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Herding and Feedback Trading by Institutional and Individual Investors

JOHN R. NOFSINGER and RICHARD W. SIAS*

ABSTRACT

We document strong positive correlation between changes in institutional ownership and returns measured over the same period. The result suggests that either institutional investors positive-feedback trade more than individual investors or institutional herding impacts prices more than herding by individual investors. We find evidence that both factors play a role in explaining the relation. We find no evidence, however, of return mean-reversion in the year following large changes in institutional ownership—stocks institutional investors purchase subsequently outperform those they sell. Moreover, institutional herding is positively correlated with lag returns and appears to be related to stock return momentum.

HERDING AND FEEDBACK TRADING HAVE THE POTENTIAL to explain a number of financial phenomena, such as excess volatility, momentum, and reversals in stock prices. Herding is a group of investors trading in the same direction over a period of time; feedback trading involves correlation between herding and lag returns.¹ Although a recent growing body of literature is devoted to investor herding and feedback trading, extant studies take divergent paths. One path depicts individual investors as engaging in herding as a result of irrational, but systematic, responses to fads or sentiment. A second path depicts institutional investors engaging in herding as a result of agency problems, security characteristics, fads, or the manner in which information is impounded in the market.

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¹ Most herding models suggest that investors follow some common signal. Feedback trading, a special case of herding, results when lag returns, or variables correlated with lag returns (e.g., earnings momentum, decisions of previous traders, changes in firm characteristics, etc.), act as the common signal.

We add to the literature by focusing on four issues. First, we investigate the cross-sectional relation between changes in institutional ownership and stock returns to assess the comparative importance of herding by institutional and individual investors for securities listed on the New York Stock Exchange (NYSE). Second, we evaluate post-herding returns for evidence of systematic patterns in post-herding asset prices. Third, we explore how changes in institutional ownership are related to lag returns (feedback trading) and stock return momentum. Last, we use a small sample of trader-type identified transaction data in an attempt to differentiate the “price-impact” of herding from intraperiod positive-feedback trading.

Our analyses reveal a strong positive relation between annual changes in institutional ownership and returns—on average, the decile of stocks experiencing the largest increase in institutional ownership outperforms the decile experiencing the largest decrease by more than 31 percent per year. The result suggests that either institutional investors engage in intrayear positive-feedback trading to a greater extent than individual investors or institutional investors’ herding impacts prices to a greater extent than individual investors’ herding.

Analyses of post-herding returns, however, reveal no evidence that institutional herding is irrational. That is, we find no evidence of return reversals in the two years following the herding period. Instead we find that the securities institutional investors purchase subsequently outperform those they sell. Although this result is inconsistent with most studies of mutual fund performance (Gruber (1996)), it is consistent some recent studies (e.g., Daniel et al. (1997)) that, like ours, focus on the returns of assets held by professional investors rather than the returns realized by these investors. Additionally, the tendency for stocks that institutional investors purchase to outperform those they sell does not appear to be fully explained by the return from momentum strategies (Jegadeesh and Titman (1993)).

Further analyses suggest that institutional investors engage in positive-feedback trading. Although we find some evidence that institutional investors’ feedback trading is related to their attraction to certain stock characteristics, this explanation fails to fully account for the relation between changes in institutional ownership and lag returns. Moreover, our analyses reveal a positive relation between subsequent returns and subsequent changes in institutional ownership for both past “losers” and “winners.” That is, the subsequent change in institutional ownership is strongly related to the degree of return momentum. We are unable, however, to infer the causation in this relation—that is, whether institutional feedback trading contributes to return momentum or return momentum determines the extent of institutional herding.

Last, we attempt to differentiate institutional intraperiod positive-feedback trading from the price impact of institutional herding. First, we evaluate feedback trading by firm size and demonstrate that institutional positive-feedback trading is largely limited to smaller firms. Nonetheless we still document a strong positive relation between large firm returns and

changes in institutional ownership over the same period. If institutional investors are not positive-feedback trading in these large firms, then the relation between changes in institutional ownership and returns measured over the same interval must be driven by the price impact of institutional herding.² Second, we evaluate the relation between daily changes in institutional ownership, returns for the same day, and lag returns for a small sample of firms over a three-month period. Our results reveal a strong positive relation between daily changes in institutional ownership and returns for the same day, but only a very weak relation between daily changes in institutional ownership and lag returns. Although the analyses are exploratory, the results are consistent with the hypotheses that changes in institutional ownership impact stock returns or institutional investors are very short term (intraday) positive feedback traders.

The paper is organized as follows: We briefly review the relevant literature in Section I. Section II examines the relation between changes in institutional ownership and returns during and following the herding interval. Section III investigates institutional feedback trading, firm characteristics, and stock return momentum. In Section IV we use transaction data that identifies trader type in an attempt to partition the price-impact of herding from intraperiod feedback trading. The last section summarizes our results.

I. Herding and Feedback Trading by Individual and Institutional Investors

Following extant empirical literature, in our definition of herding, we focus on groups of investors buying (or selling) the same stock over a period of time (the “herding interval”). Thus, empirical evaluations of herding require setting two parameters—the herding interval and the investor groups. In this study, we partition shareholders into institutional and individual investors and focus on annual changes in ownership. (In Section IV we evaluate daily changes in ownership for a small sample of firms.)

A. Herding and Feedback Trading by Individual Investors

Ignorant, uninformed, individual investors trading on sentiment is a common theme in the herding literature. Shiller (1984) and De Long et al. (1990), for example, posit that the influences of fad and fashion are likely to impact the investment decisions of individual investors. Similarly, Shleifer and Summers (1990) suggest that individual investors may herd if they follow the same signals (brokerage house recommendations, popular market gurus, or forecasters) or place greater importance on recent news (overreact). Lakonishok, Shleifer, and Vishny (1994) posit that individual investors engage in

² As noted by Choe, Kho, and Stulz (1999), the positive relation between changes in institutional ownership and returns over the same period may also occur if institutional investors are successfully forecasting short-term returns.

irrational positive feedback trading because they extrapolate past growth rates. Alternatively, Shefrin and Statman (1985) argue that individual investors tend to negative-feedback trade by selling past winners (the “disposition effect”).

Much of the empirical evidence focuses on whether individual investors’ herding impacts both closed-end fund discounts (because closed-end fund shares are held primarily by individual investors) and the returns of small capitalization stocks (that are also predominantly owned by individual investors). Although extant work largely supports the hypothesis that there is positive correlation between small firm returns and closed-end fund discounts (individual investors herd and such herding impacts both small firm returns and closed-end fund discounts), there is considerable debate regarding the statistical and economic significance of the correlation (see Lee, Shleifer, and Thaler (1991), Chopra et al. (1993), Chen, Kan, and Miller (1993), Swaminathan (1996), Sias (1997), and Neal and Wheatley (1998)). Extant evidence also suggests that individual investors’ herding is related to lag returns—that is, individual investors feedback trade. Patel, Zeckhauser, and Hendricks (1991), for example, demonstrate that flows into mutual funds are an increasing function of recent market performance. Similarly, Sirri and Tufano (1998) present evidence that individual investors invest disproportionately in funds with strong prior performance. Alternatively, consistent with the disposition effect, Odean (1998) presents evidence that individual investors are more likely to sell past winners than losers.

B. Herding and Feedback Trading by Institutional Investors

One popular view holds that institutional herding is primarily responsible for large price movements of individual stocks, and, moreover, it destabilizes stock prices. As noted by Lakonishok, Shleifer, and Vishny (1992), evidence that institutional herding moves prices does not necessarily imply that it is destabilizing. If, for example, institutional investors are better informed than individual investors, institutional investors will likely herd to undervalued stocks and away from overvalued stocks. Such herding can move prices toward, rather than away from, equilibrium values (see Froot, Scharfstein, and Stein (1992), Bikhchandani, Hirshleifer, and Welch (1992), and Hirshleifer, Subrahmanyam, and Titman (1994)).

Alternatively, institutional herding may not be related to information. Several authors (see Friedman (1984) and Dreman (1979)) suggest that institutional herding can result from irrational psychological factors and cause temporary price bubbles. Moreover, agency problems can encourage institutional herding or feedback trading (see Scharfstein and Stein (1990), Lakonishok et al. (1991), Lakonishok, Shleifer, and Vishny (1994), and Haugen (1995)). Finally, institutional investors may herd because stocks acquire desirable characteristics such as a certain price level (see Falkenstein (1996) and Del Guercio (1996)).

Most extant studies (see Lakonishok et al. (1992) and Grinblatt, Titman, and Wermers (1995)) document only weak evidence that subsets of institutional investors (mutual funds, pension funds) herd or that their herding impacts prices. These studies present somewhat stronger evidence that institutional investors engage in some positive feedback trading. Recently, however, Wermers (1999) documents a strong relation between mutual fund herding and quarterly returns.

II. Returns and Changes in Institutional Ownership

Empirical investigations usually evaluate herding by examining changes in ownership. An increase in mutual fund ownership, for example, is typically reported as evidence of herding by mutual funds. An equally reasonable interpretation, however, is that investors other than mutual funds herded out of these stocks. Similarly, an increase in institutional ownership arises when either institutional investors herd to a stock or individual investors herd away from a stock.

