes in aggregate preferences, as aggregate preferences move to more closely resemble the preferences of the now-more important types of institutional investors.[1] An alternative possibility is that changes in aggregate preferences are induced by changes in the preferences of one or more classes of professional investors.

These explanations are not mutually exclusive - in fact we find that different types of institutional investors experience different growth rates, *and* that their preferences change over time. We perform a variance decomposition to distinguish between the competing explanations. Results reveal that 93 percent of the time-series variation in aggregate preferences is due to changes in the preferences of different types of institutional investors, only 4 percent is apportioned to changes in the relative importance of the different types, and the remaining 3 percent is due to interaction effects. Most important, we find a near-uniform shift in the preferences of *all* types of institutional investors toward holding shares in higher risk and smaller capitalization firms.

We then examine the impact of the combination of institutional investors' shift in preferences and the growing importance of institutional investors on trading activity and volatility. Recent studies document marketwide increases in share turnover and firm-specific risk in the past two decades (Chordia, Roll and Subrahmanyam, 2001; Campbell, Lettau, Malkiel, and Xu, 2001). We hypothesize that the growth in institutional ownership may be partially responsible for these patterns. Moreover, we posit that the shift in preferences suggests increases in volume and firm-specific volatility should be proportionally greater for smaller capitalization securities. Consistent with the first hypothesis, we document that

[1] For example, Del Guercio (1996) shows that banks hold "more prudent" equities. If banks become less important, aggregate preferences will tend to become less prudent.

subsequent levels of turnover and firm-specific risk are positively related to levels of, and changes in, institutional ownership. Consistent with the latter hypothesis, we find that increases in turnover and firm-specific risk have been proportionally larger in smaller capitalization securities.

Last, we examine two possible explanations for the shift in institutional preferences. First, Gompers and Metrick (2001) argue that demand shocks associated with the growth in institutional ownership and institutional investors' historical preference for large capitalization securities have increased large stock valuations (or equivalently, institutional demand shocks are responsible for the disappearance of the small firm effect in recent periods). Thus, institutional preferences for large, safe stocks may have declined because institutional demand shocks impacted the relative valuations of large and small stocks. An alternative, although not mutually exclusive, possibility is that smaller stocks may provide greater opportunities for institutional investors to exploit their informational advantages. Both explanations suggest the shift in preferences results because smaller stocks offer institutional investors "greener pastures."

Consistent with the first explanation, we find that increased institutionalization (coupled with institutional investors' historical preference for larger stocks) has coincided with a significant decline in the average book-to-market ratio of larger firms, resulting in relatively more attractive valuations for smaller firms. Moreover, consistent with Gompers and Metrick, we find evidence of institutional demand shocks – future returns are positively related to current levels of institutional ownership. Nonetheless, consistent with the latter hypothesis, we find evidence that institutional investors have an informational advantage – even after controlling for the level of institutional ownership (as a proxy for demand shock effects), changes in institutional demand predict future returns. The results, however, are sensitive to how changes in institutional demand are measured. Similar to Gompers and Metrick, we find little evidence that changes in the fraction of shares held by institutional investors forecast returns. Consistent with Wermers (1999), however, we find that the Lakonishok, Shleifer, and Vishny (1992) measure of institutional herding does forecast future returns, even after controlling for security characteristics and levels of institutional ownership. Moreover, consistent with the hypothesis that smaller stocks offer better

opportunities for institutions to exploit informational advantages, our results reveal institutional investors' ability to forecast returns is inversely related to capitalization.

The balance of the paper is organized as follows. We review the data and discuss our methodology for examining preferences in Section 1. In Section 2 we document changes in aggregate institutional preferences over time and consider two possible explanations for these changes by examining homogeneity of preferences across investor classes, changes in the relative importance of each class over time, and changes in the preferences of each class over time. In Section 3 we estimate two variance decompositions in order to distinguish between the competing explanations. Specifically, we partition the time-series variance in aggregate preferences into the portion due to changes in the relative importance of each class and the portion due to changes in preferences of each class. We explore the impact of the shift in institutional preferences on liquidity and volatility in Section 4. In Section 5 we examine two possible explanations for the shift in institutional preferences. Conclusions are presented in the final section.

1. Data

The primary data for this study comes from two sources. Security characteristics are gathered from the Center for Research in Security Prices (CRSP) monthly data. Institutional ownership for each security for each quarter between March 1983 and December 1997 (a total of 60 quarters) comes from CDA Spectrum and is derived from institutional investors' 13F filings. (All institutional investors with more than $100 million in equity ownership must report their holdings to the SEC in quarterly 13F filings.)[2] All New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and NASDAQ securities with adequate CRSP data are included in the analysis.

Our analysis focuses on nine stock characteristics: three measures of risk (beta, return standard deviation, and firm-specific volatility), three measures related to institutional constraints (firm size, firm age, and dividend yield), two measures of liquidity (share price and share turnover), and one control for

[2] Institutions are required to report all material equity positions, currently defined as positions greater than 10,000 shares or $200,000 in value.

momentum trading (lag return).[3] All firms for which data is available have characteristic observations for each of the 60 quarters. The three measures of firms risk reflect the firm's systematic risk in relation to a market index, the firm's total risk and the risk specific to the firm. Beta is estimated as the sum of the coefficients in a regression of the firm's monthly return on the contemporaneous and lag one month CRSP NYSE-AMEX value-weighted index over the previous 24 to 60 months (depending on availability). Standard deviation is estimated as the natural logarithm of the standard deviation of monthly returns over the previous 24 to 60 months (depending on availability). Firm-specific volatility is calculated as the natural logarithm of one plus firm-specific risk measured over the current quarter.[4]

As mentioned previously, institutional preferences would be influenced by constraints on their holdings through regulation or other factors. The firm characteristics related to these constraints are firm size, age and dividend yield. Firm size reflects the constraints arising placed by size of holdings as well as liquidity and transaction cost constraints. Firm size is measured as the natural logarithm of equity capitalization. Firm age reflects prohibitions for some institutions from purchasing newly established firms and is given as the natural logarithm of the number of months since December 1972 for which the firm has CRSP return data.[5] Dividend yield reflects cash flow needs as well as constraints on purchasing firms with no cash flows. It is measured as the natural logarithm of one plus the average monthly dividend yield over the previous 12 months.

The two liquidity proxies are share price, given as the natural logarithm of one plus the quarter-end share price, and share turnover, defined as the natural logarithm of one plus the average ratio of monthly volume to number of shares outstanding in the current quarter. Finally, given documented momentum investing, we include a measure of momentum, the firm's cumulative return over the previous

[3] These characteristics are similar to those used in extant literature (see, Del Guercio, 1996; Falkenstein, 1996; and Gompers and Metrick, 2001). See Stoll (1978, 1989) for the evidence regarding share price as a proxy for liquidity costs.

[4] Quarterly firm-specific risk is calculated as the three-month average of the Campbell, Lettau, Malkiel, and Xu (2001) monthly firm-specific risk measure. Specifically, we assign firms to one of 49 industries, (see Fama and French (1997) for industry classification codes) and compute daily industry returns as the equal-weighted average return across firms in the industry. Daily firm-specific returns are defined as the difference between a firm's return and its industry return. Monthly firm-specific risk is computed by summing the squared daily values of firm-specific returns.

six months. The characteristics are updated every quarter for each firm. The number of securities with adequate data ranges from 4,346 in the first quarter of 1983 to 6,784 in the last quarter of 1997, for a total of 325,493 stock-quarters yielding an average of 5,425 firms each quarter.

The institutional ownership data identify the number of shares held by institutional investors. In addition, the data classify institutional owners into one of five groups: Bank trust departments, insurance companies, mutual funds, independent investment advisors, and other unclassified institutional investors.[6] For each firm *i* at time *t*, the fraction of shares held by institutional investors in aggregate is simply the sum of fractional ownership over the five classes of institutional investors:

We begin the analysis by computing, each quarter, mean cross-sectional firm characteristics and fraction of shares held by institutional investors (in aggregate and by type). Panel A in Table 1 reports the time-series mean, median, minimum, and maximum of these 60 cross-sectional averages. Over the 1983-1997 sample period, institutional investors hold 23 percent of a firm's shares, on average.[7] Together, bank trust departments and independent investment advisors hold, on average, about 17 percent of a firm's shares, and account for approximately 73 percent of all shares held by institutional investors. Insurance companies, mutual funds, and unclassified institutional investors each account for, on average, 7 to 13 percent of institutional shareholdings.

[Insert Table 1 about here]

The results reported in Table 1 also show substantial variation in the mean level of ownership by each type of institutional investor. Average holdings of independent investment advisors, for example, range from a minimum of 5.1 percent of each firm's shares to a maximum of 15.9 percent. As seen in

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[5] CRSP NASDAQ return data begins in December 1972.

[6] The classifications (made by CDA Spectrum) are inexact. Independent money managers that also manage mutual funds, for example, are classified as mutual funds if more than 50 percent of their assets are in mutual funds. Unclassified institutional investors primarily consist of internally-managed portions of public and private pension funds, foundations, and university endowments.

[7] We note in the introduction that institutional investors account for approximately half of U.S. equity ownership. Our statistic of 23 percent is not directly comparable to the 50 percent figure for two reasons. First, we report the cross-sectional average institutional ownership. The higher number often reported accounts for the fact that fractional institutional ownership tends to be larger in large capitalization stocks. Second, this is the average over 1983 to 1997, a period in which institutional investment was rapidly increasing. The maximum number of 31 percent is from the most recent quarter.

Figure 1, which shows the average fraction of shares held by each type of institutional investor across the sample period, there has been considerable time-variation in institutional ownership. This figure reveals three striking insights into the dynamics of U.S. institutional ownership. First, most of the growth in institutional ownership over the sample period results from independent investment advisor growth. Second, although bank trust departments account for a large share of institutional ownership, their importance declined in the 1990s. Third, there is strong growth in mutual fund ownership beginning in 1990.[8]

[Insert Figure 1 about here]

Panel B in Table 1 reports the time-series mean, median, minimum, and maximum of the 60 quarterly cross-sectional mean firm characteristics.[9] The average firm has ten years of CRSP return data since 1972, sells for $19/share and has a beta of 1.28.[10] Moreover, there is substantial time-series variation in the cross-sectional average values of the characteristics. The average share price, for example, ranges from a minimum of $12.70 to a maximum of $28.54.

As an initial indication of the relations between institutional ownership and share characteristics, we estimate, each quarter, a correlation matrix of the explanatory variables and the levels of institutional ownership. Table 2 reports the time-series average of the 60 quarterly cross-sectional correlation matrices. Panel A reports correlations between stock characteristics and the fraction of shares held by institutional investors (in aggregate and by type), whereas panel B reports the time-series averages of the cross-sectional correlations between the characteristics.

[Insert Table 2 about here]

[8] The growth in aggregate institutional investor ownership of corporate equities is due to: (1) the increasing role of institutional investors over the sample period, and (2) increases in the number of institutional investors required to file 13F reports because increases in stock market value have driven more institutions over the $100 million reporting threshold.

[9] For ease of interpretation, summary statistics reported in Table 1 are based on raw values, e.g., before taking natural logarithms.

[10] Because we report the average (equal-weighted) beta calculated using the value-weighted CRSP index as the market proxy, the average beta is greater than one.

