Institutional Ownership Decomposition and Stock Market Returns*

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Abstract

Evidence presented in Dasgupta et al. (2011) indicates that financial institutions can be net buyers or sellers of a stock over consecutive quarters, implying the existence of trends in a stock's institutional ownership. I investigate the relation between institutional ownership and returns after controlling for trends by decomposing a stock's institutional ownership into level, slope, and residual components. I find that the level, slope, and residual components have, respectively, positive but relatively weak, strongly positive, and strongly negative relations with returns. These relations are strongest within arbitrage-constrained stocks and are the result of financial institutions investing and actively managing their equity positions based on differences and changes in underlying firm fundamentals.

Keywords: Arbitrage constraints; Firm fundamentals; Institutional demand; Market efficiency

JEL classification*: G12, G14, G20, G23*

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1. Introduction

Existing literature indicates that the trades by financial institutions are correlated with stock market returns. For example, Lakonishok et al. (1992), Nofsinger and Sias (1999), Wermers (1999), and Sias (2004) document a positive relation between quarterly institutional trades and short-term returns. In a more recent paper, Dasgupta et al. (2011) show that financial institutions can collectively be net buyers or sellers of a stock over three to five consecutive quarters. They find a negative relation between multiquarter institutional trades and long-term returns. The evidence that institutions can be net buyers or sellers of a stock over multiple quarters suggests the existence of trends in institutional ownership; in other words, there are periods where financial institutions are, in aggregate, increasing or decreasing their holdings of a stock. While the existing literature has documented the relation between institutional trades and returns prior to controlling for any trends in institutional ownership, in this paper, I investigate the relation between institutional ownership and returns *after* controlling for trends in institutional ownership.

Theoretically, trends in a stock's institutional ownership can occur if the popularity of a stock is time-varying or if institutions find it optimal to collectively trade in the same direction currently, but optimal to trade in the opposite direction in a subsequent period. A stock's institutional ownership can also show trends if some financial institutions receive a trading signal before others or if some institutions are quicker to act on a new signal than others are. In addition, trends in ownership can occur if financial institutions act as positive feedback traders or prefer stocks with certain characteristics.[1]

Given trends in a stock's institutional ownership, if the trades by financial institutions push prices in the direction of their trades (i.e., buy trades push prices up and sell trades push prices down), we would expect positive returns when a stock's institutional ownership is trending upwards and negative returns when a stock's institutional ownership is trending downwards. Thus, the extant literature might find a positive relation between institutional trades and short-term returns because, on average, heavy buying occurs during an upward trend in a stock's institutional ownership and heavy selling occurs during a downward trend in a stock's institutional ownership. Further, increases or decreases in institutional ownership that occur faster than the stock market can bear could push prices away from fundamentals, which could lead to a future reversal in returns. Therefore, continuation of the current trend could explain the positive relation between quarterly institutional trades and short-term returns documented in Lakonishok et al. (1992), Nofsinger and Sias (1999), Wermers (1999), and Sias (2004), while a reversal in the current trend could explain the negative relation between multiquarter institutional

[1] These theoretical explanations for trends are supported by the models presented in Banerjee (1992), Bikhchandani et al. (1992), De Long et al. (1990), and Hirshleifer et al. (1994). Badrinath and Wahal (2002) and Grinblatt et al. (1995) present empirical evidence that financial institutions act as positive feedback traders. Del Guercio (1996) and Falkenstein (1996) present empirical evidence that financial institutions prefer stocks with certain characteristics.

trades and long-term returns documented in Dasgupta et al. (2011).[2] I present evidence consistent with this explanation.

I also contribute to the literature on institutional demand and returns by documenting the relation between institutional ownership and returns after controlling for trends in a stock's institutional ownership. I control for trends in a stock's institutional ownership by decomposing institutional ownership into level, slope, and residual components. I find that each component has a unique relation with returns.

The level component of institutional ownership has a positive but relatively weak relation with returns. A high-low portfolio formed on the level component earns an annualized average monthly return of 9 percent in the quarter following the formation date and a cumulative return of approximately 19 percent over the five years following the formation date. High level stocks are characterized by large market capitalizations and high liquidity and institutional ownership, while low level stocks have the opposite characteristics. Additionally, high level stocks have higher and more stable return on equity than low level stocks.