A. Data and Methodology

The data consist of monthly stock returns from the Center for Research in Security Prices (CRSP), annual market capitalizations, and the annual fraction of shares held by institutional investors for all NYSE firms (closed-end funds, REITs, primes and scores, and foreign companies are excluded). Specifically, for the 1977 to 1996 period (20 years), we obtain monthly returns and annual market capitalizations (at the beginning of each October) from the monthly CRSP tapes. The number of shares held by institutional investors is gathered at the beginning of each October from Standard and Poors' *Security Owners' Stock Guides*.³ Fractional institutional ownership is defined as the ratio of the number of shares held by institutional investors to the number of shares outstanding. The fraction of shares held by individual investors is simply one less the fraction held by institutional investors.⁴ Thus, an increase (decrease) in the fraction of shares held by institutional investors is equivalent to a decrease (increase) in the fraction held by individual investors. The sample of firms with complete data (institutional ownership at the beginning and end of the October through September year, returns for

³ Specifically, data are gathered from the January issue of the *Stock Guides*. Based on our conversations with the SEC and Vickers (who supply the data to Standard and Poors), data in the January issue reflect third-quarter institutional holdings.

⁴ According to Flow of Funds data, foreign ownership accounts for four to eight percent of total U.S. equities over our sample period. Vickers' data include some foreign ownership. Some foreign institutions, however, are likely to be missed and thus, treated (by us) as individual investors. Similarly, our data do not allow us to distinguish between domestic and foreign individual investor ownership.

Table I

Characteristics of Institutional-Ownership-Change Portfolios

Each October (1977–1995), NYSE firms are sorted into 10 portfolios based on the fraction of shares held by institutional investors. The firms in each initial institutional ownership decile are then further sorted into 10 portfolios based on the change in the fraction of shares held by institutional investors over the following year (for a total of 100 initial institutional ownership, change in institutional-ownership-sorted portfolios). Firms are then reaggregated based on their change in ownership decile rank resulting in 10 initial ownership stratified, ownership change portfolios. Reported below are the time-series average of the annual cross-sectional mean characteristics (and associated Fama–MacBeth (1973) *t*-statistics in parentheses) for each portfolio. The sample size is 19 annual observations except for post-herding returns that have 18 observations for $t = 12$ to 23 and 17 observations for $t = 24$ to 35 due to our CRSP data ending in 1996. Δ Institutional is the raw change in institutional ownership less the cross-sectional average change (each year). Abnormal returns are computed by compounding monthly capitalization decile adjusted returns for the period indicated (e.g., Panels B and C present annual abnormal returns, Panel D presents three-month and annual abnormal returns). The period $t = 0$ to 11 indicates the 12 months during the herding year, $t = 12$ to 23 and $t = 24$ to 35 indicate the first and second years following the herding year, respectively. The k month returns just prior to the herding year are indicated as the $t = -1$ to $-k$ interval. The F -statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the ownership change portfolios. Firms must have institutional ownership data at the beginning ($t = 0$) and end ($t = 11$) of the herding year and capitalization data at the beginning of the herding year to be included in the sample.

	Large Decrease	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Large Increase	F-statistic
Panel A: Institutional Ownership Statistics											
Initial % Inst.	0.3762	0.3701	0.3674	0.3651	0.3656	0.3658	0.3669	0.3672	0.3663	0.3642	0.02
ΔInstitutional	-0.1595	-0.0714	-0.0418	-0.0247	-0.0112	0.0021	0.0169	0.0365	0.0695	0.1830	624.82***
ln(Capital)	12.1481	12.5937	12.8536	13.0383	13.0684	13.0418	13.0140	12.8765	12.7328	12.6485	6.06***
ln(Book/Mkt.)	-0.3318	-0.4143	-0.4197	-0.4549	-0.4596	-0.4373	-0.4563	-0.4246	-0.4087	-0.4778	0.43
Panel B: Herding Year Abnormal Returns											
t = 0 to 11	-0.1312 (-10.80)***	-0.0822 (-7.72)***	-0.0599 (-10.15)***	-0.0286 (-4.04)***	-0.0144 (-1.52)	-0.0079 (-1.01)	0.0112 (1.70)	0.0428 (5.56)***	0.0836 (7.17)***	0.1838 (9.01)***	68.94***
Panel C: Post-Herding Year Abnormal Returns											
t = 12 to 23	-0.0238 (-1.78)*	-0.0216 (-2.51)**	-0.0133 (-1.59)	0.0013 (0.14)	0.0079 (1.31)	0.0010 (0.13)	0.0141 (1.82)*	0.0154 (1.60)	0.0164 (1.93)*	0.0305 (2.49)**	3.59***
t = 24 to 35	-0.0113 (-0.96)	0.0056 (0.46)	0.0015 (0.17)	0.0077 (0.82)	0.0100 (1.04)	0.0034 (0.38)	0.0041 (0.64)	-0.0021 (-0.45)	0.0097 (1.23)	0.0088 (0.89)	0.51
Panel D: Pre-Herding Year Abnormal Returns											
t = -1 to -3	-0.0247 (-3.57)***	-0.0107 (-3.21)***	-0.0094 (-3.11)***	-0.0057 (-1.23)	-0.0038 (-0.86)	-0.0030 (-0.92)	0.0021 (0.71)	-0.0011 (-0.34)	0.0101 (3.66)***	0.0212 (4.56)***	8.96***
t = -1 to -12	-0.0350 (-2.26)**	-0.0038 (-0.32)	-0.0073 (-0.87)	-0.0045 (-0.59)	-0.0061 (-0.73)	-0.0038 (-0.39)	-0.0013 (-0.11)	-0.0012 (-0.13)	0.0124 (1.42)	0.0514 (3.61)***	3.92***

***, **, and * Statistically significant at the 1, 5, and 10 percent levels, respectively.

October through September, and capitalization at the beginning of October) ranges from a minimum of 1,202 in 1987 to a maximum of 1,508 in 1996, for a total of 24,869 firm-years.

We begin by using a sorting procedure designed to create 10 portfolios that have similar institutional ownership at the beginning of each year and large differences in the change in institutional ownership over the year.⁵ At the beginning of each October, all firms are sorted into 10 portfolios based on the fraction of shares held by institutional investors. Firms within each initial institutional-ownership-sorted portfolio are further sorted into 10 portfolios based on the change in the fraction of shares held by institutional investors over the following year, henceforth, the “herding year” (for the first year, the change in ownership is measured as the fraction of shares held by institutional investors on October 1, 1978 less the fraction on October 1, 1977), resulting in 100 initial institutional ownership, change in institutional-ownership-sorted portfolios each year. Firms in the decile of stocks experiencing the largest increase in institutional ownership within each initial ownership decile are then reaggregated across the initial-ownership-sorted deciles to form an initial institutional ownership stratified portfolio that exhibits a large increase in institutional ownership. Similarly, stocks within each of the other ownership change deciles are reaggregated over the initial ownership deciles to form a total of 10 initial ownership stratified, change in institutional ownership portfolios (henceforth, “ownership change portfolios”). Because the level of institutional ownership increases over time, we define the change in institutional ownership as the raw change in the fraction of shares held by institutional investors for firm i over the herding year less the mean change in fractional institutional ownership for all firms over the herding year (this adjustment does not affect the composition of the portfolios). One limitation of our analysis is that it focuses on changes in the fraction of shares held by institutional investors. In some cases, however, the change in fractional institutional ownership may not reflect herding (a group of institutional investors moving to or away from the same stock), but rather one or two institutional investors taking a large position in a security.

Panel A of Table I presents the time-series average of the annual cross-sectional mean initial level of institutional ownership and change in institutional ownership for firms in each ownership change portfolio.⁶ The last column presents an F -statistic for the null hypothesis that the characteristic does not differ across the ownership change portfolios.⁷ The results demon-

⁵ We stratify portfolios by their initial ownership levels because the absolute value of changes in institutional ownership tends to be larger for firms with high levels of initial ownership—a change of 10 percent institutional ownership is more likely in portfolios with larger initial institutional ownership.

⁶ Because we evaluate the characteristics of portfolios sorted on their change in ownership, the sample is limited to 19 cross-sectional estimates—19 changes in institutional ownership are garnered from 20 observations of the level of institutional ownership.

⁷ The F -statistic is based on $n = 190$ (10 change in institutional ownership portfolios times 19 annual changes in institutional ownership).

strate that the portfolios exhibit similar levels of initial institutional ownership (about 36 percent) but vary greatly in their change in ownership—the change averages -15.95 percent for firms in the first portfolio (large decrease) versus 18.30 percent for firms in the last portfolio (large increase). The third and fourth rows in Panel A report the time-series averages of the annual cross-sectional mean natural logarithm of capitalization and natural logarithm of book-to-market ratios (at the beginning of the herding year), respectively, for firms in each portfolio. Firms in the large decrease portfolio tend to be smaller and have larger book-to-market ratios than other firms.⁸

B. Herding

We define the relative importance of herding by the relation between changes in institutional ownership (or, equivalently, the negative of changes in individual investor ownership) and returns over the herding interval. Specifically, we *define* institutional herding as more (less) important than individual investor herding if there is a positive (negative) relation between changes in institutional ownership and returns measured over the same interval. Our intuition for this definition is straightforward. A positive relation between annual changes in institutional ownership and annual returns measured over the same period arises if: (1) institutional investors engage in intrayear positive-feedback trading to a greater extent than individual investors and/or (2) institutional investors' herding impacts prices to a greater extent than individual investors' herding. The latter may occur either because institutional investors herd more than individual investors and this herding impacts prices or because institutional and individual investors are equally likely to herd but institutional herding has a larger price impact (due to larger order sizes, for example).⁹

Table I, Panel B, reports the time-series average of the cross-sectional mean annual abnormal return over the herding year (months $t = 0$ to 11).¹⁰ The t -statistics are based on Fama–MacBeth (1973) standard errors (the time-series standard error of the 19 annual cross-sectional means). The results demonstrate a strong monotonic relation between changes in institutional ownership and returns. Firms in the decile experiencing the largest decrease in institutional ownership suffer average abnormal returns of -13.12

⁸ Market values are measured at the beginning of each year (the last day in September). Book values (from COMPUSTAT) are from the fiscal year ending in May or earlier (a minimum of a four-month lag). We find similar results when evaluating returns and changes in institutional ownership for capitalization or book-to-market stratified portfolios.