Results in panel A show that for six of the nine characteristics, the correlations with aggregate institutional ownership are of the same sign across all types of institutional investors. For all of the characteristics, however, there is substantial variation in the magnitude of the average correlations across the different types of institutional investors. The average correlation between turnover and ownership by independent investment advisors, for example, is over four times the average correlation between turnover and ownership by bank trust departments. By themselves, these pairwise correlations suggest that aggregate institutional ownership is positively related to systematic risk, capitalization, firm age, dividend yield, share price, turnover, and lag return, and inversely related to total risk and firm-specific risk. However, the strong correlations between the characteristics shown in Panel B suggest that the correlations presented in panel A should be interpreted with caution. To control for these interrelations among the characteristics, we use multivariate regression analysis in the following sections.[11]

2. Changes in institutional preferences over time

2.1 Standardized regression methodology for comparisons

In an ordinary regression, a coefficient is interpreted as the expected change in the dependent variable given a unit change in the independent variable. The magnitude of the regression coefficient therefore depends upon the scale of both the dependent variable(s) and the independent variable(s). In our case, this presents a problem when comparing coefficients over time because the scales of both the dependent and independent variables change. For example, total institutional ownership doubles over the period under consideration. If institutional investors exhibit constant preferences over time for the level of a firm's share price (i.e., the correlation between share price and the fraction of shares held by institutional investors remains unchanged), the estimated coefficient will double over the period simply from the

[11] About 6.5 percent of the firms in our sample have no reported institutional ownership. Because some observations are censored (i.e., have zero institutional ownership), we also estimated a Tobit model and found the estimated coefficients to be qualitatively equivalent to the model we use. Because the results are qualitatively identical, so few of the sample firms are censored, there is no multivariate Tobit model, and the advantage of the linear nature of our variance decompositions, the analysis reported in the paper uses the multivariate regression model.

doubling of the ownership. In addition, because the magnitude of the estimated coefficient is also a function of the scale of the independent variables, time-series variation in raw coefficient estimates will arise as a result of time-series changes in the magnitudes of the characteristics.

Similarly, differences in the relative size of different institutional investor classes make cross-investor comparison of raw regression coefficients meaningless. Assume, for example, that mutual funds and bank trust departments are equally attracted to "share price." If total bank trust department holdings are twice the size of total mutual fund holdings (e.g., if mutual funds hold 10 percent of a given stock, bank trust departments hold 20 percent), the coefficient estimated from the regression of bank trust department ownership on share price will be twice the size of the coefficient estimated from the regression of mutual fund ownership on share price. It would be incorrect, however, to infer that bank trust departments are more strongly attracted to share price than are mutual funds. The larger regression coefficient is merely an artifact of the greater bank trust department holdings in the sample – the correlation between bank holdings and share price is identical to the correlation between mutual fund holdings and share price.

To overcome these issues, we standardize both the independent and dependent variables, each quarter, such that all variables have the same mean (zero) and standard deviation (one). The interpretation of a coefficient estimated using the standardized data (standardized regression coefficient) is the expected standard deviation change in the dependent variable given a one standard deviation change in the independent variable.

Specifically, the standardized value of characteristic *j* for firm *i* is given as: $(x_{i,j} - \bar{x}_j)/s_j$ where $\bar{x}_j$ is the cross-sectional average of characteristic *j* and s_j is the cross-sectional standard deviation of characteristic *j*. Then the regression of *y* on *j* independent (non-standardized) variables estimated as:

$$\hat{y}_i = b_0 + b_1 x_{i1} + b_2 x_{i2} + \ldots + b_j x_{ij} \quad (1)$$

can be re-written as:

$$\left(\frac{\hat{y}_i - \bar{y}}{s_y}\right) = \frac{b_1 s_1}{s_y}\left(\frac{x_{i1} - \bar{x}_1}{s_1}\right) + \frac{b_2 s_2}{s_y}\left(\frac{x_{i2} - \bar{x}_2}{s_2}\right) + \ldots + \frac{b_j s_j}{s_y}\left(\frac{x_{ij} - \bar{x}_j}{s_j}\right) \quad (2)$$

The coefficient $b_j s_j / s_y$ is the standardized regression coefficient for characteristic j, henceforth denoted β_j.[12] Because the standardized regression coefficient is scale-free, we can directly compare coefficients across time, across different types of institutional investors, and across characteristics. In addition, because standardization is simply a linear re-scaling of the original variables, the correlation coefficients between the variables, the *t*-statistics of the standardized coefficients, and the R^2's of the standardized regressions are identical to their values calculated using raw data.

2.2 The dynamic nature of aggregate preferences

We estimate, each quarter, a cross-sectional standardized regression of aggregate institutional ownership on the nine share characteristics. These 60 cross-sectional regressions have relatively high explanatory power, with an average R^2 of 51.13 percent. The first row in each cell in Table 3 (panel A) reports the average coefficient from these 60 cross-sectional regressions. The second row in each cell reports, in parentheses, the fraction of the estimated coefficients that are positive followed by the fraction of the positive coefficients that differ significantly from zero at the 5 percent level or better. Similarly, the third row reports the fraction of estimated coefficients that are negative followed by the fraction of negative coefficients that differ significantly from zero at the 5 percent level or better. For example, aggregate institutional ownership is positively related to beta in 73 percent of the regressions. When the coefficient is positive, it differs significantly from zero (at the 5 percent level or better) in 84 percent of the cases. The coefficient is negative in 27 percent of the cases. When the coefficient is negative, it differs significantly from zero (at the 5 percent level or better) in 56 percent of the cases. The mean standardized coefficient suggests, on average, a firm with a one standard deviation greater beta would have a 3.69 percent standard deviation greater institutional ownership.

[Insert Table 3 about here]

The results in panel A show that when examining the relations over the whole sample period, aggregate institutional ownership is positively related to the three risk measures.[13] The magnitude of the relation is low, however, and the positive relation is certainly not universal. Between 22 and 30 percent of the quarterly regressions show negative coefficients, some of which are significant. Unlike the somewhat mixed results for the risk measures, the relation of the remaining measures to institutional ownership are unambiguous in their signs and significance. The coefficients and t-statistics associated with firm size, age and dividend yield suggest that institutional investor preferences are affected by their constraints and the strong positive relations between institutional ownership and share price or turnover indicate that liquidity is an important factor in institutional investment decisions. Finally there is a negative relation between institutional ownership and lag return.[14,15]

Because the variables are standardized, we can directly compare the coefficients associated with each characteristic. Doing so, it is clear that firm size and share price are the largest attractions for institutional investors. That is, the average coefficients associated with share price and size are more than double the absolute value of any of the other coefficients. Equivalently, a change in share price or size is

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[12] Because all variables in equation (3) are mean zero, the intercept in equation (3) is always zero.

[13] To account for non-linearities, Falkenstein (1996) uses both return standard deviation and return variance in a regression of mutual fund ownership on share characteristics. We find, however, that accounting for the non-linearity by using the natural logarithm of return standard deviation results in a higher raw- and adjusted-R^2 than using both standard deviation and variance.

[14] Falkenstein (1996) and Gompers and Metrick (2001) interpret the negative relation between the level of institutional ownership and lag return (controlling for other factors) as evidence that institutional investors are not positive feedback traders. However, a negative coefficient associated with lag return does not necessarily suggest negative feedback trading by institutional investors, given positive coefficients associated with size and price. In unreported results, a regression of *changes* in institutional ownership on the nine characteristics reveals a positive relation between lag return and changes in institutional ownership. Together the results suggest that institutional investors in aggregate are momentum investors – moving toward (away from) securities that have recently increased (decreased) in value. Although they move toward larger stocks, the move is not so greater that the *level* of institutional ownership following large returns is greater than expected given capitalization and share price. Thus, in a regression of the *level* of institutional ownership on lag return (and the other characteristics), a negative coefficient only suggests that firms that recently became large (small) have lower (larger) levels of institutional ownership than firms that have been large (small) for some time. Although the analysis reveals institutional investors are positive feedback traders (i.e., they tend to buy stocks that have recently increased in value), the results do not necessarily suggest institutional positive feedback trading is motivated by institutional investors' attraction to securities with high lag returns. Rather, institutional investors may momentum trade because they prefer larger or higher priced stocks.

[15] The signs on the coefficients are consistent with earlier work (Falkenstein, 1996; Gompers and Metrick, 2001).

associated with at least twice the change in institutional ownership as that due to an equivalent change in any of the other characteristics.

To examine whether these preferences have changed over time, in panel B we partition the analysis into two equal, seven and a half year periods (March 1983 through June 1990 and September 1990 through December 1997). The last row in panel B reports the results of a Wilcoxon rank-sum test of the null hypothesis that the aggregate institutional preferences (i.e., estimated standardized coefficients) are identical across the two periods. The results indicate that we can reject the null hypothesis for five of the nine characteristics because of statistically significant (at the 1 percent level) shifts in aggregate institutional preferences.[16] Moreover, the results support the hypothesis that institutional investors have become more willing to hold less conservative securities. Specifically, institutions move from a slight preference for securities with higher total risk (standard deviation) in the early period, to a much stronger preference for return volatility in the latter period. Not only has there been a large shift in the magnitude of the coefficient on total risk, but there has also been a large change in the signs of the quarterly regressions and the significance levels. In the early part of the sample period, 57 percent of the quarterly regressions show a positive coefficient on standard deviation, with 29% of them significant. In sharp contrast, during the second half of the sample period, 100% of the coefficients are positive and all of them are significantly different from zero. In addition, institutional investors exhibit a significantly weaker preference for large capitalization securities in the latter period. Institutions also exhibit an increasing aversion to dividend yield.

This shift in preferences toward smaller, more risky firms is not indiscriminate. At the same time they increased their preferences for smaller firms, institutional investors significantly increased their preferences for holding more liquid securities. This can be seen from an examination of the coefficients associated with our liquidity measures (price and turnover). Institutions increased their preferences for high-priced stocks, while decreasing their attraction to turnover. Because the coefficients are

[16] These shifts are due to changes in magnitude. With the exception of the risk measures, we find that the signs of the coefficients tend to be relatively stable.

standardized, we can evaluate the net effect of these changes. Institutional investors' increased preference for high-priced stocks is much greater than their decreased preference for turnover. Thus, the results suggest that, overall, institutional investors exhibit a stronger liquidity preference in the latter period. That is, controlling for size, risk, and other characteristics, institutions have shifted their preferences toward more liquid securities.[17]

2.3 Heterogeneity in preferences across institutions

One possible interpretation of the results in Table 3 is that aggregate institutional preferences have shifted toward less conservative securities because more conservative types of institutional investors (e.g., banks) have become relatively less important over time while less conservative types (e.g., mutual funds) have become more important. We examine this possibility in a two-step process. First, we examine whether there is significant heterogeneity in preferences across different types of institutional investors.[18] Second, we examine whether the changes in relative dominance of the different types of institutions can explain the changes in preferences that we have documented for institutions in aggregate.

Because aggregate institutional ownership is a linear combination of ownership by each type of institutional investor, we can express the standardized coefficients from a cross-sectional regression of aggregate institutional ownership on the share characteristics as the sum of the products of: (1) the relative impact of each type of institutional investor, and (2) the standardized coefficients from the cross-sectional regressions of each class of institutional investor on the share characteristics. Specifically, the coefficient associated with characteristic *j* from the regression of aggregate institutional ownership on the nine share characteristics can be written as:

$$\beta_{total,j} = \frac{s_{indep}}{s_{total}}\beta_{indep,j} + \frac{s_{banks}}{s_{total}}\beta_{banks,j} + \frac{s_{mf}}{s_{total}}\beta_{mf,j} + \frac{s_{ins}}{s_{total}}\beta_{ins,j} + \frac{s_{unclassified}}{s_{total}}\beta_{unclassified,j} \quad (3)$$

[17] The increased concern for liquidity costs should not be surprising given the observed increased preference for smaller, riskier stocks.