I document a strong positive relation between the slope component and returns. A high-low portfolio formed on the slope component earns annualized equally- and value-weighted monthly Carhart (1997) four factor alphas of 35 percent and 12 percent, respectively. High slope stocks consistently outperform low slope stocks both before and after the portfolio formation date. In the five years leading up to the portfolio formation date, the high-low slope portfolio has a cumulative return of 86 percent. After the portfolio formation date, this portfolio has a

[2] More recently, Edelen et al. (2016) also find positive short-term and negative long-term relations between institutional trades and returns.

cumulative return of over 96 percent. Overall, over the ten years surrounding the portfolio date, the high-low slope portfolio earns a cumulative return of over 280 percent. The outperformance of high slope stocks appears to be driven primarily by financial institutions habitually purchasing stocks whose operating performance is improving over time. Relative to low slope stocks, financial institutions increase their ownership in high slope stocks by approximately 60 percentage points over the ten years surrounding the formation date. Five years before the formation date, high slope stocks have a return on equity that is five percentage points below the return on equity of low slope stocks. However, on the formation date, the return on equity of high slope stocks has improved and high slope stocks have a return on equity that is almost 7 percentage points higher than low slope stocks. Following the formation date, the return on equity of high slope stocks continues to improve relative to low slope stocks; the return on equity of high slope stocks is as much as 20 percentage points higher than low slope stocks over the next five years.

The residual component of institutional ownership has a strong negative relation with returns, which appears to be primarily driven by a large reversal in firm fundamentals and institutional trades. Over the five years leading up to the portfolio formation date, the low-high portfolio formed on the residual component loses 30 percent of its value and has institutional ownership decrease by 25 percentage points. However, following the formation date, financial institutions repurchase all of the shares that they had previously sold and the low-high residual portfolio regains all of the value it had previously lost. A similar reversal is found in return on equity. The return on equity of the low-high residual portfolio declines by five percentage points in the five years leading up to the portfolio formation date. After the portfolio formation date, the return on equity of the low-high residual portfolio increases by as much as 11 percentage points.

I also investigate the impact of arbitrage constraints on the relations between the three institutional ownership components and returns. I find that these three relations are generally strongest within hard-to-value and hard-to-arbitrage stocks.[3] In totality, the evidence presented in this paper is consistent with institutional-trades-driven mispricing arising from time variation in firm fundamentals, which persists because of arbitrage constraints. This evidence provides an explanation for the positive short-term and negative long-term relation between institutional trades and returns. In the short term, momentum in firm fundamentals results in a continuation in institutional trades and returns. However, in the long term, mean-reversion in firm fundamentals leads to a future reversal in both institutional trades and returns. Overall, these results highlight the importance of controlling for trends when analyzing the relation between institutional ownership and returns.

2. Data

Data description

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[3] This result is consistent with Edelen et al.'s (2016) hypothesis that arbitrageurs may fail to correct institutional-trades-driven mispricing because they are hesitant to take the opposite side of large institutional trades. However, arbitrageurs could make trades to counter institutional-trades-driven mispricing without having sufficient capital to fully correct the mispricing, as in Shleifer and Vishny (1997). Additionally, as suggested in Abreu and Brunnermeier (2003), arbitrageurs may find it more beneficial to allow institutional-trades-driven mispricing to persist and widen in order to earn a larger future return.

I obtain data from multiple sources. Stock returns and other stock market data are obtained from the CRSP database. Accounting information needed to calculate quarterly and annual accounting variables comes from the Compustat database. Quarterly earnings variables are linked to CRSP data at the end of the calendar quarter following the earnings report date. Earnings report dates are obtained from the Compustat and Thomson Reuters I/B/E/S databases. Where available, I use the earnings report date from Compustat; otherwise, I use the earnings report date from I/B/E/S. Following Fama and French (1992), annual accounting information from fiscal year $t - 1$ is linked to CRSP data starting in June of year t and ending in May of year $t + 1$.

Data necessary to construct institutional ownership and other related variables are obtained from the Thomson Reuters Institutional Holdings (13F) database. Mutual fund holdings data comes from the Thomson Reuters Mutual Fund Holdings database. I use a sample period from 1980 to 2010, and I control for delisting returns following the methodology used in Bulsiewicz (2013), which is described in the Appendix. The Fama and French (1993) book-to-market, firm size, and market factors, as well as the return momentum factor, are obtained from Kenneth French's personal website.[4] In all of my analyses, I use only common shares (share code equal to 10 or 11) with a price between $5 and $1,000, inclusive.