⁹ A positive relation between changes in institutional ownership and returns may also arise if: (1) herding does not impact returns and (2) individual investors strongly negative-feedback trade. Given extant evidence and the results presented in this study, however, we believe this scenario is unlikely.

¹⁰ Monthly abnormal returns are calculated as the difference between the raw return for firm i in month t and the cross-sectional average return for firms in the same capitalization decile in month t . Capitalization deciles (breakpoints based on firms included in our sample) are formed annually at the beginning of each October. Each firm's annual abnormal return is computed by compounding its monthly abnormal returns.

percent, statistically significant at the 1 percent level. Alternatively, those in the decile experiencing the largest increase in institutional ownership enjoy abnormal returns of 18.38 percent, again differing from zero at the 1 percent level. This positive relation between changes in institutional ownership and returns during the herding interval suggests that either institutional investors engage in intrayear positive-feedback trading to a greater extent than individual investors or institutional investors' herding has a larger price impact than individual investors' herding.

C. Post-Herding Returns

We examine post herding returns for two reasons. First, most extant work (Jensen (1968) and Gruber (1996)), suggests mutual fund managers do not, on average, perform better than other investors. Evidence that stocks institutional investors sell subsequently perform as well as stocks they buy would be consistent with extant investigations. Alternatively, evidence that stocks institutional investors buy outperform those they sell would be consistent with the hypothesis that, at the margin, institutional investors are better informed than other investors.

Second, post-herding return patterns may tell us something about whether institutional herding destabilizes asset prices. The results presented in Panel B suggest that institutional herding is associated with a large price change over the herding year (months $t = 0$ to 11). It is possible, for example, that institutional herding over the herding year drives prices away from fundamental values. If this is the case, then we may observe subsequent return reversals as stock prices eventually revert toward fundamental values. Alternatively, the lack of subsequent return reversals is consistent with the hypothesis that the herding year returns are due to information and changes in institutional ownership are correlated with information. This may occur because institutional investors are better informed than other investors (and, hence, herd toward undervalued stocks and away from overvalued stocks) or because institutional investors buy (sell) following good (bad) information. It is also possible, however, that return continuations in the year or two following the herding year reflect institutional investors continuing to drive prices away from fundamental values. That is, whether return continuations or reversals indicate destabilizing behavior depends on the time period considered. If destabilizing behavior were expected to cause "price bubbles" that burst within a one- to two-year period, then our evidence of return continuations can be interpreted as inconsistent with the hypothesis that institutional herding destabilizes asset prices. If, however, destabilizing behavior causes bubbles lasting longer than a few years, then our results may be consistent with institutional herding destabilizing asset prices. In sum, although the analysis limits the possible scenarios, return continuations in the two years following the herding interval may be consistent with both destabilizing and rational pricing.

Panel C in Table I presents the time-series average of the annual cross-sectional mean annual abnormal returns for firms within each ownership change portfolio over the first (months $t = 12$ to 23) and second years (months

$t = 24$ to 35) following the herding year. The results do not support the hypothesis that herding year returns are soon reversed. On average, in the year following the herding year, the decile of firms previously experiencing the largest increase in institutional ownership outperforms the decile of firms previously experiencing the largest decrease in institutional ownership by 5.43 percent. In the second year following the change in ownership, the institutional change portfolios exhibit similar abnormal returns.

D. Further Tests

One possible explanation for the results presented in Panel C is that positive-feedback trading institutional investors herd to past “winners” and away from past “losers.” Thus, post-herding returns may reflect the return from momentum strategies documented by Jegadeesh and Titman (1993). We begin to evaluate the relation between changes in institutional ownership, past returns, and subsequent returns by using a two-pass sorting procedure to allow variation in one variable while holding the other variable (approximately) constant. Stocks are first sorted into past-return quintiles (each year) based on their raw return over the herding year ($t = 0$ to 11). We then independently sort the stocks into quintiles based on their change in institutional ownership each herding year ($t = 0$ to 11) and form a five by five matrix of portfolios independently sorted on returns and changes in institutional ownership. Table II, Panel A, reports the time-series average of the cross-sectional mean abnormal returns for stocks in each portfolio in the year following formation (i.e., $t = 12$ to 23). Each column reports the subsequent abnormal return for stocks that differ on changes in institutional ownership but experience similar herding year performance. The second to last row in Panel A reports F -statistics based on the null hypothesis that the post-herding return does not differ across the institutional change portfolios within each lag return quintile. The last row reports the mean annual difference (and associated t -statistic) between the large increase and large decrease portfolios within each lag return quintile. Analogous statistics are reported in the last two columns for the lag performance sorted portfolios within each institutional change quintile.

The results presented in Table II suggest that both changes in institutional ownership and past year performance play a role in forecasting returns. The F -statistics reported in the second to last row of Panel A reveal that we fail to reject (at traditional levels) the null hypothesis that the change in ownership portfolios exhibit equal subsequent returns within each past performance quintile. The t -statistics however, suggest that both extreme losers and winners (the bottom and top lag performance quintiles) that previously experienced a large increase in institutional ownership significantly outperform similar lag performance stocks that previously experienced a large decrease in institutional ownership.

Nonetheless, the last two columns reveal that the change in institutional ownership does not subsume the return from momentum strategies. For three of the five change in institutional ownership quintiles, we reject the null

Table II
Analyses of Post-Herding Returns

In Panel A, stocks are sorted (each October) into quintiles based on their raw return over the "herding year" (months $t = 0$ to 11). Stocks are independently sorted into quintiles based on changes in the fraction of shares held by institutional investors over the herding year (months $t = 0$ to 11). Firms are then sorted into 25 portfolios based on their herding year return quintile and their change in ownership quintile. The time-series averages of the 18 annual cross-sectional mean abnormal returns over the following 12 months (months $t = 12$ to 23) are reported for each portfolio. Abnormal returns for each firm are computed by compounding monthly capitalization decile adjusted returns. The second to last row in Panel A reports an F -statistic based on the null hypothesis that the time-series averages of cross-sectional mean post-herding year abnormal returns (months $t = 12$ to 23) are equal across the change in ownership portfolios within each herding year performance quintile. The last row in Panel A presents a paired t -test ($n = 18$ annual differences) based on the null hypothesis that the return difference between the large increase and large decrease portfolios, within each lag performance quintile, does not differ from zero. Analogous F - and t -statistics are reported in the last two columns of Panel A for the lag performance portfolios within each institutional change quintile.

In Panel B, NYSE firms are sorted (each October) into 10 portfolios based on the fraction of shares held by institutional investors. The firms in each initial institutional ownership decile are then further sorted into 10 portfolios based on the change in the fraction of shares held by institutional investors over the following year (for a total of 100 initial institutional ownership, change in institutional ownership sorted portfolios). Firms are then reaggregated based on their change in ownership decile rank resulting in 10 initial ownership stratified, ownership change portfolios. Firms in each of these 10 portfolios are then further sorted, each year, into large (above the median firm capitalization) and small (below median firm capitalization) firms. Reported below are the time-series averages of the annual cross-sectional mean abnormal return in the year following the change in ownership (and associated Fama-MacBeth (1973) t -statistics) for small and large firms within each ownership change portfolio. The F -statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the ownership change portfolios.

Panel A: Post-Herding Returns for Stocks Sorted on Herding Year Return and Changes in Institutional Ownership									
ΔInstitutional Ownership	Loser	Quintile 2	Quintile 3	Quintile 4	Winners	F-statistic	Win.-Los. t-statistic		
Decrease	-0.0631	0.0061	-0.0141	0.0135	-0.0229	3.26**	0.0402 (1.39)		
Quintile 2	-0.0402	-0.0216	0.0162	0.0151	0.0236	4.39***	0.0638 (2.78)**		
Quintile 3	-0.0182	-0.0061	0.0080	0.0229	0.0033	0.82	0.0216 (0.61)		
Quintile 4	-0.0207	0.0139	0.0122	0.0196	0.0327	1.48	0.0533 (1.78)*		
Increase	-0.0051	0.0040	-0.0047	0.0422	0.0574	2.75**	0.0625 (1.62)		
F-statistic	1.48	0.97	1.41	0.71	1.92				
Inc.-Dec. t-statistic	0.0580 (2.16)**	-0.0021 (-0.13)	0.0093 (0.72)	0.0287 (1.55)	0.0803 (3.14)***				

Panel B: Post-Herding Abnormal Returns by Firm Size for Months 12-23									
	Large Decrease	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Large Increase
Large firms (cap > median)	-0.0153 (-0.90)	-0.0270 (-3.06)***	-0.0139 (-2.03)*	-0.0001 (-0.01)	-0.0028 (-0.40)	-0.0052 (-0.74)	0.0139 (2.09)**	0.0160 (2.01)*	0.0117 (1.12)
Small firms (cap < median)	-0.0254 (-1.45)	-0.0153 (-1.20)	-0.0146 (-0.88)	0.0043 (0.28)	0.0215 (1.65)	0.0083 (0.63)	0.0156 (1.34)	0.0136 (0.88)	0.0478 (2.71)**

***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

hypothesis (at the 5 percent level or better) that the herding year performance sorted portfolios exhibit equal subsequent returns. In only one case, however, is the difference between the winner and loser return statistically significant (at the 5 percent level or better), holding the change in institutional ownership approximately constant.