[18] If institutional preferences were homogenous, changes in the relative importance of different classes would not affect aggregate preferences.

where $\beta_{total,j}$ is the standardized regression coefficient associated with characteristic j and aggregate institutional ownership, $\beta_{banks,j}$ is the standardized regression coefficient associated with characteristic j from the regression of bank trust department ownership on the nine share characteristics, s_{banks} is the cross-sectional standard deviation of bank trust department ownership, and s_{total} is the cross-sectional standard deviation of aggregate institutional ownership.[19] The other variables are likewise defined for each of the other institutional classifications.

Equation (3) demonstrates that aggregate preferences are a function of each type of institutional investor's preferences (e.g., $\beta_{banks,j}$) and the impact of that type of investor's preferences on aggregate preferences (e.g., s_{banks}/s_{total}). The "preference impact" of a specific type of investor is the ratio of the cross-sectional standard deviation of ownership by that type of investor to the cross-sectional standard deviation of aggregate institutional ownership.

In general, an increase in ownership by a class of institutional investor will increase the preference impact of that investor class.[20] For example, a doubling of mutual fund ownership by doubling their current portfolio would result in a doubling of their standard deviation (s_{mf}) but not change their standardized coefficient (β_{mf}).[21] Such a change would impact aggregate preferences, however, because mutual fund preferences would account for a larger portion of aggregate preferences.

Because we are using the same set of independent variables, and ownership by different types of institutional investors is positively cross-correlated, the residuals from a regression of ownership by one

[19] To derive this equation, note that because covariances are linear in the arguments and total institutional ownership is the sum of the ownership by each type of investor, the sum of coefficients based on raw (non-standardized) data for each investor type equals the coefficient based on aggregate institutional ownership (i.e., $b_{total}=b_{banks}$ + ... + b_{other}). In addition, the raw coefficient can be written as a function of the standardized coefficient (e.g., $b_{total}=\beta_{total}*s_{total}/s_j$, $b_{banks}=\beta_{banks}*s_{banks}/s_j$). Substituting the later into the former and rearranging terms yields equation (4).

[20] A special case where this would not occur would arise if an investor type added to its fractional ownership of every firm by some constant. This addition of a constant would not change the cross-sectional standard deviation of that type's (or aggregate) ownership.

[21] A doubling of mutual fund ownership would cause the cross-sectional standard deviation of mutual fund ownership to double. Mutual funds' preference impact (s_{mf}/s_{total}) would not double because a doubling of mutual fund ownership would also increase the cross-sectional standard deviation of total institutional ownership. Because, however, changes in ownership are less than perfectly positively correlated across institutional investor classes, the change in the cross-sectional standard deviation of total institutional ownership would be smaller than the change in

type of institutional investor on firm characteristics are likely to be correlated with the residuals from a regression of ownership by a second type of institutional investor on the same characteristics. Therefore we estimate a multivariate regression (i.e., multiple *dependent* variables) that allows us to compute a test statistic of the hypothesis that the levels of ownership by different types of institutional investors are similarly related to a specific characteristic accounting for this residual correlation. Specifically, we compute an *F*-statistic from a likelihood ratio test (Wilk's Lambda) that accounts for this residual correlation.[22] Note that for a given class of institutional investor, the estimated coefficients and *t*-statistics garnered from the multivariate regressions are identical to those estimated from univariate (i.e., single *dependent* variable) regressions. As a test for homogeneous preferences, our null hypothesis is that the standardized regression coefficient associated with a characteristic is the same across the different types of institutional investors.

We estimate, each quarter, multivariate cross-sectional standardized regressions of ownership by each class of institutional investor on the nine share characteristics. As before, the first row in each cell in Table 4 reports the average coefficient from the 60 cross-sectional regressions. The second row in each cell reports, in parentheses, the fraction of the estimated coefficients that are positive followed by the fraction of positive coefficients that differ significantly from zero at the 5 percent level or better. Similarly, the third row reports the fraction of estimated coefficients that are negative followed by the fraction of negative coefficients that differ significantly from zero at the 5 percent level or better. The last column reports the average *F*-statistic associated with the hypothesis that independent investment advisors, bank trust departments, mutual funds, insurance companies, and unclassified institutional investors exhibit homogeneous preferences for that characteristic, i.e., the estimated standardized coefficients are the same for each type of institutional investor. The second line in the last column reports (in parentheses) the fraction of the *F*-statistics that have a *p*-value less than 5 percent.

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the cross-sectional standard deviation in mutual fund ownership, yielding an increase in mutual funds' "preference impact."

[22] See Jobson (1992) for a complete discussion of the multivariate regression model and the *F*-statistic computed from the likelihood ratio test.

[Insert Table 4 about here]

According to the results in the first five columns of Table 4, although different types of institutional investors tend to be attracted to the same characteristics (i.e., the signs tend to be the same), there is substantial heterogeneity in their preferences (i.e., magnitudes differ). For example, on average, a one standard deviation greater share price is associated with a 3 percent standard deviation greater holding by insurance companies, but a 33 percent standard deviation greater holding by independent investment advisors. For every characteristic considered, in at least 65 percent of the 60 quarterly cross-sectional regressions we reject (at the 5 percent level) the hypothesis that different types of institutional investors exhibit homogeneous preferences. In the case of capitalization, dividend yield, share price, and turnover, we reject the hypothesis of equal preferences in at least 97 percent of the regressions.[23]

Independent advisors and mutual funds appear to be the least conservative type of institutional investor - exhibiting the highest average preferences for return standard deviation and beta, and the weakest preferences for capitalization. As shown in Figure 1, these two investor types also account for essentially all of the growth in aggregate institutional ownership over our sample period.

Consistent with Del Guercio (1996), bank trust departments generally exhibit the strongest preferences for conservative securities. Specifically, banks have negative coefficients associated with both beta and standard deviation, on average. In addition, banks exhibit the greatest preference for age and have among the strongest preference for size.

[23] The results in Table 4 largely reject the hypothesis that different classes of institutional investors exhibit homogeneous preferences for security characteristics. It is less clear, however, from where this power to reject originates. That is, the results may be driven by one type of institutional investor who is different from the other types. To examine this issue, we estimate an *F*-statistic from the likelihood ratio test (Wilk's Lambda) for each of the ten possible pairs of coefficients associated with each characteristic, e.g., we test that the coefficient associated with share price is the same for bank trust departments and mutual funds, the same for bank trust departments and insurance companies, etc. This results in a total of 90 *F*-statistics each quarter (nine characteristics times 10 possible pairs). Although to conserve space we do not report each of these statistics, the results reveal that a single type of institutional investor does not drive the *F*-statistics shown in Table 4 – differences span across each type.

2.4 Tests for changes in the impact and preferences of each class

The second step in the process is to determine whether the different institutional types' heterogeneous preferences coupled with the changes in their relative importance can account for the shift in aggregate preferences toward less conservative securities. Thus, as shown in equation (3), since aggregate preferences are a linear function of the product of the two factors (the preference impact of each class and the preferences of each class), we examine whether the changes in the preference impact can explain the changes in aggregate preferences.

To formally examine this hypothesis, each quarter we compute the preference impact of each class (k=1 to 5) of institutional investor (i.e., the ratio of the cross-sectional standard deviation of ownership by that investor class to the cross-sectional standard deviation of aggregate institutional ownership, s_k/s_{total}). We then partition these quarterly estimates into the two equal periods as before (March 1983 through June 1990 and September 1990 through December 1997). The first column in Table 5 reports the mean preference impact for each institutional investor class over each sample period. The table also reports the results of a Wilcoxon rank-sum test of the null hypothesis that preference impacts in the first period are identical to preference impacts in the second period.

[Insert Table 5 about here]

Consistent with the implications of Figure 1, the results in the first column of Table 5 show that all five classes of institutional investors experience statistically significant shifts in importance over the two sub-periods. The relative importance of bank trust departments, insurance companies, and unclassified institutional investors declines over time, whereas the impact of mutual funds and independent investment advisors increases over time.

The evidence in the first column of Table 5 is consistent with the explanation that changes in aggregate institutional preferences are due to a decline in the relative impact of more conservative investors and a corresponding increase in the role of less conservative investors. This does not rule out, however, the competing explanation that shifts in aggregate preferences might be due to shifts in preferences of the various types of institutional investors independent of any changes in their relative

importance. The remaining columns in Table 5 report the time-series mean standardized coefficient for each characteristic over each sample sub-period by institutional classification. As before, the results of a non-parametric Wilcoxon rank-sum test of the null hypothesis that coefficient estimates in the first period equal the coefficient estimates in the second period is reported in the third line of each panel.

The results clearly support the hypothesis that shifts in aggregate preferences are at least partially due to shifts in the preferences of each investor class. Specifically, in the latter period, all institutional investors exhibit stronger preferences for return standard deviation (the *z*-statistics are statistically significant at the 1 percent level for each class), and all investors other than independent investment advisors significantly increased their preference for firm-specific risk. Similarly, three of the five classes of institutions (including banks) exhibit a weaker preference for capitalization in the latter period. Four of the five classes exhibit an avoidance of high dividend yield securities in the second period. Overall, the results suggest that most investor classes have moved toward smaller, riskier stocks in the latter period.

We also find uniformly stronger preferences for share price in the latter period. Specifically, each class of institutional investor exhibits a much stronger preference for share price in the latter period (the *z*-statistics are statistically significant at the 1 percent level for each class). Alternatively, most institutional investors appear less attracted to turnover in the latter period.

Table 5 shows that both changes in the preference impact of each class of institutional investor and changes in each class's preferences help explain the changes in aggregate institutional preferences. To determine how much of the aggregate changes are due to changing impacts or changing institutional preferences in the next section we provide a decomposition of the times-series variance in aggregate preferences.

3. The Role of Changing Preferences and Changing Preference Impacts

We first directly estimate the contribution that each class of institutional investor makes to changes in aggregate preferences. We then decompose each contribution into the portion due to changes in preference impacts and the portion due to changes in preferences.

3.1 The impact of each class of institutional investor

The time-series variance in aggregate preferences (equation (4)) can be written as:

$$\sigma^2(\beta_{total}) = \sum_{k=1}^{5} \sigma^2\left(\frac{s_k}{s_{total}}\beta_k\right) + \sum_{k=1}^{5}\sum_{m=1,m\neq k}^{5} cov\left(\frac{s_k}{s_{total}}\beta_k, \frac{s_m}{s_{total}}\beta_m\right) \quad (4)$$

This equation demonstrates that the contribution each class of institutional investor makes to time-series variation in aggregate preferences can be measured as the sum of the time-series variance in the product of the preference impacts and preferences of each type and the time-series covariance of the product across different classes of institutional investors.[24] Therefore, we can directly measure the percentage contribution each class of institutional investor makes to time-series variation in aggregate preferences by restricting the right-hand side of equation (4) to a single class of institutional investor and dividing by the time-series variance in aggregate preferences (i.e., the left-hand side of equation (4)):

$$\%\ of\ \sigma^2(\beta_{total})\ due\ to\ class\ k = \frac{\sigma^2\left(\frac{s_k}{s_{total}}\beta_k\right) + \sum_{m=1}^{4} cov\left(\frac{s_k}{s_{total}}\beta_k, \frac{s_m}{s_{total}}\beta_m\right)}{\sigma^2(\beta_{total})} \quad (5)$$

The first row in each panel of Table 6 reports the contribution made by that type of institutional investor to the time-series variation in aggregate preferences for each characteristic, i.e., equation (5). Because aggregate institutional ownership is a linear function of ownership by each class of institutional investor, the sum of the percent of time-series variance in aggregate preferences attributed to each class (i.e., the sum across the first rows of panels A through E in each column) is one.

[Insert Table 6 about here]

The last column in the first row of Table 6 shows that the average relative contribution of the different types of institutional investors shown in Table 6 corresponds to the relative fractional ownerships reported in Table 1. Although the relative contributions for each characteristic tend to stay in the same general hierarchy, there is some variation across the characteristics.