Institutional ownership components

[4] Kenneth French's website is http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

I explicitly control for trends in a stock's institutional ownership using the Hodrick-Prescott (1997) filter with λ = 1600.[5] Specifically, for each equity security in the market, I use the Hodrick-Prescott filter to decompose institutional ownership into level (*Level*), slope (*Slope*), and residual (*Residual*) components. The Hodrick-Prescott (1997) filter minimizes:

$$\sum_{t=1}^{T}(Inst_t - \tau_t)^2 + \lambda\sum_{t=2}^{T-1}[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2, \quad (1)$$

where *Inst* is institutional ownership and τ is the trend component of institutional ownership.[6] The level component measures the expected level of institutional ownership. The slope component measures the current direction and magnitude of institutional trades. The residual component is equal to the difference between actual institutional ownership and the expected or fitted level (*Level*) of institutional ownership, capturing the cumulative effect of institutional trades over multiple periods.

Institutional ownership components over time

Figure 1 plots the equally-weighted time series of *Level*, *Slope*, and *Residual*. Similar to the general increase in institutional ownership over time documented in Gompers and Metrick (2001), *Level* increases over time as well. The evidence presented in panel B shows that there are cycles in *Slope*. The lowest point occurred in the first quarter of 1998 and the highest point

Figures begin on page 37.

[5] Braun and Larrain (2005) and Hodrick and Prescott (1997) use the Hodrick-Prescott filter to control for trends in economic data, while Naes et al. (2001) and Campello and Graham (2013) use the filter to control for trends in financial data.

[6] The main results reported in this paper are robust to alternative values of λ and to de-trending institutional ownership using a linear time trend model. Additionally, I obtain similar results after controlling for non-stationarity in institutional ownership. These results are omitted for brevity.

occurred in the fourth quarter of 2003. Panel C of Figure 1 indicates cycles in *Residual* as well; that is, there are periods where institutional ownership is above or below its expected level. *Residual* obtains its highest and lowest values during the 2007-2008 Financial Crisis, consistent with heavy institutional trading at that time.

Institutional trades and trading frictions

In a frictionless efficient market where investors are not capital constrained, stock market prices should accurately reflect firm fundamentals (Fama 1991). However, Baker and Wurgler (2006) state that an uninformed demand shock of an arbitrage-constrained stock could result in mispricing. Furthermore, they suggest that hard-to-value stocks (i.e., stocks whose future cash flows are uncertain) are likely hard to arbitrage as well. Following a similar line of reasoning, institutional trades are more likely to affect the prices of hard-to-arbitrage stocks. In other words, stocks with large trading frictions or hard-to-value stocks are likely more sensitive to institutional trades than stocks with small trading frictions or easy-to-value stocks.

In this paper, I measure trading frictions using firm size and illiquidity. Illiquidity is measured using the Amihud (2002) measure. Theoretically, Gebhardt et al. (2001) show that the value of a stock is a function of its book value, return on equity, and cost of capital.[7] Because return on equity is an important driver of firm value, I measure whether or not a stock is hard to value by the volatility of return on equity. Stocks with volatile return on equity are likely harder to value than stocks with stable return on equity. Specifically, I define *Hard to Value* (*HTV*) as the standard deviation of quarterly return on equity calculated using the ten quarters before and

[7] Gebhardt et al. (2001) generate this result by rewriting the residual income valuation model presented in Ohlson (1995).

after the formation date, inclusive of return on equity on the formation date. I use *HTV* to assess whether the effect of institutional trades on prices is strongest within hard-to-value stocks.

Relation between institutional ownership components and other variables

To investigate the extent to which *Level*, *Slope*, and *Residual* are related to other known variables, I calculate correlations between the three components and additional institutional and financial variables and present the results in Table 1.[8] To minimize the effect of outliers, I have winsorized all variables at the 1st and 99th percentile each quarter. Table 1 shows that *Level* is highly correlated with raw institutional ownership, with a correlation of 97 percent. *Slope* and *Residual* have correlations of 23 percent and 40 percent, respectively, with quarterly changes in institutional ownership. However, the three components are not highly correlated with the additional institutional and financial variables.[9]

Tables begin on page 29.