Because the two-pass results suggest that both lag performance and lag changes in ownership may forecast future returns, we further evaluate the relation by estimating annual cross-sectional regressions of the return in the year following herding (months $t = 12$ to 23) on the previous change in institutional ownership (over months $t = 0$ to 11) and the return during the herding year (months $t = 0$ to 11). To allow direct comparison of the explanatory variables, we express each in terms of its ordinal ranking scaled to lie between zero and one (see Chan, Jegadeesh, and Lakonishok (1996)).¹¹ Average coefficients across the 18 annual regressions with Fama–MacBeth (1973) t -statistics in parentheses are

$$\begin{aligned} \text{Return}_{t=12 \text{ to } 23} = & 0.1120 + 0.0427 \Delta \text{Inst. Ownership Rank}_{t=0 \text{ to } 11} \\ & (2.19)^{**} \\ & + 0.0685 \text{Return Rank}_{t=0 \text{ to } 11}, \\ & (1.47) \end{aligned} \quad (1)$$

where $**$ indicates statistical significance at the 5 percent level.¹² In sum, the regression results reported above and the results presented in Table II suggest that the change in institutional ownership helps forecast returns even after controlling for return momentum.

Previous studies document that returns from momentum strategies vary across capitalization (e.g., Jegadeesh and Titman (1993)). Therefore, it is possible that the subsequent performance of stocks institutional investors herd to (or away from) may also be related to capitalization. To examine the relation between size and post-herding returns, we partition each of the 10 ownership change portfolios (the initial institutional ownership stratified change in the institutional-ownership-sorted portfolios used in Table I) into two groups using beginning-of-herding year capitalizations (each year) and examine post-herding year returns for small and large stocks separately. Panel B of Table II reports the time-series average of cross-sectional mean abnormal returns (and associated Fama–MacBeth (1973) t -statistics) in the post-herding year for large (capitalization greater than median) and small firms within each ownership change portfolio. For stocks institutional investors sell, subsequent performance varies little across the two capitalization groups. For stocks institutional investors purchase, however, we find stronger subsequent performance in small stocks. Nonetheless, for both large

¹¹ We find similar results using unscaled variables.

¹² Because our CRSP data end in 1996 and we require post-herding returns (i.e., months $t = 12$ to 23), we estimate 18, rather than 19, annual cross-sectional regressions.

and small stocks, we reject the hypothesis of equal post-herding year abnormal returns across the institutional change portfolios (the F -statistics are significant at the 5 percent level for both small and large stocks).

One limitation of our analysis is that due to the coarseness of our institutional ownership data (once a year observations) we do not know when, exactly, the change in ownership occurs. Consider, for example, an institutional investor following a momentum strategy who buys a stock in October versus an institutional investor following a momentum strategy who buys a stock in September. In the former case, momentum returns will primarily accumulate during the herding year (given our beginning of October formation period) and return reversals may occur in the subsequent year. In the latter case, momentum returns will primarily accrue in the post-herding year. More precise dating of when the change in ownership occurs would lead to a cleaner test of importance of momentum in explaining both herding year and post-herding year returns.

E. Reconciliation with Previous Studies

Contrary to most studies of mutual fund performance (Jensen (1968) and Gruber (1996)), our results are consistent with the hypothesis that institutional investors, at the margin, purchase undervalued and sell overvalued stocks.¹³ There are several differences between this study and most previous studies that merit discussion. First, our study focuses on all institutional investors—most previous studies focus on mutual funds (a notable exception is Lakonishok et al. (1992) who focus on a sample of pension funds). Mutual funds, however, make up a relatively small proportion of total institutional ownership—at the end of 1990 (1970), for example, mutual funds accounted for less than 16 (18) percent of total institutional ownership. Second, most extant studies evaluate *average* abnormal performance. Alternatively, we focus on securities that experience large changes in institutional ownership. Thus, we evaluate the extremes for evidence that institutional investors, at the margin, are better informed than other investors.

A key difference between our results and those reported in most previous studies is that we evaluate the returns of assets held by institutional investors (ignoring transaction costs and fees) rather than the returns realized by institutional investors. Other studies using the former approach largely come to the same conclusion (see Grinblatt and Titman (1989, 1993), Daniel et al. (1997), and Wermers (1999)).

¹³ Because we are testing whether changes in institutional ownership forecast price movements, we evaluate returns immediately following the herding year. Thus, the results do not test whether an investor could garner abnormal returns from observing the change in institutional ownership (because of the reporting lag—see footnote 3). As a test of the latter hypothesis, we also evaluate the one-year abnormal returns for the year beginning in February. The decile of stocks institutional investors purchased over the herding year outperform the decile they sold by 3.58 percent, on average, over months $t = 16$ through 27 (February–January).

Another important possibility is that the stocks institutional investors purchase outperform the ones they sell because institutional investors are attracted to characteristics that are correlated with priced factors. That is, compounded monthly capitalization decile adjusted returns may not fully account for differences in risk. To evaluate this possibility, we estimate the post-herding year returns with a total of nine different methodologies—four risk-adjustment methods (capitalization adjusted, book/market adjusted, capitalization and book/market adjusted, and market adjusted) and two compounding methods (buy-and-hold abnormal returns and compounding monthly abnormal returns). Moreover, we compute abnormal returns using the Barber and Lyon (1997) algorithm for stocks in the top and bottom ownership change portfolios.¹⁴ Table III, Panel A, presents the time-series average of the annual cross-sectional abnormal post-herding year returns for the seven additional methodologies (results computed from compounding monthly capitalization decile adjusted returns are reported in Table I). Although we document some variation in the post-herding abnormal returns, we consistently find that the stocks institutional investors purchase subsequently outperform those they sell. Moreover, for every methodology, we reject the hypothesis (at the 5 percent level or better) that the ownership change portfolios exhibit equal post-herding year abnormal returns. Panel B reports the time-series mean of the cross-sectional average abnormal returns computed from the Barber and Lyon (1997) matching firm methodology. Again, we reject the hypothesis that the large increase and large decrease portfolios exhibit equal post-herding returns.¹⁵

III. Institutional Feedback Trading

Panel D in Table I reports the time-series average of the annual cross-sectional mean abnormal returns in the three ($t = -1$ to -3) and 12 ($t = -1$ to -12) months prior to the herding year for the ownership change portfolios. The results are consistent with positive feedback trading by institutional investors—on average, firms experiencing increases (declines) in institutional ownership have positive (negative) abnormal returns over the three or 12 months prior to the beginning of the herding year. The results

¹⁴ Specifically, the Barber and Lyon (1997) abnormal return is defined as the difference between the buy-and-hold return for the firm in the extreme institutional change portfolio and the return for the matched firm. The matching firm is chosen (from the other eight institutional change portfolios) as the one with the closest book-to-market ratio from those firms within 70 to 130 percent of the subject firm's capitalization.

¹⁵ It is possible that we still fail to properly account for cross-sectional risk differences. Thus, the post-herding return difference could be due to institutional investors herding to riskier stocks. Regardless, our results are inconsistent with most previous studies of mutual fund performance. That is, even ignoring cross-sectional risk differences (the market-adjusted returns), stocks that institutional investors purchase outperform those they sell, which is inconsistent with most extant studies of returns garnered by mutual funds (e.g., Gruber (1996)).

also suggest that institutional positive feedback trading plays a role in explaining the strong positive relation between annual changes in institutional ownership and returns measured over the same interval.

A. Feedback Trading and Stock Return Momentum

Because institutional investor herding is positively correlated with lag returns, it is possible that institutional feedback trading may be related to the return from momentum strategies documented by Jegadeesh and Titman (1993). To evaluate the relation between feedback trading and return from momentum strategies, we begin by sorting securities into six-month performance deciles based on their return each April through September ($t = -1$ to -6 is the six-month period prior to the institutional ownership observation). Panel A in Table IV reports the time-series average of the mean cross-sectional raw return during the formation period ($t = -1$ to -6), abnormal return during the subsequent 12 months ($t = 0$ to 11), and the change in institutional ownership over the subsequent 12 months ($t = 0$ to 11) for firms in each “momentum” portfolio.

The first two rows of Panel A reveal the familiar return momentum pattern.¹⁶ The last row in Panel A reveals that changes in institutional ownership are also related to lag performance for the momentum portfolios. Although the results are statistically significant, the changes in institutional ownership are not particularly large. On average, past winners experience an increase in institutional ownership of 0.68 percent and past losers average a 1.99 percent decrease in institutional ownership.