3.2 The importance of changing preference impacts and changing preferences

In this section, we examine the relative importance of the changes in the preference impacts versus changes in preferences in explaining the overall changes in aggregate preferences. Specifically, for each characteristic and investor class, we estimate the components of equation (3), e.g., changes in s_{banks}/s_{total} versus changes in β_{banks}. Since the contribution made by a specific investor class to aggregate preferences is the product of their own preference impact and their own preferences (e.g., $(s_{banks}/s_{total})*\beta_{banks}$), the time-series variance in aggregate preferences is not a linear function of their preference impacts and preferences. Thus, following the methodology of Ferson and Harvey (1991) we estimate the relative importance of each by assuming the other is a constant. Specifically, for a given characteristic, we estimate the fraction of time-series variance in aggregate preferences attributed to changes in the preference impact of institutional investor type k by:

$$\%\ of\ \sigma^2(\beta_{total})\ due\ to\ \Delta impact_k = \frac{E(\beta_k)\sigma^2\left(\frac{s_k}{s_{total}}\right) + E(\beta_k)\sum_{m=1}^{4} E(\beta_m)cov\left(\frac{s_k}{s_{total}}, \frac{s_m}{s_{total}}\right)}{\sigma^2(\beta_{total})} \quad (6)$$

where $\sigma^2(\beta_{total})$ is the time-series variance in the aggregate preference for a given characteristic, $E(\beta_k)$ is the time-series mean preference for institutional investor class k, and $E(\beta_m)$ is the time-series mean preference for institutional investor class m (m=1 to 4). The time-series variance in institutional investor class k's preference impact is given by $\sigma^2(s_k/s_{total})$. Similarly, the time-series covariances of preference impacts between institutional investor class k and the other four institutional investor types are given by the last term in the numerator.

Analogously, for a given characteristic, the importance of changing preferences by each class of institutional investor is estimated by holding preference impacts constant:

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[24] To differentiate time-series and cross-sectional standard deviation, we denote cross-sectional standard deviation as "s" and time-series standard deviation as "σ."

$$\%\ of\ \sigma^2(\beta_{total})\ due\ to\ \Delta pref._k = \frac{E\left(\frac{s_k}{s_{total}}\right)\sigma^2(\beta_k) + E\left(\frac{s_k}{s_{total}}\right)\sum_{m=1}^{4} E\left(\frac{s_m}{s_{total}}\right) cov(\beta_k, \beta_m)}{\sigma^2(\beta_{total})} \quad (7)$$

where $E(s_k/s_{total})$ is the time-series mean preference impact for institutional investor class k, and $E(s_m/s_{total})$ is the time-series mean preference impact for the other four institutional classes (m=1 to 4). The time-series variance in institutional investor class k's preference is given by $\sigma^2(\beta_k)$. Similarly, the time-series covariances of preferences for a given characteristic between institutional investor class k and the other four institutional investor types are given by the last term in the numerator.

The balance of the time-series variation in the aggregate preference for a given characteristic due to investor class k results from the interaction of preferences and preference impacts and is estimated as the difference between the time-series variance in the aggregate preference attributed to investor class k (i.e., equation (5)) and sum of the portions due to changing preference impacts and changing preferences (i.e., equations (6) and (7)).

The estimates resulting from equations (6) and (7) and the interaction effects for each class of institutional investor are reported in the second, third, and fourth row, respectively, of panels A through E in Table 6. In addition, the relative importance of preferences (preference impacts) in the aggregate are found in panel F, and are determined by summing the figures in the second (third) rows of panels A through E. The results yield a striking pattern – changes in preferences have a much greater effect on aggregate preferences than changes in preference impacts. The last column in panel F shows that, on average, changing preference impacts account for only 4 percent of the time-series variation in aggregate preferences, while changing preferences by each class of institutional investor account for 93 percent.[25] Moreover, the last column in panels A through E reveal that, on average, the relative importance of changing preferences far outweighs that of changing preference impacts for every institutional classification. In sum, the results in Table 6 reveal that changing institutional preferences, and not

[25] Although the time-series variance and covariance of changing preference impacts is the same for each characteristic (e.g., $\sigma^2(s_k/s_{total})$ in equation (6) is the same for each characteristic), the importance of changing

changes in the relative importance of different classes of institutional investors, are primarily responsible for changes in aggregate institutional preferences.

4. The Impact on Turnover and Volatility

4.1 Dynamic preferences and small stock liquidity

The strong growth in institutional ownership of equities shown in Figure 1 and by Gompers and Metrick (2001) coupled with the Schwartz and Shapiro (1992) evidence that institutional investors account for 50 percent of security ownership, but 70 percent of trading volume suggests that trading volume should have increased commiserate with the strong increase in institutional ownership. In fact, Chordia, Roll, and Subrahmanyam (2001) document such growth. In this section we test whether the growth in institutional ownership leads to growth in a firm's trading volume. Moreover, given the shift in institutional preferences toward smaller firms, we posit that smaller stocks should experience the greatest growth in share turnover. That is, we test the two hypotheses that growth in institutional ownership provides markets in general, and small stocks in particular, with more liquidity.

We begin by testing the first hypothesis: whether institutional investors are responsible for the growth in share turnover in general. To test this hypothesis, we examine whether levels of, and changes in, institutional ownership help explain cross-sectional variation in subsequent turnover after accounting for security characteristics. Specifically, we adapt the methodology used in Gompers and Metrick (2001) and regress next quarter's turnover on this quarter's values of our nine security characteristics, the level of institutional ownership measured at the beginning of this quarter and the change in institutional ownership over this quarter. We estimate this regression for each quarter.[26] As before, to allow comparison across coefficients, the dependent and independent variables are standardized each quarter:

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preference impacts differs across the characteristics because the mean preference vectors (e.g., $E(\beta_k)$) differ across characteristics.

[26] Because we require beginning and end of quarter institutional ownership to compute the change in institutional ownership, we estimate 59 (rather than 60) cross-sectional regressions.

$$Turnover_{i,t+1} = \sum_{j=1}^{9} \beta_{j,t} X_{i,j,t} + \beta_{10,t} \%Total_{i,t-1} + \beta_{11,t} \Delta\%Total_{i,t} + \varepsilon_{i,t} \quad (8)$$

where for firm I, $Turnover_{i,t+1}$ is the share turnover in the subsequent quarter (t+1), $\%Total_{i,t-1}$ is the standardized fraction of shares held by institutional investors at the end of quarter t-1 (or, equivalently, beginning of quarter t), $\Delta\%Total_{i,t}$ is the standardized change in the fraction of shares held by institutional investors over quarter t, and $X_{i,j,t}$ is the standardized value of characteristic j at the end of quarter t. Recall that one of these characteristics is the turnover in quarter t. Thus, the regression examines whether cross-sectional variation in the level of, or changes in, institutional ownership explains cross-sectional variation in subsequent turnover, controlling for the firm's existing turnover and the other eight security characteristics. If institutional investors contribute to the observed increase in turnover, then both the levels of and changes in institutional ownership should be positively related to subsequent turnover. The time-series average coefficients from the 59 cross-sectional regressions and associated t-statistics (computed from time-series standard errors) are reported in the first column of Panel A in Table 7.

[Insert Table 7 about here]

Consistent with the hypothesis that institutional investors are responsible for the growth in market volume, we find that both the level of institutional ownership and changes in institutional ownership forecast higher turnover. That is, controlling for current turnover and the eight other security characteristics, firms with higher levels of, or increases in, institutional ownership, average higher subsequent turnover.

If institutional investors are responsible for the increase in turnover across all stocks, then the shift in institutional preferences toward smaller firms suggests that these firms should experience disproportionate turnover growth. To test this hypothesis, we compute the cross-sectional average turnover for (1) all firms, (2) small firms (bottom third equity capitalization), and (3) large firms (top third equity capitalization), each quarter.[27] The time-series average of these quarterly cross-sectional averages

[27] Capitalization rankings are updated quarterly, based on beginning of quarter capitalization. Following Wermers (1999), we use NYSE capitalization breakpoints.

are reported for the early (January 1983-June 1990) and late (July 1990-December 1997) periods in the first three rows of Panel B in Table 7. In addition, the last row in Panel B reports the time-series average ratio of small firm turnover to large firm turnover. Finally we compute a *z*-statistic from a Wilcoxon rank sum test of the null hypothesis that the values in the early period do not differ from the values in the late period. These statistics are reported in the last column of Panel B.

Consistent with Chordia, Roll, and Subrahmanyam (2001), we document a significant increase in average turnover for all firms. In addition, our results demonstrate that both small and large stocks have experienced the increase in turnover. Moreover, consistent with the hypothesis that the shift in institutional preferences has resulted in small stocks experiencing the greatest liquidity growth, the ratio of average small firm turnover to average large firm turnover increases over time (statistically significant at the 1 percent level).

4.2 Dynamic preferences and small stock firm-specific risk

Campbell, Lettau, Malkiel, and Xu (2001) document an increase in firm-specific risk over the past few decades and suggest the increased institutionalization of markets as a possible explanation. There are several reasons why institutional investors may be responsible for increases in firm-specific risk. First, institutional investors tend to have larger trades than individual investors, which can lead to greater price changes. Second, Roll (1988) and Durnev, Morck, Yeung, and Zarowin (2001) note that greater levels of informed trading will cause greater firm-specific volatility. If institutional investors are more likely to be informed than other investors (see sections 5.1 and 5.2), an increase in institutional ownership will likely increase firm-specific volatility. Third, as noted by Malkiel and Xu (2001), institutional investors may also be more likely to trade in the same direction (i.e., herd), thereby inducing greater volatilities among favored firms. Thus, we hypothesize that the growth in firm-specific risk results, at least in part, from the growth in institutional ownership. Moreover, as a result of the shift in institutional preferences, we hypothesize that growth in firm-specific risk will be greater in smaller capitalization securities.

To test whether the increase in firm-specific risk is related to the increased institutionalization in recent years, we repeat the regression analysis in the previous section using firm-specific risk as the dependent variable (rather than turnover). Specifically, we estimate quarterly standardized regressions of next quarter's standardized firm-specific risk on this quarter's standardized values of the nine security characteristics, the standardized level of institutional ownership measured at the beginning of this quarter, and the standardized change in the fraction of shares held by institutional investors over this quarter:

$$Firm\text{-}specific\ risk_{i,t+1} = \sum_{j=1}^{9} \beta_{j,t} X_{i,j,t} + \beta_{10,t} \%Total_{i,t-1} + \beta_{11,t} \Delta\%Total_{i,t} + \varepsilon_{i,t} \quad (9)$$

The second column of Panel A in Table 7 reports the time-series average of the 59 cross-sectional regressions and associated *t*-statistics (computed from time-series standard errors). Consistent with the hypothesis that institutional investors are at least partially responsible for increases in firm-specific risk, we document that both levels of, and changes in, institutional ownership are positively related to subsequent firm-specific risk even after controlling for current levels of firm-specific risk, and the eight other security characteristics.

If institutional investors are responsible for the increase in firm-specific risk, then the shift in institutional preferences suggests smaller firms should have experienced the greatest growth in firm-specific risk. We test this hypothesis by comparing the firm-specific risk for all firms, small firms, and large firms, as well as the ratio of the cross-sectional average firm-specific risk for small firms to the cross-sectional average firm-specific risk for large firms in the early and late periods. The first row of Panel C in Table 7 reports the time-series average of the quarterly cross-sectional averages of firm-specific risk for the early (January 1983-June 1990) and late (July 1990-December 1997) periods for all firms. The last column reports a *z*-statistic from a Wilcoxon rank sum test of the null hypothesis that the value in the early period does not differ from the values in the later period. Consistent with Campbell, Lettau, Malkiel, and Xu (2001), we document a significant increase in the average firm-specific risk for all firms between the early and late periods.