3. Portfolio sorts and return regressions on institutional ownership components

Portfolio formation methodology

Next, I investigate whether there is a relation between the three components of institutional ownership and future returns, using portfolio sorts and Fama-MacBeth (1973) predictive regressions. If financial institutions push prices in the direction of their trades (i.e., buy trades push prices upwards and sell trades push prices downwards), then there should be a positive relation between *Slope* and future returns. Additionally, if the multi-period trades by financial

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[8] The additional variables are book-to-market ratio, change in institutional ownership, expected mutual fund trades, firm size, mutual fund herding, illiquidity, institutional ownership, persistence, return momentum, and residual institutional ownership.

[9] These correlations are omitted for brevity and are available from the author.

institutions result in mispricing, then there should be a negative relation between *Residual* and future returns. To investigate these hypotheses, I sort stocks on *Level*, *Slope*, and *Residual* for each calendar quarter from 1980 to 2010 and allocate them to decile portfolios using NYSE breakpoints. Each portfolio is held for one quarter.[10]

Portfolio summary statistics

After allocating stocks to decile portfolios on *Level*, *Slope*, and *Residual*, equally-weighted summary statistics are calculated for the lowest and highest deciles as well as for the low-high portfolios constructed using the two extreme deciles. Prior to computing summary statistics, I winsorize each variable at the 1st and 99th percentile each quarter. These statistics are presented in Table 2.

Table 2 shows that high *Level* stocks appear to be large, highly liquid, growth stocks, while low *Level* stocks have the opposite characteristics. Low *Slope* stocks have higher book-to-market ratios, larger market capitalizations, and lower return momentum than high *Slope* stocks. However, high and low *Slope* stocks have similar levels of institutional ownership. High *Residual* stocks have lower book-to-market ratios, more liquidity, and much higher institutional ownership, and experience more positive returns over the past year than low *Residual* stocks. Low and high *Residual* stocks have similar market capitalizations.

Fama-MacBeth predictive regression results

The relation between the three components of institutional ownership and future returns is investigated using Fama and MacBeth (1973) predictive regressions. Each calendar quarter,

[10] In this paper, I report results for quarterly formation dates and quarterly holding periods. However, I obtain similar results using annual formation dates and holding periods.

quarterly returns are regressed on lagged *Level*, *Slope*, and *Residual* and other institutional and financial control variables.[11] The estimated Fama-MacBeth coefficients for *Level*, *Slope*, and *Residual* are presented in Table 3. The results are consistent with financial institutions having an effect on equity returns, even after controlling for other common institutional and financial variables.

Panel A of Table 3 shows the results for the full sample and for two subperiods, 1980 to 1995 and 1996 to 2010. A positive relation between *Level* and returns in the first subperiod weakens in the second subperiod. There is a strong positive relation between *Slope* and future returns across the full sample. This evidence is consistent with institutions pushing prices in the direction of their trades. Furthermore, in accordance with institutional-trades-driven mispricing, the results show a strong negative relation between *Residual* and future returns. The relation between *Slope* and *Residual* and returns appears to be much stronger during the second half of the sample, consistent with the hypothesis that institutional trades affect prices more when financial institutions hold a larger percentage of outstanding shares.

The results shown in panel B of Table 3 are consistent with institutional trades having the largest effect on hard-to-arbitrage stocks. Each of the five models in panel B includes not only the institutional and financial control variables, but also interaction terms between the three institutional ownership components and three proxies for arbitrage constraints: firm size, illiquidity, and the standard deviation of return on equity (*HTV*). The estimated coefficients for

[11] The control variables are book-to-market ratio, change in institutional ownership, expected mutual fund trades, firm size, illiquidity, institutional trade persistence, mutual fund herding, residual institutional ownership, and return momentum.

the control variables are omitted from panel B for brevity.[12] Model 1 shows that firm size generally dampens the effect of institutional trades, consistent with the hypothesis that institutional trades have more of an effect on small market capitalization stocks than large market capitalization stocks. Similarly, model 2 shows that institutional trades affect the prices of illiquid stocks more than the prices of liquid stocks. Consistent with institutional trades having a larger effect on the prices of hard-to-value stocks, model 3 shows that all of the interaction terms between *Level*, *Slope*, and *Residual* and *Hard to Value* are statistically significant.