One potential motive for institutional positive feedback trading is institutional investors’ attraction to stock characteristics correlated with lag returns (firm size or share price). Moreover, the process of adjusting large institutional positions may take a significant amount of time (see Chan and Lakonishok (1993)). That is, there is probably a lag in changes in institutional ownership—institutional investors may slowly move to a larger stock. To examine the importance of these constraints as an explanation for institutional positive feedback trading, we begin by estimating the abnormal level of institutional ownership immediately following the end of the momentum portfolio

¹⁶ Contrary to Jegadeesh and Titman (1993) and Chan, Jegadeesh, and Lakonishok (1996), we find stronger momentum in losers than winners. Further analysis suggests at least two factors contribute to this asymmetry. First, firm size appears to play a role in explaining the asymmetry. These previous studies include AMEX and Nasdaq stocks that are typically smaller than NYSE stocks. When Chan, Jegadeesh, and Lakonishok repeat their analysis for a sample restricted to larger stocks, they also find asymmetry. Second, the asymmetry exhibits substantial variation for different formation months. Defining asymmetry as the sum of the post-formation abnormal winner and loser returns (e.g., if abnormal loser returns are minus five percent and abnormal winner returns are five percent in the year following formation, asymmetry is zero), we find asymmetry is largest for formation at the beginning of February (asymmetry = -5.83 percent) and October (asymmetry = -5.36 percent) and smallest for formation at the beginning of December (asymmetry = -1.41 percent) and July (asymmetry = -1.43 percent).

Table III
Post-Herding Returns—Alternative Methodologies

Each October (1977–1994), NYSE firms are sorted into 10 portfolios based on the fraction of shares held by institutional investors. The firms in each initial institutional ownership decile are then further sorted into 10 portfolios based on the change in the fraction of shares held by institutional investors over the following year (for a total of 100 initial institutional ownership, change in institutional-ownership-sorted portfolios). Firms are then reaggregated based on their change in ownership decile rank resulting in 10 initial ownership stratified, ownership change portfolios. For each portfolio, Panel A reports the time-series average of the annual cross-sectional mean abnormal returns (and associated Fama–MacBeth (1973) t -statistics) calculated with seven different methodologies. CARs are computed by compounding monthly abnormal returns. Abnormal buy and hold (B&H) returns are calculated as the firm's raw return over the post-herding year less the average raw return for firms in the same portfolio over the same period. Book/Market abnormal returns are the return for the subject firm less the mean return for firms in the same book/market decile (all deciles are formed annually at the beginning of each October). Capitalization decile abnormal returns are the return for the subject firm less the mean return for firms in the same capitalization decile. Capitalization and book/market abnormal returns are the return for the subject firm less the mean return for firms in the same capitalization decile and the same book/market decile. Equal-weighted (EW) market-adjusted returns are the return of the subject firm less the CRSP equal-weighted return for NYSE stocks. The F -statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the ownership change portfolios. Firms must have institutional ownership data at the beginning ($t = 0$) and end ($t = 11$) of the herding year and capitalization data at the beginning of the herding year to be included in the sample. Firms also must have COMPUSTAT book values available to be included in the book/market adjusted returns.

Panel B reports the time-series average of the post-herding annual cross-sectional mean abnormal return (and associated Fama–MacBeth (1973) t -statistic) computed from Barber and Lyon's (1997) algorithm for firms in the extreme institutional change deciles. The abnormal return is calculated as the difference between the buy-and-hold return for the subject firm and a matched firm. The matching firm is chosen (from the other eight institutional change portfolios) as the one with the closest book-to-market ratio from those firms within 70–130 percent of the subject firm's capitalization. The F -statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ for the large increase and large decrease portfolios.

Abnormal Return	Large Decrease	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Large Increase	F-stat.
Panel A: Portfolio Adjusted Returns											
Book/Market decile CAR	-0.0213 (-1.92)*	-0.0232 (-2.63)**	-0.0157 (-1.96)*	-0.0016 (-0.18)	0.0097 (1.97)*	-0.0009 (-0.14)	0.0117 (1.38)	0.0162 (1.61)	0.0101 (1.32)	0.0373 (3.24)***	4.58***
Capitalization and B/M decile CAR	-0.0223 (-2.15)**	-0.0232 (-2.93)***	-0.0179 (-2.42)**	-0.0013 (-0.17)	0.0086 (1.63)	-0.0009 (-0.14)	0.0124 (1.86)*	0.0139 (1.41)	0.0138 (1.87)*	0.0351 (3.46)***	5.40***
EW market-adjusted CAR	-0.0225 (-1.28)	-0.0218 (-1.95)*	-0.0130 (-1.50)	-0.0003 (-0.04)	0.0051 (0.70)	-0.0019 (-0.25)	0.0104 (1.25)	0.0099 (1.07)	0.0091 (0.95)	0.0258 (1.84)*	2.06**
Capitalization decile B&H	-0.0274 (-2.09)*	-0.0262 (-2.77)**	-0.0191 (-2.29)**	-0.0015 (-0.15)	0.0052 (0.75)	-0.0031 (-0.39)	0.0139 (1.81)*	0.0134 (1.46)	0.0125 (1.55)	0.0298 (1.86)*	3.63***
Book/Market decile B&H	-0.0199 (-1.82)*	-0.0268 (-2.54)**	-0.0188 (-2.24)**	-0.0007 (-0.07)	0.0120 (2.10)*	-0.0009 (-0.12)	0.0121 (1.38)	0.0175 (1.79)*	0.0091 (1.24)	0.0412 (2.68)**	4.49***
Capitalization and B/M deciles B&H	-0.0250 (-2.55)**	-0.0260 (-2.63)**	-0.0229 (-3.14)***	-0.0018 (-0.20)	0.0081 (1.24)	-0.0055 (-0.75)	0.0123 (1.77)*	0.0138 (1.41)	0.0123 (1.70)	0.0353 (2.67)**	5.13***
EW market-adjusted B&H	-0.0257 (-1.59)	-0.0251 (-2.30)**	-0.0150 (-1.81)*	-0.0009 (-0.09)	0.0055 (0.77)	-0.0030 (-0.40)	0.0115 (1.33)	0.0118 (1.23)	0.0082 (0.86)	0.0302 (1.72)	2.55***
Panel B: Matched-Firm Adjusted Returns											
Barber & Lyon abnormal returns	-0.0178 (-1.26)									0.0400 (2.99)***	8.81***

***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table IV
Momentum Portfolios and Subsequent Changes in Institutional Ownership

At the beginning of each October (1977–1990), NYSE firms are sorted into 10 portfolios based on their raw performance over the previous six months ($t = -1$ to -6). Panel A reports the time-series average of the annual cross-sectional mean raw returns for the formation period ($t = -1$ to -6), abnormal returns over the subsequent 12 months ($t = 0$ to 11), and the change in the fraction of shares held by institutional investors over the subsequent 12 months. Abnormal returns for each firm are computed by compounding monthly capitalization decile adjusted returns. Δ Institutional is the change in institutional ownership less the cross-sectional average change (each year). Panel B reports the time-series average of the annual cross-sectional mean abnormal levels of, and changes in, institutional ownership for firms in each of the 10 lag performance sorted portfolios. The “beginning” abnormal level of institutional ownership is calculated as the residual in a regression of the fraction of shares held by institutional investors immediately following the formation period (i.e., at the beginning of month $t = 0$) on the firm’s characteristics (measured at time $t = 0$): share price (measured as $\ln(1 + \text{share price})$), return standard deviation (based on monthly returns over the previous 24 to 60 months depending on availability), return variance (based on monthly returns over the previous 24 to 60 months depending on availability), liquidity (measured as $\ln(1 + \text{September volume/number of shares outstanding})$), firm size (measured as $\ln(1 + \text{equity capitalization})$), and firm size squared (measured as $(\ln(1 + \text{equity capitalization}))^2$). Similarly, the “ending” abnormal level of institutional ownership is calculated as the residual in a regression of the fractional institutional ownership one year following formation (i.e., at the end of month $t = 11$) on the same characteristics (measured at $t = 0$). The abnormal change in institutional ownership is estimated as the difference in these residuals. The F -statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the portfolios.

	Losers	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Winners	F -statistic
Panel A: Returns and Changes in Institutional Ownership: Sorted by Six-Month Prior Performance											
Formation period raw return ($t = -1$ to -6)	-0.2929	-0.1362	-0.0664	-0.0128	0.0335	0.0784	0.1262	0.1833	0.2669	0.5220	53.77***
Subsequent abnormal return ($t = 0$ to 11)	-0.0565 (-3.65)**	-0.0204 (-1.44)	-0.0009 (-0.10)	-0.0082 (-1.44)	-0.0057 (0.57)	0.0041 (0.51)	0.0130 (1.08)	0.0137 (1.50)	0.0193 (1.42)	0.0265 (1.34)	3.76***
Δ Inst. ($t = 0$ to 11)	-0.0199 (-6.26)***	-0.0031 (-1.88)*	-0.0001 (-0.06)	0.0015 (0.69)	0.0004 (0.22)	0.0024 (1.01)	0.0011 (0.72)	-0.0004 (-0.21)	0.0017 (0.90)	0.0068 (2.83)**	10.75***
Panel B: Abnormal Levels of, and Changes in, Institutional Ownership: Sorted by Six-Month Prior Performance											
Abnormal beg. % inst. ($t = 0$)	0.0026 (0.78)	0.0112 (3.23)***	0.0126 (2.99)***	0.0125 (2.92)***	0.0142 (4.31)***	0.0091 (2.28)**	-0.0024 (-0.59)	-0.0071 (-2.17)*	-0.0109 (-2.25)**	-0.0425 (-9.86)***	19.36***
Abnormal end % inst. ($t = 11$)	-0.0141 (-3.89)***	0.0092 (2.44)**	0.0133 (3.30)***	0.0141 (3.64)***	0.0158 (4.79)***	0.0131 (3.35)***	-0.0007 (-0.18)	-0.0052 (-1.29)	-0.0096 (-2.28)**	-0.0363 (-6.74)***	17.08***
Abnormal Δ inst. ($t = 0$ to 11)	-0.0167 (-7.84)***	-0.0020 (-1.40)	0.0007 (0.35)	0.0016 (0.71)	0.0016 (0.88)	0.0040 (1.97)*	0.0017 (1.30)	0.0019 (0.97)	0.0013 (0.83)	0.0062 (2.51)**	10.65***

***, **, and * Statistically significant at the 1, 5, and 10 percent levels, respectively.

formation period (the beginning of October, $t = 0$) and one year following the end of the formation period (the beginning of the following October, or, equivalently, the end of month $t = 11$). The “beginning” abnormal level of institutional ownership is estimated as the residual in a regression of the fraction of shares held by institutional investors immediately following the formation period on the characteristics (measured at $t = 0$) suggested by Falkenstein (1996): share price, return standard deviation, return variance, liquidity, firm size, and squared firm size (specific definitions are given in Table IV).¹⁷ Similarly, the “ending” abnormal level of institutional ownership is estimated as the residual in a regression of fractional institutional ownership one year following formation ($t = 11$) on the same variables. We define the abnormal change in institutional ownership as the difference in these residuals.