The second and third rows of Panel C provide the test of the hypothesis that small firms should have experienced a greater increase in firm-specific risk by separating the times-series averages into those for large and small firms. The last row in Panel C reports the time-series average ratio of average small firm firm-specific risk to average large firm firm-specific risk for the early and late periods. The results show that the increases in firm-specific risk found for the sample, on average, occur for both small and large firms. Moreover, consistent with the hypothesis that the shift in institutional preferences has caused small stocks to become relatively more volatile, the ratio of average firm-specific risk at small firms to average firm-specific risk at large firms has increased over time (statistically significant at the 1 percent level).

5. Why the Shift in Institutional Preferences?

As noted in the introduction, institutional investors may have decreased their preference for large stocks for several reasons. First, Gompers and Metrick (2001) argue that the disappearance of the small firm effect in recent years results from demand shocks associated with the strong growth in institutional ownership and institutional investors' historical preference for large capitalization securities. Thus, institutional investors may have become more willing to hold smaller capitalization securities because their own demand shocks have driven large capitalization securities' valuations "too high." Alternatively, institutional investors may have shifted toward small stocks because such stocks provide the greatest opportunities for these investors to exploit their informational advantages. Specifically, we hypothesize that the increased institutionalization of the market has resulted in increased competition among institutional investors in the market for liquid, conservative, large-capitalization securities. Back, Cao, and Willard (2000) show that competition among informed traders will decrease expected profits to each informed trader.[28] That is, the increased institutionalization of large capitalization stocks has likely

[28] Recent research suggests institutional investors are better informed than other investors. See Grinblatt and Titman (1989, 1993), Daniel, Grinblatt, Titman, and Wermers (1997), Wermers (1999, 2000), Nofsinger and Sias (1999), Chakravarty (2000), and Sias, Starks, and Titman (2001). Specifically, these studies reveal that the securities institutional investors purchase outperform those they sell. Alternatively, many earlier studies (e.g., Gruber, 1996)

resulted in fewer opportunities for institutional investors to exploit their informational advantages by trading large, safe stocks. Alternatively, smaller stocks, where institutions play a less dominant role, should provide institutional investors with greater opportunities to exploit informational advantages. Both explanations are, essentially, "greener pastures" stories, i.e., if, ceteris paribus, institutional investors would prefer to hold larger, safer securities, small stocks must offer a more attractive tradeoff between risk and expected return in order to induce institutions to shift their preferences.

5.1 Large stock valuations

To examine whether institutional demand shocks documented by Gompers and Metrick (2001) have driven the value of large stocks too high (thus inducing the observed shift in preferences), we examine measures of their valuations relative to small stocks. We evaluate changes in each group's book-to-market ratios. For each quarter we compute the book-to-market ratio for all firms with adequate data.[29] To control for outliers, we use the natural logarithm of (1+book value/market value) as our book-to-market measure. We then partition the firms into three capitalization portfolios based on beginning of quarter capitalization and compute the cross-sectional average of the book-to-market measures for these groups as well as for the sample as a whole. For all firms, small firms (bottom third capitalization firms) and large firms (top third capitalization firms), Panel A in Table 8 reports the time-series average of these cross-sectional averages for the early period (March 1983-June 1990) and the late period (September 1990-December 1997). In addition, we compute the quarterly ratio of the average small firm book-to-market measure to average large firm book-to-market measure. The final row reports the time-series average of this ratio for each sample. The last column reports Wilcoxon rank sum *z*-statistics associated with the null hypothesis that the values in the early period do not differ from the values in the later period.

[Insert Table 8 about here]

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find that mutual funds fail to outperform market averages. Wermers (2000) resolves these seemingly inconsistent results by attributing differences to transaction costs and the performance of non-stock holdings.

[29] To be included firms must have Compustat book value data as well as CRSP return and capitalization data. Firms reporting negative book value are excluded from the analysis.

The results reveal little evidence of changes over time in the average book-to-market measure for firms on average. Focusing on large firms provides a different result. Consistent with the hypothesis that the combination of institutional investors' preference for large capitalization securities and demand shocks associated with the growth in institutional ownership have impacted large stock valuations, we document a statistically significant (at the 1 percent level) decline in the average large firm book-to-market measure. In contrast, we find no evidence of an increase in small stock valuations according to the book-to-market measure. In sum, the results in Panel A are consistent with the hypothesis that institutional investors increased their preferences for small stocks as a result of their own large-firm demand shocks driving large stock valuations to relatively unattractive levels.

5.2 Institutional demand shocks and informed trading

Gompers and Metrick (2001) argue that if institutional demand shocks impact security returns, then cross-sectional variation in future returns will be positively related to current institutional ownership levels as a proxy for future institutional demand. Alternatively, if institutional investors can forecast returns, then cross-sectional variation in future returns will be related to changes in institutional ownership as a proxy for the level of informed institutional trading. We employ the methodology of Gompers and Metrick to test for evidence of institutional demand shocks and whether institutional investors are better informed than other investors. Specifically, we estimate quarterly cross-sectional regressions of next quarter's return on the nine security characteristics used in the previous sections (measured at the end of this quarter), the level of institutional ownership measured at the beginning of this quarter, and the change in institutional ownership over this quarter. To allow direct comparison across coefficients, we again standardize the dependent and independent variables. Moreover, to allow direct comparison with the next set of regressions, we include only those firms that are traded by at least five institutions during the quarter:

$$Return_{i,t+1} = \sum_{j=1}^{9} \beta_{j,t} X_{i,j,t} + \beta_{10,t} Total_{i,t-1} + \beta_{11,t} \Delta\%Total_{i,t} + \varepsilon_{i,t} \quad (10)$$

Average coefficients from the 59 cross-sectional regressions and associated *t*-statistics (computed from time-series standard errors) are reported in the first column of Panel B in Table 8. Consistent with Gompers and Metrick (2001), we find a statistically significant (at the 1 percent level) positive relation between the level of institutional ownership and future returns, but little evidence of a substantial relation between future returns and changes in the fraction of shares held by institutional investors.[30]

The results are consistent with the hypothesis that institutional demand shocks affect security returns, but fail to support the hypothesis that institutions are better informed than other investors. The results, however, are inconsistent with Wermers (1999) who finds that future returns are related to the Lakonishok, Shleifer, and Vishny (1992) herding measure (as a proxy for the level of informed institutional trading). We next examine if our test of whether institutional investors are better informed is sensitive to the proxy for informed institutional trading.

We begin by computing the Lakonishok, Shleifer, and Vishny (1992) herding measure each security i in quarter t as:

$$H_{i,t} = \left| B_{i,t}/(B_{i,t} + S_{i,t}) - p_t \right| - AF_{i,t} \tag{11}$$

where $B_{i,t}$ ($S_{i,t}$) is the number of institutional investors increasing (decreasing) their position in security i during quarter t. Thus, $B_{i,t}/(B_{i,t} + S_{i,t})$ is the fraction of institutional investors changing their position in security i over quarter t that are buyers. The cross-sectional average of this fraction each quarter is given as p_t. The adjustment factor for security i in quarter t ($AF_{i,t}$) ensures that the expected value (under the hypothesis of no herding) of the herding measure is zero.[31] The "signed herding measure" (SHM) is then computed as the herding measure signed positive if the term within absolute values is positive (i.e., the fraction of traders that are buyers of firm i in quarter t is greater than the cross-sectional average in quarter t) and signed negative if the term within absolute values is negative (i.e., the fraction of traders that are buyers of firm i in quarter t is less than the cross-sectional average in quarter t). Following

[30] Although we do not report specific results (to conserve space), consistent with Gompers and Metrick (2001), we also find that subsequent returns are related to end-of-quarter levels of institutional ownership (i.e., replacing $\%Total_{i,t-1}$ and $\Delta\%Total_{i,t-1}$ with $\%Total_{i,t}$ in equation (11))

Wermers (1999), we require firms to have at least five institutional traders to be included in the analysis. We then estimate quarterly cross-sectional regressions of next quarter's standardized returns on the nine standardized security characteristics used in the previous sections measured at the end of this quarter, the standardized level of institutional ownership measured at the beginning of this quarter, and the standardized signed herding measure compute over this quarter:

$$Return_{i,t+1} = \sum_{j=1}^{9} \beta_{j,t} X_{i,j,t} + \beta_{10,t} \%Total_{i,t-1} + \beta_{11,t} SHM_{i,t} + \varepsilon_{i,t} \quad (12)$$

Average coefficients from 59 cross-sectional regressions and associated *t*-statistics (computed from time-series standard errors) are reported in the second column of Panel B in Table 8. Consistent with the first regression and the hypothesis that institutional demand shocks impact security returns, we again document a positive relation (statistically significant at the 1 percent level) between institutional ownership levels and future returns. Consistent with the hypothesis that institutional investors have an informational advantage, we also document a positive relation between the signed herding measure and future returns. In sum, the results in Panel B suggest that institutional demand shocks impact returns, *and* that institutional investors have some forecasting ability. Evidence of their ability to forecast returns, however, is sensitive to the informed trading proxy.

5.3 Predicting small and large stock returns

We posit that institutional investors may have shifted their preferences toward smaller capitalization stocks because competition between informed traders is less intense in small stocks, thus providing institutional investors greater opportunities to exploit any informational advantages. To test this hypothesis, small and large securities (as defined previously) are partitioned into two groups: "buy herding securities" (i.e., those that institutional investors bought more than average (i.e., $B_{i,t}/(B_{i,t} + S_{i,t}) > p_t$)) and "sell herding securities" (i.e., those that institutional investors sold more than average (i.e., $B_{i,t}$

[31] $AF_{i,t}$ is computed for each security-quarter by assuming $B_{i,t}$ follows a binomial distribution with probability p_t. See Lakonishok, Shleifer, and Vishny (1992) for a detailed discussion.

$/(B_{i,t} + S_{i,t}) < p_t)$). Within both the small and large firm groups, buy-herding securities are then sorted into five groups by the level of institutional herding, each quarter. Similarly, within each capitalization group, sell herding securities are sorted into five portfolios, each quarter. This process results in a total of ten portfolios each quarter within both the small capitalization group and the large capitalization group.

For each of the 59 quarters, we next compute a capitalization-adjusted return for each security for the two quarters prior to the herding (quarters t=-1 and t=-2), the quarter of the herding (t=0), and the four quarters following the herding (quarters t=1 to 4).[32] We also compute, for each firm, the compound total capitalization-adjusted annual return over the subsequent four quarters (quarters t=1 to 4). Portfolio returns are computed as the equal-weighted average of the member securities' capitalization-adjusted returns. We then compute the difference in returns for the portfolio most heavily purchased by institutional investors (i.e., the top buy-herding quintile) and the portfolio most heavily sold by institutional investors (i.e., the top sell-herding quintile), within each capitalization group. Panel A in Table 9 reports the time-series average of these 59 quarterly observations of the return difference between the top buy-herding portfolio and the top-sell herding portfolio for small and large firms (t-statistics are computed from time-series standard errors).

[Insert Table 9 about here]

The positive values in the two quarters prior to the portfolio formation period reveal that institutional investors are positive feedback traders (i.e., the securities they buy outperform those they sell in the six months prior to their transactions) consistent with Grinblatt, Titman, and Wermers (1995), Wermers (1999, 2000), Nofsinger and Sias (1999), and Sias, Starks, and Titman (2001). In addition, there is a significant positive relation between the institutional herding measure and returns the same quarter. Moreover, consistent with the results in the previous section, the results also suggest that institutional investors have are better informed than other investors. That is, securities institutional

[32] Because the herding measure requires institutional ownership at both the beginning and end of the quarter, 60 quarters of data yield 59 observations.

investors herd to subsequently outperform those they herd away from.[33] However, the results reveal that institutional investors' ability to forecast security returns arises primarily in small capitalization securities. That is, consistent with our hypothesis, small stocks appear to offer the most fertile ground for forecasting returns.[34]

If the increases in institutional ownership increase the competition between informed traders, then we expect that institutions' ability to forecast returns will have decreased over time. To examine this hypothesis, we partition the results in Panel A into the early period (March 1983-June 1990, n=29 quarters) and the late period (September 1990-December 1997, n=30 quarters). Panel B (Panel C) in Table 9 reports the time-series average return difference between small (large) firms' top buy-herding portfolio return and top sell-herding portfolio return for the early and late periods. The third rows in Panels B and C report the results of a Wilcoxon rank sum test of the null hypothesis that the return differences between the top buy-herding portfolio and the top sell-herding portfolio in the early period are identical to those in the late period.

For both small and large firms, the return differences between the top buy-herding portfolio and the top sell-herding portfolio in the year following the herding (quarters +1 to +4) are smaller in the more recent period. Thus, the point estimates are consistent with the hypothesis that the increased institutional presence has led to greater competition between informed traders and a decline in institutions' ability to exploit uninformed investors. Differences between the early and late periods, however, are relatively small and do not differ significantly from zero.

6. Conclusions

While institutional investors still prefer large stocks (i.e., there is a positive coefficient associated with capitalization), institutional investors have become much more willing to hold smaller stocks over the

[33] We also form portfolios based on all firms (i.e., ignoring capitalizations). The securities most heavily purchased by institutional investors outperform the securities most heavily sold by 3.77 percent (t-statistic=5.85) in the year following the herding.
[34] Wermers (1999) finds a similar result for mutual funds.

past decade. This shift is consistent with at least two possible explanations. First, shifts in the relative importance of different classes of institutional investors might have impacted aggregate institutional preferences. Second, shifts in the preferences of each group might be responsible for shifts in aggregate institutional preferences. Consistent with the first hypothesis, we document that markets have witnessed dramatic growth in the typically less conservative independent advisors and mutual funds, accompanied by a substantial decline in the relative importance of traditionally more conservative bank trust departments. Consistent with the second hypothesis, we document that most types of institutional investors have moved toward smaller securities over time. A variance decomposition reveals that changes in the preferences of each class of institutional investor are much more important than changes in the relative importance of each class in explaining the aggregate institutional movement toward smaller securities.

Our results suggest that the growing role of institutional investors and their shifting preferences has impacted financial markets. Specifically, the growth in institutional ownership appears to help explain why markets have become more liquid and why firm-specific risk has increased over time. Moreover, our results suggest that the shift in institutional preferences has led to relative increases in small stocks' liquidity and firm-specific risk vis-à-vis large stocks.

Last, we consider two potential explanations for the institutional migration toward smaller securities. First, we hypothesize that institutional demand shocks combined with institutional investors' historical preference for larger capitalization securities have driven the relative valuations of large stocks higher over time. As a result, institutional investors have moved toward "less expensive" smaller stocks. Consistent with this hypothesis, we find evidence of institutional demand shocks (consistent with Gompers and Metrick (2001)) and that large stocks' book-to-market ratios have declined over time. Second, we hypothesize that increased institutionalization in large capitalization securities and the incentive structure of institutional money management has led some institutions to move toward smaller securities because such securities offer greater opportunities for them to exploit informational advantages. Consistent with our hypothesis, we find evidence that institutional investors are able to forecast returns

and that post-herding returns of smaller securities are larger than post-herding returns of larger securities. The results are consistent with the hypothesis that institutional investors' informational advantages are greatest in smaller capitalization securities. In sum, our results suggest that the shift in preferences results from institutional investors' belief that smaller stocks offer "greener pastures."

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Table 1
Descriptive statistics

	Mean	Median	Minimum	Maximum
		Panel A: Percentage institutional ownership		
% Total	0.2297	0.2183	0.1544	0.3126
% Ind. inv. advisers	0.1151	0.1177	0.0509	0.1594
% Bank trust depts.	0.0518	0.0507	0.0412	0.0620
% Mutual funds	0.0287	0.0170	0.0115	0.0715
% Insurance	0.0185	0.0176	0.0153	0.0231
% Unclassified	0.0156	0.0156	0.0110	0.0205
		Panel B: Share characteristics		
Beta	1.28	1.29	1.03	1.58
Standard deviation	13.82%	13.87%	12.62%	15.05%
Firm-specific risk	4.34%	4.20%	1.67%	10.03%
Size ($000)	687,464	605,147	352,315	1,518,455
Age (# months)	123	121	103	139
Dividend (%/month)	0.16	0.15	0.13	0.25
Price ($)	18.90	18.40	12.70	28.54
Turnover	6.50%	6.24%	3.67%	11.08%
Lag 6-month return	8.35%	8.13%	-25.99%	52.21%
Number of firms	5,425	5,449	4,346	6,784

Each quarter between March 1983 and December 1997 (60 quarters) we estimate the cross-sectional average fraction of shares held by institutional investors (overall and by type) and share characteristics. Beta is estimated as the sum of the coefficients in a regression of the firm's monthly return on the contemporaneous and lag one month CRSP NYAM value-weighted index over the previous 24 to 60 months (depending on availability). Standard deviation is estimated from monthly returns over the previous 24 to 60 months (depending on availability). Firm-specific risk is estimated as the squared difference between daily firm returns and associated industry returns summed each month and averaged over the three months in the current quarter. Firm age is given as the number of months since December 1972 for which the firm has CRSP return data. Dividend yield is measured as the average monthly dividend yield over the previous 12 months. Share price is given as the quarter-end share price. Turnover is defined as the ratio of monthly volume to number of shares outstanding averaged over the three months in the current quarter. Lag return is the cumulative return for the firm over the previous six months. The time-series mean, median, minimum, and maximum of the 60 quarterly cross-sectional means are reported above.

Table 2
Average cross-sectional correlations between institutional ownership and share characteristics

	Beta	Standard deviation	Firm spec. risk	Size	Age	Dividend yield	Price	Turnover	Lag return
Panel A: Correlation between institutional ownership and share characteristics									
% Total	0.0379	-0.2652	-0.2473	0.6538	0.2889	0.0316	0.5975	0.2477	0.0505
% Ind. inv. advisers	0.0851	-0.1568	-0.2092	0.4847	0.1973	-0.0337	0.4753	0.2817	0.0534
% Bank trust depts.	-0.0565	-0.3093	-0.1894	0.5279	0.3008	0.1081	0.4867	0.0622	0.0308
% Mutual funds	0.0410	-0.1353	-0.1518	0.4133	0.1352	0.0061	0.3757	0.2013	0.0428
% Insurance	0.0048	-0.1422	-0.1160	0.3673	0.1658	0.0362	0.2899	0.0985	0.0112
% Unclassified	0.0115	-0.1501	-0.1174	0.3930	0.1724	0.0292	0.3052	0.0939	-0.0012
Panel B: Share characteristics									
Beta	1.00								
Standard deviation	0.4594	1.00							
Firm specific risk	0.1218	0.4070	1.00						
Size	-0.0470	-0.5006	-0.3794	1.00					
Age	-0.1215	-0.2750	-0.1580	0.3254	1.00				
Dividend yield	-0.2384	-0.4871	-0.1641	0.2340	0.1267	1.00			
Price	-0.1458	-0.6346	-0.4731	0.8048	0.3230	0.2518	1.00		
Turnover	0.1975	0.2115	0.0445	0.1422	-0.0978	-0.1169	0.1165	1.00	
Lag 6-month return	0.0137	-0.0112	-0.0869	0.1444	0.0432	0.0306	0.2229	0.1392	1.00

Each quarter between March 1983 and December 1997 we estimate the cross-sectional correlation between share characteristics and the fraction of shares held by institutional investors (in aggregate and by investor classification). This table presents the time-series average of the 60 quarterly cross-sectional correlations. Panel A presents the mean correlation between share characteristics and the institutional ownership measures (overall and by type). Panel B presents the mean correlations between the share characteristics. Beta is estimated as the sum of the coefficients in a regression of the firm's monthly return on the contemporaneous and lag one month CRSP NYAM value-weighted index over the previous 24 to 60 months (depending on availability). Standard deviation is estimated as the natural logarithm of monthly return standard deviation over the previous 24 to 60 months (depending on availability). Firm-specific risk is estimated as the natural logarithm of one plus the average monthly estimate of firm-specific risk in the current quarter. The average monthly estimate is generated as the squared difference between daily firm returns and associated industry returns summed each month. Firm size is measured as the natural logarithm of equity capitalization. Firm age is given as the natural logarithm of the number of months since December 1972 for which the firm has CRSP return data. Dividend yield is measured as the natural logarithm of one plus the average monthly dividend yield over the previous 12 months. Share price is given as the natural logarithm of one plus the quarter-end share price. Turnover is defined as the natural logarithm of one plus the monthly turnover averaged over the three months in the current quarter. Monthly turnover is given as the ratio of monthly volume to number of shares outstanding. Lag return is the cumulative return for the firm over the previous six months.

Table 3
Tests for changes in aggregate preferences

Period	Beta	Standard deviation	Firm specific risk	Size	Age	Dividend yield	Price	Turnover	Lag return
				Panel A: Entire sample period					
831-974 (*n*=60)	0.0369	0.0682	0.0099	0.4386	0.1016	-0.0920	0.2905	0.1381	-0.0990
	(0.73/0.84)	(0.78/0.75)	(0.70/0.36)	(1.00/1.00)	(1.00/0.98)	(0.00/ .)	(1.00/1.00)	(1.00/1.00)	(0.00/ .)
	(0.27/0.56)	(0.22/0.31)	(0.30/0.11)	(0.00/ .)	(0.00/ .)	(1.00/1.00)	(0.00/ .)	(0.00/ .)	(1.00/1.00)
				Panel B: Sub-period analysis					
831-902 (*n*=30)	0.0412	0.0037	0.0071	0.4930	0.0971	-0.0714	0.2074	0.1470	-0.1019
	(0.77/0.74)	(0.57/0.29)	(0.60/0.28)	(1.00/1.00)	(1.00/0.97)	(0.00/ .)	(1.00/1.00)	(1.00/1.00)	(0.00/ .)
	(0.23/0.29)	(0.43/0.31)	(0.40/0.00)	(0.00/ .)	(0.00/ .)	(1.00/1.00)	(0.00/ .)	(0.00/ .)	(1.00/1.00)
903-974 (*n*=30)	0.0327	0.1328	0.0127	0.3844	0.1060	-0.1127	0.3736	0.1292	-0.0961
	(0.70/0.95)	(1.00/1.00)	(0.80/0.42)	(1.00/1.00)	(1.00/1.00)	(0.00/ .)	(1.00/1.00)	(1.00/1.00)	(0.00/ .)
	(0.30/0.78)	(0.00/ .)	(0.20/0.33)	(0.00/ .)	(0.00/ .)	(1.00/1.00)	(0.00/ .)	(0.00/ .)	(1.00/1.00)
***z*-statistic**	-0.69	6.65**	1.65	-5.45**	0.86	-4.56**	6.63**	-2.62**	0.72

Each quarter between March 1983 and December 1997 we estimate a cross-sectional regression of the fraction of shares held by institutional investors on nine share characteristics. The number of securities in each cross-sectional regression ranges from 4,346 to 6,784. Both the level of institutional ownership and share characteristics are standardized each quarter, i.e., re-scaled to have a mean of zero and a standard deviation of one. The first number in each cell reports the time-series average coefficient from the quarterly regressions. The second row in each cell reports the fraction of the regressions with a positive coefficient associated with the characteristic followed by the fraction of positive coefficients that are statistically significant (at the 5 percent level or better). The third row in each cell reports the fraction of the regressions with a negative coefficient associated with that characteristic followed by the fraction of negative coefficients that are statistically significant (at the 5 percent level or better). Results are reported for the entire sample period (panel A) for two sub-periods (panel B): The first quarter of 1983 through the second quarter of 1990 and the third quarter of 1990 through the fourth quarter of 1997. The last row presents the results of a Wilcoxon rank-sum test of the null hypothesis that the coefficient estimates in the first period equal the coefficient estimates in the second period. The average R^2 for the 60 cross-sectional regressions is 51.13 percent. ** indicates statistical significance at the 1 percent level; * indicates statistical significance at the 5 percent level.