If feedback trading results from institutional investors slowly adjusting their positions in stocks as a result of changing firm characteristics, losers should begin the year with positive abnormal levels of institutional ownership (because institutional investors have not yet had a chance to fully adjust their positions in these stocks that have recently changed—become much smaller) and finish the year with “normal” levels of institutional ownership. Similarly, winners should begin the year with negative abnormal levels of institutional ownership (because institutional investors have not yet had a chance to buy these stocks) and end the year with normal levels of institutional ownership. The results (time-series averages of annual cross-sectional means), reported in Table IV (Panel B), are consistent with this hypothesis for winners but not for losers. Winners begin the year with negative abnormal levels of institutional ownership and move toward normal levels. Although lag winners exhibit a statistically significant increase in changes in abnormal institutional ownership, they still exhibit lower than expected levels of institutional ownership one year following the formation period. Losers, however, begin the year with institutional ownership very close to expected levels given their characteristics. As institutional investors continue to sell the losers, these firms move to negative abnormal levels of institutional ownership. The results suggest that, at least for losers, institutional investors’ attraction to certain stock characteristics fails to fully explain their positive feedback trading. Similar to Panel A, however, abnormal changes in institutional ownership are not particularly large.

To further evaluate the relation between momentum and changes in institutional ownership, we sort the extreme winner and loser deciles (based on returns measured over months $t = -1$ to -6) into five portfolios based on their change in institutional ownership over the 12 months ($t = 0$ to 11) following the formation period. Panel A in Table V reports the time-series

¹⁷ Falkenstein also includes firm age, a variable associated with the number of news stories regarding the firm, and the lag return. We do not gather the first two variables for our data. Additionally, because we are looking at abnormal levels of institutional ownership on portfolios sorted by lag performance and because we do not want to force a linear relation between lag return and the level of institutional ownership, we do not include lag return in the model. All the variables in the regression model are statistically significant and have the same signs as those reported by Falkenstein (1996).

Table V
Winners and Losers Sorted by Subsequent Changes in Institutional Ownership

At the beginning of each October (1977–1990), NYSE firms are sorted into 10 portfolios based on their raw performance over the previous six months ($t = -1$ to -6). Panel A reports the time-series mean of the annual cross-sectional average subsequent changes in fractional institutional ownership and abnormal returns over the following year ($t = 0$ to 11) for stocks in the top lag ($t = -1$ to -6) performance decile (winners) sorted into subsequent ($t = 0$ to 11) changes in institutional ownership quintiles. Similarly, Panel B reports the data for lag losers sorted into subsequent change in ownership quintiles. Abnormal returns are computed by compounding monthly capitalization decile adjusted returns. t -statistics (in parentheses) are calculated from time-series standard errors of annual cross-sectional averages. The F -statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the portfolios.

	Subsequent Decline in Institutional Ownership	2	3	4	Subsequent Increase in Institutional Ownership	F -statistic
Panel A: Winners Sorted by Subsequent Changes in Institutional Ownership						
Δ Inst. ($t = 0$ to 11)	-0.1331	-0.0322	0.0003	0.0382	0.1590	337.73***
Subsequent abnormal return	-0.0648	-0.0637	-0.0140	0.0829	0.1919	18.50***
($t = 0$ to 11)	(-2.81)**	(-2.86)**	(-0.62)	(3.40)***	(5.60)***	
Panel B: Losers Sorted by Subsequent Change in Institutional Ownership						
Δ Inst. ($t = 0$ to 11)	-0.1480	-0.0533	-0.0198	0.0123	0.1076	250.36***
Subsequent abnormal return	-0.2355	-0.1395	-0.0445	-0.0066	0.1411	25.30***
($t = 0$ to 11)	(-8.66)***	(-8.61)***	(-1.26)	(-0.40)	(3.71)***	

***, **, and * Statistically significant at the 1, 5, and 10 percent levels, respectively.

average of the cross-sectional mean of subsequent changes in institutional ownership and abnormal returns for stocks in the top past performance decile (winners). The results reveal a strong relation between subsequent returns and subsequent changes in institutional ownership. The quintile of winners that experience the largest subsequent decline in institutional ownership exhibits strong return reversals—abnormal returns average -6.48 percent in the year following formation. Alternatively, the quintile of winners that experience the largest subsequent increase in institutional ownership exhibits very strong momentum—abnormal returns average 19.19 percent in the year following formation. Panel B reports similar results for the decile of lag losers partitioned into subsequent changes in institutional ownership quintiles. In sum, the results suggest that the degree of momentum is positively related to the change in institutional ownership.

Several limitations of the momentum analysis should be noted. First, although our results demonstrate correlation between subsequent returns and subsequent changes in institutional ownership, causation remains ambiguous. That is, there are two possible reasons for this relation—either institutional investors rebalance their portfolios as a result of the subsequent momentum (institutional investors may buy past winners, but only keep those that subsequently perform well) or subsequent performance may be determined by the degree that institutional investors herd to (or away from) these stocks. Second, due to data availability, we use an atypical formation period (the third quarter of each calendar year). Because both institutional and individual investors have incentives to rebalance portfolios late in the calendar year (see Sias and Starks (1997)), our results may be clouded by seasonal rebalancing.

B. Feedback Trading, Herding, and Firm Size

Lakonishok et al. (1992) report evidence that pension fund feedback trading is largely limited to smaller capitalization stocks. In this section, we examine the relation between firm size, feedback trading, and changes in institutional ownership. We begin by sorting our sample into capitalization deciles at the beginning of each October ($t = 0$). The first column in Panel A of Table VI reports the time-series average of the annual cross-sectional mean level of institutional ownership at the beginning of each October for firms within each capitalization decile. Although we document a positive relation between firm size and the level of institutional ownership, the relation is not linear. The results suggest the positive relation is driven more from institutional investors' avoidance of small stocks rather than their attraction to large stocks. For example, there is an eight percent difference in the mean level of institutional ownership for firms in the first two capitalization deciles versus a $\frac{1}{2}$ percent difference for firms in the largest two capitalization deciles.

Next we sort firms within each capitalization decile into 10 portfolios based on their change in institutional ownership each year. The time-series average of the cross-sectional mean abnormal return in the three months prior to the herding year are reported (in Panel A) for firms within each capitalization-institutional change portfolio. (We find similar results using lag 6-, 9-, or

Table VI
Pre-Herding Year and Herding Year Abnormal Returns by Capitalization Decile

Each October (1977–1995), NYSE firms are sorted into capitalization deciles. Firms within each capitalization decile are then further sorted into 10 portfolios based on the change in the fraction of shares held by institutional investors over the following year (for a total of 100 capitalization-change in institutional-ownership-sorted portfolios). Reported below are the time-series average of the annual cross-sectional mean abnormal returns for each portfolio. The sample size is 19 annual observations. Abnormal returns are computed by compounding monthly capitalization decile adjusted returns for the period indicated: Panel A presents quarterly abnormal returns for the three months prior to the herding year; Panel B presents annual abnormal returns for the herding year. The *F*-statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the ownership change portfolios. Firms must have institutional ownership data at the beginning (*t* = 0) and end (*t* = 11) of the herding year and capitalization data at the beginning of the herding year to be included in the sample.