Table 4
Regressions of standardized ownership by institutional classification on standardized share characteristics

	Indep. inv. advisors	Bank trust departments	Mutual funds	Insurance companies	Unclassified	*F*-statistic
Beta	0.0614	-0.0034	0.0199	0.0021	0.0039	7.6264
	(0.82/0.86)	(0.38/0.35)	(0.82/0.47)	(0.57/0.12)	(0.53/0.19)	(0.65)
	(0.18/0.45)	(0.62/0.32)	(0.18/0.73)	(0.43/0.31)	(0.47/0.07)	
Standard deviation	0.0803	-0.0106	0.0746	0.0374	0.0363	7.2142
	(0.95/0.67)	(0.52/0.29)	(0.87/0.65)	(0.85/0.40)	(0.87/0.58)	(0.68)
	(0.05/0.00)	(0.48/0.69)	(0.13/0.13)	(0.15/0.11)	(0.13/0.00)	
Firm-specific risk	-0.0273	0.0509	0.0064	0.0163	0.0239	7.12
	(0.07/0.00)	(1.00/0.92)	(0.70/0.10)	(0.80/0.48)	(1.00/0.37)	(0.82)
	(0.93/0.46)	(0.00/ .)	(0.30/0.00)	(0.20/0.08)	(0.00/ .)	
Size	0.2358	0.3556	0.2845	0.3569	0.3986	23.8374
	(1.00/1.00)	(1.00/1.00)	(1.00/1.00)	(1.00/1.00)	(1.00/1.00)	(1.00)
	(0.00/ .)	(0.00/ .)	(0.00/ .)	(0.00/ .)	(0.00/ .)	
Age	0.0677	0.1286	0.0248	0.0629	0.0616	16.5013
	(0.98/0.93)	(1.00/0.98)	(0.82/0.73)	(1.00/0.87)	(1.00/0.85)	(0.85)
	(0.02/0.00)	(0.00/ .)	(0.18/0.91)	(0.00/ .)	(0.00/ .)	
Dividend yield	-0.1071	-0.0357	-0.0497	-0.0326	-0.0464	8.9161
	(0.00/ .)	(0.05/1.00)	(0.05/1.00)	(0.05/0.00)	(0.00/ .)	(0.97)
	(1.00/1.00)	(0.92/1.00)	(0.95/1.00)	(0.95/1.00)	(1.00/1.00)	
Price	0.3302	0.2008	0.2014	0.0281	0.0229	36.5067
	(1.00/1.00)	(1.00/1.00)	(1.00/0.93)	(0.62/0.59)	(0.55/0.64)	(1.00)
	(0.00/ .)	(0.00/ .)	(0.00/ .)	(0.38/0.00)	(0.45/0.30)	
Turnover	0.1836	0.0055	0.1195	0.0456	0.0351	43.6801
	(1.00/1.00)	(0.53/0.44)	(1.00/1.00)	(0.95/0.63)	(0.90/0.72)	(1.00)
	(0.00/ .)	(0.47/0.18)	(0.00/ .)	(0.05/0.00)	(0.10/0.33)	
Lag return	-0.0824	-0.0676	-0.0571	-0.0527	-0.0700	4.1762
	(0.00/ .)	(0.00/ .)	(0.02/0.00)	(0.00/ .)	(0.00/ .)	(0.67)
	(1.00/0.95)	(1.00/1.00)	(0.98/0.88)	(1.00/0.88)	(1.00/0.90)	
Average R^2	34.80%	31.99%	22.17%	15.21%	17.50%	

Each quarter between March 1983 and December 1997 we estimate cross-sectional regressions of fractional institutional ownership (for each class of institutional investor) on nine share characteristics. The number of securities in each cross-sectional regression ranges from 4,346 to 6,784. Both the institutional ownership measures and share characteristics are standardized each quarter, i.e., re-scaled to have a mean of zero and a standard deviation of one. The first number in each cell reports the time-series average coefficient from the 60 quarterly regressions. The second row in each cell reports the fraction of the 60 regressions with a positive coefficient associated with the characteristic followed by the fraction of positive coefficients that are statistically significant (at the 5 percent level or better). The third row in each cell reports the fraction of the 60 regressions with a negative coefficient associated with that characteristic followed by the fraction of negative coefficients that are statistically significant (at the 5 percent level or better). Average R^2s from the 60 regressions are reported in the last row. Each quarter, we also compute an *F*-statistic associated with a likelihood ratio test of the hypothesis that the coefficients associated with that characteristic are equal for independent investment advisors, bank trust departments, mutual funds, insurance companies, and unclassified institutional investors. The mean *F*-statistic is reported in the last column. The last column also reports (in parentheses) the fraction of the *F*-statistics that are statistically significant at the 5 percent level or better.

Table 5
Tests for changes in preferences and preference impact over time by investor class

	Preference impact	Beta	Standard deviation	Firm spec. risk	Size	Age	Dividend yield	Price	Turnover	Lag return
					Panel A: Independent investment advisors					
831-902 (*n*=30)	0.5109	0.0720	0.0291	-0.0205	0.2862	0.0618	-0.0870	0.2793	0.2054	-0.0927
903-974 (*n*=30)	0.5524	0.0507	0.1317	-0.0341	0.1854	0.0734	-0.1272	0.3810	0.1618	-0.0722
***z*-statistic**	3.47**	-1.46	6.04**	-1.37	-5.55**	1.38	-4.03**	6.54**	-3.90**	2.12*
					Panel B: Bank trust departments					
831-902 (*n*=30)	0.3806	-0.0018	-0.0440	0.0370	0.4132	0.1011	-0.0199	0.1443	0.0174	-0.0652
903-974 (*n*=30)	0.2802	-0.0049	0.0229	0.0649	0.2980	0.1560	-0.0516	0.2572	-0.0065	-0.0700
***z*-statistic**	-6.56**	-0.23	5.12**	5.58**	-6.19**	4.24**	-5.33**	5.76**	-3.97**	-1.12
					Panel C: Mutual funds					
831-902 (*n*=30)	0.1508	0.0243	0.0165	0.0016	0.2625	0.0395	-0.0439	0.1311	0.1149	-0.0558
903-974 (*n*=30)	0.2513	0.0154	0.1326	0.0112	0.3064	0.0101	-0.0555	0.2717	0.1242	-0.0585
***z*-statistic**	5.97**	-0.36	6.41**	2.99**	1.71	-1.72	-0.85	6.56**	1.56	-0.26
					Panel D: Insurance companies					
831-902 (*n*=30)	0.1951	0.0020	0.0117	0.0017	0.3523	0.0667	-0.0267	-0.0100	0.0699	-0.0545
903-974 (*n*=30)	0.1489	0.0022	0.0630	0.0308	0.3615	0.0591	-0.0386	0.0662	0.0212	-0.0510
***z*-statistic**	-4.74**	0.08	5.63**	5.88**	1.22	-1.23	-2.86**	5.71**	-5.06**	0.73
					Panel E: Unclassified institutional investors					
831-902 (*n*=30)	0.1921	-0.0022	0.0203	0.0162	0.4277	0.0479	-0.0431	-0.0241	0.0266	-0.0592
903-974 (*n*=30)	0.1471	0.0100	0.0523	0.0316	0.3695	0.0754	-0.0498	0.0700	0.0436	-0.0808
***z*-statistic**	-5.68**	2.65**	3.70**	4.55**	-3.33**	3.79**	-2.43*	5.64**	1.83	-3.04**

Each quarter between March 1983 and December 1997 we compute the "preference impact" of each institutional investor class as the ratio of the cross-sectional standard deviation of holdings by that investor class to the cross-sectional standard deviation of aggregate institutional holdings. We then report the mean preference impact of each institutional investor class for two sub-periods: The first quarter of 1983 through the second quarter of 1990 and the third quarter of 1990 through the fourth quarter of 1997. These averages are reported in the first column. We also present the results of a Wilcoxon rank-sum test of the null hypothesis that the preference impacts in the first period equal the preference impacts in the second period. In addition, we estimate cross-sectional regressions of institutional ownership for each institutional investor class on nine share characteristics, each quarter. Both the institutional ownership measures and share characteristics are standardized each quarter, i.e., re-scaled to have a mean of zero and a standard deviation of one. We then report the mean coefficient for each institutional investor class for the two sub-periods as well as the results of a Wilcoxon rank-sum test of the null hypothesis that the coefficient estimates in the first period equal the coefficient estimates in the second period. ** indicates statistical significance at the 1 percent level; * indicates statistical significance at the 5 percent level.

Table 6
Explaining time-series variation in aggregate preferences

	Beta	Standard deviation	Firm spec. risk	Size	Age	Dividend yield	Price	Turnover	Lag return	Average
					Panel A: Independent investment advisors					
Total	0.6467	0.4400	0.5037	0.2839	0.4200	0.6006	0.4046	0.8385	0.6116	0.5277
Preferences	0.5944	0.3791	0.4306	0.3599	0.3511	0.6099	0.2833	0.8637	0.6052	0.4975
Impact	0.0033	0.0019	0.0170	-0.0220	-0.0055	0.0103	0.0106	0.0764	-0.0016	0.0101
Interaction	0.0490	0.0589	0.0561	-0.0540	0.0744	-0.0196	0.1107	-0.1016	0.0081	0.0202
					Panel B: Bank trust departments					
Total	0.1317	0.1778	0.2163	0.5647	0.2742	0.1316	0.1527	0.1568	0.1070	0.2125
Preferences	0.1274	0.1366	0.2151	0.2695	0.2899	0.1580	0.2266	0.1819	0.0987	0.1893
Impact	0.0003	0.0006	0.0531	0.0655	0.0336	-0.0032	-0.0094	-0.0042	0.0088	0.0161
Interaction	0.0040	0.0407	-0.0519	0.2298	-0.0493	-0.0233	-0.0645	-0.0209	-0.0005	0.0071
					Panel C: Mutual funds					
Total	0.0941	0.2762	0.0670	-0.0323	0.1481	0.1680	0.2644	-0.1240	0.1398	0.1112
Preferences	0.0793	0.1604	0.0985	0.0692	0.0852	0.1278	0.1570	0.0576	0.1397	0.1083
Impact	0.0008	0.0040	-0.0046	-0.0424	-0.0069	0.0004	0.0064	0.0737	-0.0093	0.0025
Interaction	0.0140	0.1118	-0.0269	-0.0591	0.0698	0.0399	0.1009	-0.2554	0.0093	0.0005
					Panel D: Insurance companies					
Total	0.0859	0.0700	0.1228	0.0643	0.0736	0.0623	0.0769	0.0421	0.0766	0.0750
Preferences	0.0827	0.0678	0.1498	0.0463	0.0538	0.0735	0.0740	0.1142	0.0790	0.0823
Impact	0.0000	-0.0005	0.0033	0.0176	0.0044	-0.0001	-0.0003	-0.0071	0.0025	0.0022
Interaction	0.0032	0.0026	-0.0303	0.0005	0.0154	-0.0110	0.0032	-0.0650	-0.0048	-0.0096
					Panel E: Unclassified					
Total	0.0415	0.0360	0.0902	0.1194	0.0841	0.0375	0.1014	0.0866	0.0650	0.0735
Preferences	0.0383	0.0365	0.0906	0.0304	0.0780	0.0482	0.0897	0.0169	0.0595	0.0542
Impact	-0.0001	-0.0010	0.0119	0.0396	0.0081	-0.0015	-0.0005	-0.0126	0.0056	0.0055
Interaction	0.0034	0.0005	-0.0123	0.0495	-0.0021	-0.0092	0.0122	0.0824	0.0000	0.0138
					Panel F: Aggregate					
Total	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Preferences	0.9222	0.7803	0.9846	0.7752	0.8579	1.0174	0.8306	1.2342	0.9821	0.9316
Impact	0.0043	0.0051	0.0807	0.0582	0.0338	0.0059	0.0068	0.1262	0.0059	0.0363
Interaction	0.0736	0.2146	-0.0652	0.1666	0.1083	-0.0232	0.1625	-0.3604	0.0120	0.0321