	% Inst.	Large Decrease	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Large Increase	F-stat.
Panel A: Pre-Herding Year Abnormal Three-Month Returns (<i>t</i> = -1 to -3)												
Smallest	0.1600	-0.0896	-0.0607	-0.0731	-0.0317	-0.0602	-0.0199	-0.0246	-0.0218	-0.0161	-0.0373	3.64***
Decile 2	0.2417	-0.0579	-0.0487	-0.0431	-0.0395	-0.0089	-0.0123	-0.0061	-0.0144	0.0042	0.0478	6.24***
Decile 3	0.2940	-0.0351	-0.0419	-0.0301	-0.0113	-0.0111	-0.0085	0.0044	0.0169	0.0310	0.0112	3.91***
Decile 4	0.3425	-0.0222	-0.0115	-0.0042	-0.0106	-0.0071	-0.0026	-0.0065	0.0023	0.0261	0.0444	3.69***
Decile 5	0.3586	0.0163	-0.0213	0.0033	0.0077	-0.0020	0.0080	0.0011	0.0159	0.0153	0.0164	1.37
Decile 6	0.3916	-0.0053	-0.0046	-0.0064	0.0088	0.0023	0.0058	-0.0095	0.0018	0.0309	0.0245	2.61***
Decile 7	0.4303	0.0121	0.0019	-0.0034	0.0021	-0.0052	0.0068	-0.0012	0.0033	0.0072	0.0129	0.52
Decile 8	0.4667	0.0146	0.0122	-0.0058	-0.0068	0.0093	-0.0050	0.0073	0.0058	0.0125	0.0221	1.22
Decile 9	0.4867	0.0111	0.0064	0.0149	0.0025	0.0167	0.0140	-0.0001	-0.0010	0.0020	0.0238	1.17
Largest	0.4918	0.0274	0.0255	0.0200	0.0132	0.0041	0.0126	0.0040	0.0047	0.0049	0.0071	1.41
Panel B: Herding Year Annual Abnormal Returns (<i>t</i> = 0 to 11)												
Smallest		-0.1666	-0.1504	-0.1168	-0.0919	-0.0087	-0.0175	-0.0601	0.0558	0.0976	0.2943	16.73***
Decile 2		-0.1068	-0.1215	-0.0730	-0.0756	-0.0517	-0.0152	-0.0168	0.0515	0.1356	0.3000	26.19***
Decile 3		-0.1501	-0.1188	-0.0673	-0.0739	0.0019	-0.0346	0.0206	0.0408	0.1127	0.3253	31.26***
Decile 4		-0.1261	-0.1327	-0.0544	-0.0709	-0.0114	0.0258	0.0289	0.0622	0.1053	0.2210	28.29***
Decile 5		-0.1075	-0.0928	-0.0497	-0.0285	-0.0234	0.0156	0.0420	0.0315	0.0570	0.1958	16.02***
Decile 6		-0.0758	-0.0974	-0.0571	-0.0142	-0.0311	0.0079	0.0077	0.0482	0.0774	0.1463	15.47***
Decile 7		-0.0610	-0.0536	-0.0630	-0.0546	-0.0370	0.0258	0.0066	0.0271	0.0663	0.1463	11.77***
Decile 8		-0.0629	-0.00601	-0.0402	-0.0206	-0.0214	-0.0003	0.0116	0.0276	0.0488	0.1167	9.83***
Decile 9		-0.0672	-0.0276	-0.0440	0.0090	-0.0086	-0.0164	0.0017	0.0076	0.0343	0.0985	8.27***
Largest		-0.0637	-0.0613	-0.0100	-0.0109	-0.0103	-0.0046	0.0107	0.0353	0.0305	0.0676	7.49***

***, **, and * Statistically significant at the 1, 5, and 10 percent levels, respectively.

12-month returns.) Consistent with Lakonishok et al. (1992), we find that institutional feedback trading is largely restricted to smaller capitalization stocks. In fact, in the largest capitalization decile, the stocks institutional investors sold exhibited higher lag performance than the stocks institutional investors purchased.

Panel B in Table VI reports the time-series average of the cross-sectional mean abnormal return over the herding year ($t = 0$ to 11) for firms within each capitalization-institutional change portfolio. The strong positive relation between changes in institutional ownership and returns measured over the same period is found for firms of all capitalizations. Although the relation is strongest for smaller stocks, there is still a very strong relation for the larger capitalization deciles.¹⁸ Within the largest capitalization decile, for example, the stocks institutional investors purchase outperform the ones they sell by more than 13 percent over the herding year.

The strong positive relation between changes in institutional ownership and returns measured over the same period that we document in Tables I and VI is consistent with two hypotheses. First, institutional investors are short-term (intra-year) positive feedback traders. Hence, when a stock does well (for whatever reason), institutional ownership grows. Alternatively, changes in institutional ownership may drive returns (price pressure). The results presented in Panel A of Table VI reveal little evidence that institutional investors are attracted to large stocks that become even larger. If institutional investors are not positive-feedback trading in these large stocks, then the positive relation between changes in institutional ownership and large firm returns measured over the same period (Panel B) must originate from price moves associated with changes in institutional ownership. Overall, the evidence is consistent with the hypothesis that both institutional positive feedback trading and price-pressure associated with changes in institutional ownership contribute to the positive relation between annual changes in institutional ownership and returns measured over the same interval.

IV. Partitioning the Price-Impact of Herding from Intraproduct Feedback Trading: An Exploratory Analysis

In this section we take a different approach to distinguishing the hypothesis that institutional investors' herding "causes" abnormal stock returns (herding price pressure) from the hypothesis that abnormal stock returns

¹⁸ There are several possible reasons for the stronger relation in small stocks. First, given the results in Panel A, part of the relation in Panel B (for small stocks) likely represents intrayear institutional positive-feedback trading. Second, if institutional herding impacts stock returns, the impact may be greater for small capitalization, and typically less liquid, stocks. Third, if the relation between changes in institutional ownership and returns results from intrayear positive-feedback trading, the larger herding year return difference for small capitalization stocks may reflect the fact that small capitalization stocks are more volatile. Therefore these stocks will exhibit larger return differences when sorted on performance or variables correlated with performance—such as the change in institutional ownership.

“cause” institutional investors to herd (intra-year positive-feedback trading). Specifically, we employ a small, but unique, dataset to attempt to untangle the causation issue.

The Trades, Orders, Reports, and Quotes (TORQ) data, compiled by Joel Hasbrouck and the NYSE, consists of all orders and transactions for 144 capitalization-stratified NYSE stocks from November 1, 1990 through January 31, 1991. Unlike most transaction data, TORQ data provide an “audit trail” of each transaction that identifies the buyer(s) and/or seller(s) as an institutional or individual investor. The audit trail consists of approximately 2.12 million NYSE trade participant records. Each trade consists of a minimum of two trade participant records (at least one buyer and one seller), but can consist of multiple buyers and/or multiple sellers (a 500-share institutional buy order is matched with a 400-share individual investor sell order and 100 specialist shares for a total of three trade participant records). Moreover, because one order can be filled over multiple trades, transactions do not necessarily reflect single orders.

We begin by replicating, with the TORQ data, the herding analysis in Section II. First, using institutional ownership for all NYSE firms as of October 1990 (data from the previous section), we again form initial institutional ownership deciles. Each TORQ firm is then assigned to its appropriate initial institutional ownership decile. In keeping with the previous sections, closed-end funds, REITs, primes and scores, and foreign companies are excluded (resulting in a sample of 114 TORQ firms). For each firm i , we estimate the change in institutional ownership between November 1, 1990 and January 31, 1991 as the total volume of shares identified as purchased by institutional investors less the total volume of shares identified as sold by institutional investors divided by the number of shares outstanding:

$$\Delta \text{Institutional Ownership}_i = \frac{\text{Institutional Buy Volume}_i - \text{Institutional Sell Volume}_i}{\text{Number of Shares Outstanding}_i}. \quad (2)$$

Within each initial institutional ownership decile, TORQ firms are then sorted by the change in institutional ownership (equation (2)).¹⁹ The two firms within each initial institutional ownership decile with the largest increase in institutional ownership are chosen to represent the “large increase” sample. Analogously, the two firms within each initial institutional ownership decile with the largest decrease in institutional ownership are chosen to represent the “large decrease” sample. Remaining firms in the TORQ data are designated

¹⁹ Because (1) not all NYSE trade participants are identified and (2) some trading occurs off the exchanges (third and fourth market trading) this measure is an estimate of the change in institutional ownership. On average (cross-sectionally), approximately 75 percent of the volume is identified as an institutional or individual investor for the 40 firms used in the analysis presented in Table VII. Following the algorithm used by Radhakrishna (1996) for the TORQ data, we estimate that, on average, specialist participation makes up nine percent of the volume, leaving approximately 16 percent of the volume as unidentified institutional or individual investor trades.

as “small change” firms. Again, following the methodology of the previous section, we reaggregate the TORQ firms across initial institutional ownership deciles, resulting in 20 TORQ firms that experienced a large decrease in institutional ownership, 20 TORQ firms that experienced a large increase in institutional ownership, and 74 TORQ firms that experienced a small change in institutional ownership.

Table VII, Panel A, presents the cross-sectional average change in institutional ownership, raw three-month return, and abnormal three-month return for firms in each sample. Consistent with the annual herding interval results presented in Section II, the TORQ firms with a large increase in institutional ownership over the three-month period experience average three-month abnormal returns of 18.83 percent versus -9.96 percent for firms with a large decrease in institutional ownership.²⁰ The remaining TORQ firms averaged three-month abnormal returns of 1.13 percent. Consistent with the previous results, we reject the hypothesis (at the 1 percent level) that firms with large decreases in institutional ownership garner the same returns as firms with large increases in institutional ownership.²¹

Although the results presented in Panel A reveal the same positive relation between changes in institutional ownership and returns documented in the previous sections, causation remains unclear. We next attempt to evaluate causation with a simple test. If intraperiod feedback trading is responsible for the relation documented in Panel A, the change in ownership should occur after the stock price has changed—that is, daily changes in institutional ownership should be positively correlated with lag returns. Alternatively, if institutional herding drives returns, the daily change in institutional ownership should be positively correlated with returns that day (the “contemporaneous” return). To formalize the test, we begin by estimating, for each firm i , the daily change in institutional ownership between November 1, 1990 and January 31, 1991 as the volume of shares identified as purchased by institutional investors on day t less the volume of shares identified as sold by institutional investors on day t , divided by the number of shares outstanding:

$$\begin{aligned} \text{Daily} \\ \Delta \text{Institutional} &= \frac{\text{Institutional Buy Volume}_{i,t} - \text{Institutional Sell Volume}_{i,t}}{\text{Number of Shares Outstanding}_i} \\ \text{Ownership}_{i,t} & \end{aligned} \quad (3)$$

²⁰ The estimated average change in institutional ownership reported in Table VII appears small relative to the average change reported in Table I. There are several likely explanations for this result. First, given that there are only 114 eligible TORQ firms, selecting the top and bottom two institutional change firms within each initial institutional ownership decile yields portfolios that more closely resemble quintiles than deciles. Second, the results reported in Table VII are based on quarterly changes in ownership—multiplying these numbers by four yields changes in ownership that more closely approximate those reported in Table I.