Each quarter between March 1983 and December 1997 we compute the "preference impact" for each institutional investor class as the ratio of the cross-sectional standard deviation of ownership by that institutional investor class to the cross-sectional standard deviation of aggregate institutional ownership. We also compute the "preferences" as the standardized regression coefficient from quarterly cross-sectional regressions of fractional institutional ownership (overall and for each class of institutional investor) on nine share characteristics. Because aggregate preferences can then be written as a linear function of the product of each investor classes' preference impacts and preferences, we can directly estimate the fraction of time-series variation in aggregate preferences attributed to each institutional investor class. These estimates are reported in the first row of panels A through E. In addition, by assuming preference impacts (preferences) are constant, we can estimate the fraction of time-series variance in aggregate preferences attributed to changes in preferences (preference impacts). These estimates are reported in the second and third row of each panel. The remaining time-series variation in aggregate preferences is attributed to the interaction between preferences and preference impacts and is reported in the last row of each panel.

Table 7
Institutional ownership, turnover, and firm-specific risk

	Panel A: Regression results	
Independent variables	**Turnover$_{t+1}$**	**Firm-specific risk$_{t+1}$**
Beta	0.0102	-0.0078
	(3.40)**	(-1.81)
Standard deviation	0.0730	0.0386
	(20.01)**	(6.42)**
Firm-specific risk	-0.0248	0.6081
	(-6.71)**	(39.62)**
Size	0.0149	-0.0069
	(4.15)**	(-2.03)*
Age	-0.0399	-0.0083
	(-15.16)**	(-4.21)**
Dividend yield	-0.0052	-0.0060
	(-2.49)*	(-3.21)**
Price	0.0106	-0.1339
	(2.58)**	(-18.51)**
Turnover	0.7313	-0.0133
	(146.75)**	(-4.02)**
Lag return	-0.0021	-0.0974
	(-0.36)	(-25.45)**
Beginning-of-quarter % total	0.0748	0.0175
	(16.73)**	(9.99)**
Change in % total	0.0373	0.0128
	(13.25)**	(6.36)**

	Early (3/83-6/90)	**Late (9/90-12/97)**	***z*-statistic**
	Panel B: Turnover at small and large firms (in percent, *n*=60 quarters)		
All firms	5.1070	7.5140	5.42**
Small firms	4.7861	7.1251	5.12**
Large firms	6.0046	7.6399	4.07**
Small/large	0.7984	0.9318	4.49**
	Panel C: Firm-specific risk at small and large firms (in percent, *n*=60 quarters)		
All firms	2.9099	4.8550	6.11**
Small firm	3.5603	6.3367	6.21**
Large firms	0.6456	0.7922	7.32**
Small/large	5.9723	8.2656	3.81**

Each quarter between June 1983 and December 1997 we estimate cross-sectional regressions of turnover in quarter t+1 on nine security characteristics in quarter t, the level of institutional ownership at the beginning of quarter t and the change in the fraction of shares held by institutional investors over quarter t. Both the independent and dependent variables are standardized each quarter, i.e., re-scaled to zero mean, unit variance. The first column in Panel A reports the time-series average coefficient from these 59 cross-sectional regressions and associated t-statistics (computed from time-series standard errors). The second column in Panel A reports the results of a similar analysis of firm-specific risk. We also compute the cross-sectional average turnover and firm-specific risk for all firms, small firms (bottom third capitalization) and large firms (top third capitalizations) each quarter. In addition, we compute, each quarter, the ratio of the cross-sectional average small firm turnover (firm-specific risk) to the cross-sectional average large firm turnover (firm-specific risk). Panels B and C reports the time-series average of the quarterly cross-sectional averages over the early period (March 1983-June 1990) and the late period (September 1990 to December 1997) for each group for turnover and firm-specific risk, respectively. The last column in Panels B and C report the results of a Wilcoxon rank sum test of the null hypothesis that values in the early period do not differ from the values in the late period. Turnover is defined as the natural logarithm of one plus the monthly turnover averaged over the three months in the current quarter. Monthly turnover is given as the ratio of monthly volume to number of shares outstanding. Firm-specific risk is estimated as the natural logarithm of one plus the average monthly estimate of firm-specific risk in the current quarter. The average monthly estimate is generated as the squared difference between daily firm returns and associated industry returns summed each month.

Table 8
Institutional ownership, valuation levels, and returns

	Panel A: Book-to-market ratios at small and large firms (n=60 quarters)		
	Early (3/83-6/90)	**Late (9/90-12/97)**	***z*-statistic**
All firms	0.5442	0.5385	-1.10
Small firms	0.5563	0.5817	1.02
Large firms	0.5221	0.4062	-5.79**
Small/large	1.0761	1.4356	6.59**

	Panel B: Regression results	
Independent variables	**Return$_{t+1}$**	**Return$_{t+1}$**
Beta	0.0055	0.0057
	(0.64)	(0.67)
Standard deviation	-0.0340	-0.0344
	(-2.61)*	(-2.63)*
Firm-specific risk	-0.0357	-0.0344
	(-3.28)**	(-3.19)**
Size	-0.0243	-0.0235
	(-2.59)*	(-2.49)*
Age	0.0119	0.0125
	(2.02)*	(2.12)*
Dividend yield	0.0066	0.0069
	(0.94)	(0.98)
Price	0.0189	0.0179
	(1.51)	(1.45)
Turnover	-0.0330	-0.0330
	(-3.70)**	(-3.72)**
Lag return	0.0517	0.0504
	(5.27)**	(5.19)**
Beginning-of-quarter % total	0.0191	0.0205
	(3.03)**	(3.28)**
Change in % total	0.0008	
	(0.23)	
Signed herding measure		0.0114
		(4.29)**

Each quarter, we compute the cross-sectional average book-to-market ratio for all firms, small firms (bottom third capitalization) and large firms (top third capitalizations). We also compute, each quarter, the ratio of the cross-sectional average small firm book-to-market ratio to the cross-sectional average large firm book-to-market ratio. To control for outliers we define the book-to-market ratio as the natural logarithm of one plus the Compustat book value to CRSP market value. Panel A reports the time-series average of the quarterly cross-sectional averages over the early (March 1983-June 1990) and late periods (September 1990 to December 1997) for each group. The last column in Panel A reports the results of a Wilcoxon rank sum test of the null hypothesis that values in the early period do not differ from the values in the late period. Each quarter between June 1983 and December 1997 we estimate a cross-sectional regression of return in quarter t+1 on nine security characteristics in quarter t, the level of institutional ownership at the beginning of quarter t and the change in the fraction of shares held by institutional investors over quarter t. Both the independent and dependent variables are standardized each quarter, i.e., re-scaled to zero mean, unit variance. The first column in Panel B reports the time-series average coefficient from these 59 cross-sectional regressions and associated t-statistics (computed from time-series standard errors). The second column in Panel B reports the results for a similar analysis, but replaces the change in the fraction of shares held by institutional investors with the signed herding measure (the Lakonishok, Shleifer and Vishny (1992) herding measure signed positive if the ratio of the number of institutions buying the security to the number the number trading the security that quarter is greater than the cross-sectional average ratio that quarter and negative if the ratio of the number of institutions buying the security to the number the number trading the security that quarter is less than the cross-sectional average ratio that quarter). Firms must have at least five institutional traders to be included in the analysis.

Table 9
Average abnormal returns for top buy-herding portfolio less top sell-herding portfolio

	Quarter –2	Quarter –1	Portfolio formation quarter	Quarter +1	Quarter +2	Quarter +3	Quarter +4	Qtrs +1 to +4
Panel A: Average return from top-buy herding portfolio less average return on top sell-herding portfolio – All periods								
Small firms	8.82	11.84	13.53	2.07	2.02	0.82	-0.56	5.00
	(16.82)**	(13.24)**	(16.13)**	(2.53)*	(2.34)*	(0.99)	(-0.56)	(6.33)**
Large firms	3.02	2.58	7.13	0.76	0.09	-0.21	-0.25	0.84
	(6.94)**	(5.30)**	(11.54)**	(1.28)	(0.16)	(-0.41)	(-0.46)	(0.68)
Panel B: Average return from top-buy herding portfolio less average return on top sell-herding portfolio – Small firms								
Small firms - Early	7.92	9.85	10.53	1.98	3.02	0.31	-0.44	5.31
(3/83-6/90)	(11.28)**	(9.56)**	(10.66)**	(2.45)*	(2.96)**	(0.23)	(-0.30)	(5.34)**
Small firms - Late	9.69	13.77	16.43	2.17	1.07	1.32	-0.68	4.69
(9/90-12/97)	(12.86)**	(10.00)**	(14.60)**	(1.52)	(0.77)	(1.30)	(-0.49)	(3.81)**
***z*-statistics**	1.92	2.20*	3.87**	0.55	-0.01	0.37	-0.19	-0.37
Panel C: Average return from top-buy herding portfolio less average return on top sell-herding portfolio – Large firms								
Large firms - Early	3.43	1.72	7.21	1.25	0.72	-0.69	-0.58	1.18
(3/83-6/90)	(5.40)**	(2.64)*	(9.11)**	(1.61)	(0.96)	(-0.79)	(-0.83)	(0.64)
Large firms - Late	2.62	3.40	7.05	0.28	-0.51	0.25	0.06	0.51
(9/90-12/97)	(4.40)**	(4.89)**	(7.37)**	(0.32)	(-0.59)	(0.47)	(0.08)	(0.31)
***z*-statistics**	-1.24	1.60	-0.45	-0.72	-0.83	1.39	0.72	-0.04

Each quarter between March 1983 and December 1997 we compute the Lakonishok, Shleifer and Vishny (1992) "herding measure" for each security with at least five institutional traders. Each security is then classified as either a buy herding security (the ratio of the number of institutions buying the security to the number the number trading the security that quarter is greater than the cross-sectional average ratio that quarter) or a sell herding security (the ratio of the number of institutions buying the security to the number the number trading the security that quarter is less than the cross-sectional average ratio that quarter). We then compute the average capitalization-adjusted return difference between those securities most heavily purchased by institutional investors (top buy-herding quintile) and those securities most heavily sold by institutional investors (top sell-herding quintile) for small stocks (bottom third capitalization) and large stocks (top third capitalization). The time-series average of these portfolio returns (and associated *t*-statistics computed from time-series standard errors) in the two quarters prior to the herding quarter, the herding quarter, and the four quarters following the herding quarter are reported above. Capitalization-adjusted returns are calculated as the difference between the firm's return and the average return for firms within the same capitalization group. Panels B and C partition the analysis into an early period (March 1983-June 1990) and a late period (September 1990 to December 1997) for small stocks and large stocks, respectively. The last rows in Panels B and C report the results of a Wilcoxon rank sum test of the null hypothesis that values in the early period do not differ from the values in the late period.

Figure 1: Percentage Institutional Ownership