²¹ Because of the small sample size, we also estimate a z -statistic from a Wilcoxon rank-sum test. As with the parametric test, we reject the hypothesis that the samples garner equal returns (at the 1 percent level).

Table VII
Returns and Changes in Ownership for TORQ Trader-Type Identified Transactions

Using TORQ transaction data ($n = 114$ firms), we estimate the change in institutional ownership for each firm over three months (November 1, 1990–January 31, 1991) as the difference between the total volume of shares identified as purchased by institutional investors and the total volume of shares identified as sold by institutional investors divided by the number of shares outstanding for the firm. TORQ firms within each initial institutional ownership decile (decile cutoffs are based on all NYSE firms as of October 1990) are then sorted by their estimated change in institutional ownership. The two TORQ firms within each initial institutional ownership decile with the largest decrease in institutional ownership are chosen to represent the Large Decrease sample. Similarly, the two TORQ firms within each initial institutional ownership decile with the largest increase in institutional ownership are chosen to represent the Large Increase sample—yielding a total of 40 initial institutional ownership stratified firms that experience a large change in institutional ownership. Remaining TORQ firms with adequate data ($n = 74$ firms) represent the Small Change sample. Panel A reports the mean change in institutional ownership (over the three months), raw three-month return, and abnormal three-month return (computed by compounding capitalization decile adjusted returns) for firms in each of the three samples. The last column in Panel A reports the mean difference between the Large Increase and Large Decrease samples and the results of a t -test for difference in means.

We also estimate the change in institutional ownership each day, for each firm, as the difference between that day's volume of shares identified as purchased by institutional investors and that day's volume of shares identified as sold by institutional investors divided by the number of shares outstanding. For each of the 40 firms that experience a large change in institutional ownership, we estimate a time-series regression of the daily change in institutional ownership on the previous day's change in institutional ownership, that day's abnormal return, and the lag abnormal return (measured over the past trading day, past 5 trading days, past 10 trading days, or past 20 trading days). To allow direct comparisons of the coefficients associated with returns, we express each in terms of their ordinal ranking scaled to lie between zero and one (denoted as "rank"). Panel B reports cross-sectional average coefficients (multiplied by 100) and Fama–MacBeth (1973) type t -statistics from the 40 time-series regressions:

$$\Delta \text{Inst. Ownership}_{i,t} = \alpha_i + \beta_{1,i} \Delta \text{Inst. Ownership}_{i,t-1} + \beta_{2,i} \text{Return Rank}_{i,t} + \beta_{3,i} \text{Lag Return Rank}_{i,t} + \epsilon_{i,t}.$$

The last column in Panel B reports the cross-sectional average difference (and associated paired t -statistic) between the daily and lag return coefficients.

Panel A: Change in Ownership and Returns for TORQ Sample					
	Large Increase	Small Change	Large Decrease	Increase–Decrease (<i>t</i> -statistic)	
Change in ownership	0.0162	0.0023	−0.0106	0.0268 (6.20)***	
Raw 3-month return	0.3834	0.1884	0.0610	0.3224 (3.30)***	
Abnormal 3-month return	0.1883	0.0113	−0.0996	0.2879 (3.52)***	

Panel B: Average Regression Coefficients (× 100)					
β_1 Lag Δ Inst. Ownership	β_2 Return Rank	β_3 Lag Return Rank Measured over the Past <i>k</i> Trading Days			Difference $\beta_2 - \beta_3$
		1	5	10	20
0.0247 (2.36)**	0.0645 (7.54)***	−0.0024 (−0.20)			0.0668 (4.98)***
0.0194 (1.66)	0.0646 (7.63)***		0.0182 (1.29)		0.0463 (3.19)***
0.0207 (1.76)*	0.0625 (7.26)***			0.0062 (0.55)	0.0563 (4.99)***
0.0197 (1.87)*	0.0634 (7.62)***				0.0582 (3.52)***

***, **, and * Statistically significant at the 1, 5, and 10 percent levels, respectively.

Thus, the sum of the daily changes (equation (3)) in institutional ownership (over the November–January period) for firm i equals the total change in institutional ownership for firm i (equation (2)). For each of the 40 firms with a large change in institutional ownership, we next estimate a time-series regression of the daily change in institutional ownership on that day's abnormal return, the lag abnormal return measured over the previous 1, 5, 10, or 20 trading days (we find similar results using raw returns), and the change in institutional ownership on the previous day.²² Because returns are measured over different lengths and we want to compare the relative importance of the relations between the daily change in ownership and contemporaneous and lag returns, we express the return variables in terms of their ordinal ranking scaled to lie between zero and one (see Chan et al. (1996)).²³

$$\begin{aligned}\Delta \text{Inst. Ownership}_{i,t} = & \alpha_i + \beta_{1,i} \Delta \text{Inst. Ownership}_{i,t-1} \\ & + \beta_{2,i} \text{Return Rank}_{i,t} \\ & + \beta_{3,i} \text{Lag Return Rank}_{i,t} + \epsilon_{i,t}.\end{aligned}\tag{4}$$

Cross-sectional average coefficients ($n = 40$ TORQ firms with a large change in institutional ownership) and Fama–MacBeth (1973) type t -statistics are reported in Table VII, Panel B. The last column reports the average difference between the coefficient associated with that day's abnormal return (β_2) and the coefficient associated with lag abnormal returns (β_3).

The results suggest the relation between the change in institutional ownership and returns is primarily contemporaneous. For the four regressions presented in Panel B, we consistently reject the hypothesis that the coefficient associated with the contemporaneous return is zero. We are not able, however, to reject the hypothesis (at traditional levels) that there is no relation between the daily change in institutional ownership and lag returns. The last column reveals that we can reject (at the 1 percent level) the hypothesis that the contemporaneous and lag return coefficients are equal.

In sum, the results presented in Table VII are consistent with the hypothesis that changes in ownership occur on the same day as the price change. We find little support for the contention that the relation between the change in institutional ownership over the three-month period and the return during that three-month period primarily arises from institutional feedback trading. Inferences from these results, however, are seriously tempered with several

²² We find evidence that daily changes in institutional ownership are autocorrelated at the one-day lag. When including the lag daily change in institutional ownership, the Durbin–Watson statistic rejects the null of no autocorrelation for two of the 40 firms (three additional firms have ambiguous Durbin–Watson statistics). Nonetheless, we find similar results when the lag change in institutional ownership is excluded from the regression or when changes in institutional ownership over the previous two days are included.

²³ Twenty-four of the 40 firms in the sample have 63 daily observations. Some firms, however, have missing return data for some observations. Only two firms have fewer than 30 observations (we find similar results when we exclude these firms).

obvious limitations. First, we are dealing with a small sample of firms over a very short time period. Second, changes in institutional ownership, as measured by equations (2) and (3), may not result from institutional herding, but rather because one (or a few) institutional investors take a large position in the stock. Third, and most important, the positive relation between daily returns and daily changes in institutional ownership may result from intraday positive feedback trading—institutional investors buy (sell) immediately following good (bad) news.

V. Summary

Extant herding research takes two paths: herding by institutional investors and herding by individual investors. We bring these paths together by attempting to infer the relative importance of herding by institutional versus individual investors. The results can be summarized as follows—there is a strong positive relation between annual changes in institutional ownership and returns over the herding interval. Moreover, this relation holds across capitalizations. The result is consistent with two hypotheses: institutional investors engage in intrayear positive feedback trading to a greater extent than individual investors and/or institutional investors' herding has a larger impact on returns than individual investors' herding. Analyses of (1) feedback trading by capitalization, and (2) institutional investors' transactions for a small sample of firms over a short period support the hypothesis that both factors play a role in explaining the strong relation between changes in institutional ownership and returns measured over the same interval. Further work is needed on understanding this relation. For example, the positive relation between changes in institutional ownership and returns over the same period may arise from liquidity constraints—many institutional investors may face minimum capitalization restrictions. As a firm becomes larger, institutional ownership may grow simply because more institutional investors are allowed to hold the security in their portfolios. Similarly, institutional investors' attraction to low transactions cost securities (Falkenstein (1996)) may help explain the positive relation between returns and changes in institutional ownership. As a share price increases, transaction costs should be reduced, inducing greater holdings by institutional investors.

Although we find evidence that returns are strongly correlated with changes in institutional ownership over the herding year, we find no evidence of subsequent return reversals. In fact, stocks institutional investors purchase subsequently outperform those they sell. Moreover, returns from momentum strategies do not seem to fully explain the phenomena. The result is consistent with the hypothesis that institutional investors, at the margin, are better informed than other investors.

Additionally, changes in institutional ownership are positively correlated with lag returns. Such positive feedback trading appears to be related to the momentum pattern in stock returns. Again, however, causation remains

ambiguous—either institutional investors rebalance their portfolios as a result of return momentum or return momentum depends on the extent that institutional investors herd to, or away from, a stock.

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