In panel B of Table 3, model 4 includes interaction terms between the three institutional ownership components. Based on the estimated sign of the interaction terms, *Level* dampens the effect of *Residual*. This is consistent with the size and illiquidity results shown in models 1 and 2: stocks with higher institutional ownership are generally liquid stocks with large market capitalizations, which are less likely to be influenced by price pressure from institutional trades. Model 4 also shows that *Residual* magnifies the *Level* effect. The intuition for this result is that high *Residual* stocks have experienced heavier institutional buying in the past than low *Residual* stocks. Therefore, the *Level* of high *Residual* stocks increases more over time than the *Level* of low *Residual* stocks.

Furthermore, model 4 shows that *Slope* magnifies the *Residual* effect. In other words, the more vigorously financial institutions are buying or selling a stock, the larger the impact their trades have on stock prices, and the more their trades push prices in a certain direction. Model 4 also shows *Residual* dampening the *Slope* effect. The intuition for *Residual* dampening the *Slope*

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[12] I obtained fairly similar results when I estimated the models presented in panel B of Table 3 without the financial control variables.

effect is: high *Residual* stocks have been more heavily purchased by financial institutions and have had higher returns in the past than low *Residual* stocks. As a result, in the future high *Residual* stocks are purchased less and have lower returns than low *Residual* stocks. Similarly, since low *Residual stocks* have been purchased less by financial institutions and have had lower returns than high *Residual* stocks, low *Residual* stocks are more likely to be heavily bought by financial institutions and have larger returns in the future than high *Residual* stocks.

Model 5 in panel B of Table 3 shows the estimated parameters from a model that combines all of the interaction terms included in models 1 to 4. The results in the combined model are similar to the models that included the interaction terms involving firm size, illiquidity, *Hard to Value*, and institutional ownership components separately. These results are consistent with the findings reported in models 1 to 4. Overall, these results suggest that the trades by financial institutions have a large impact on equity prices, especially within arbitrage-constrained stocks (i.e., small, illiquid, and hard-to-value stocks).

Portfolio returns

I also assess the relation between *Level*, *Slope*, and *Residual* and future returns using portfolio sorts. Monthly equally-weighted and value-weighted portfolio returns are calculated for decile portfolios formed on *Level*, *Slope*, and *Residual*. The average monthly raw returns and Carhart (1997) four-factor alphas for the low, high, and low-high *Level*, *Slope*, and *Residual* portfolios are presented in Table 4. The results using portfolio sorts are largely similar to the results found using Fama-MacBeth (1973) regressions: the low-high *Level* and *Slope* portfolios earn a negative return while the low-high *Residual* portfolio earns a positive return. Similar results are obtained using equally-weighted and value-weighted portfolios, as well as before and after adjusting for the Carhart (1997) book-to-market, firm size, market, and momentum factors.

Subperiod Analysis

The results for subperiods are similar to the results found using the whole sample. I divide the sample into two subperiods, 1980 to 1995 and 1996 to 2010, and calculate the average monthly Carhart (1997) four-factor alphas for those two periods. Panel A of Table 5 shows that the returns earned on the low-high *Level*, *Slope*, and *Residual* portfolios were all larger in magnitude during the second half of the sample than the first half of the sample. Again, this is consistent with financial institutions having a larger impact on prices as their ownership grows.

Subgroup analysis

I further investigate the relation between institutional trades and returns using two-way portfolio sorts. Independent of the decile portfolio allocations on *Level*, *Slope*, and *Residual*, stocks are allocated to tertile portfolios on firm size (*ME*), illiquidity (*ILIQ*), and *Hard-to-Value* (*HTV*), using 30^{th} and 70^{th} percentile breakpoints. The intersection of these sorts produces 30 *ME-Level*, *ME-Slope*, *ME-Residual*, *ILIQ-Level*, *ILIQ-Slope*, *ILIQ-Residual*, *HTV-Level*, *HTV-Slope*, and *HTV-Residual* portfolios. These portfolios are formed each calendar quarter and held for one quarter. Panels B, C, and D of Table 5 present the average monthly Carhart (1997) alphas for the low-high *Level*, *Slope*, and *Residual* portfolios constructed within each size, illiquidity, and hard-to-value tertile. The results for size subgroups are similar to the results found using Fama-MacBeth (1973) regressions: The returns to the *Level*, *Slope*, and *Residual* portfolios increase as firm size decreases. For illiquidity subgroups, the returns to the low-high *Slope* and *Residual* portfolios are largest within illiquid stocks. The *Level* effect of institutional ownership is strongest within moderately illiquid stocks using equally-weighted portfolios and within illiquid stocks using value-weighted portfolios.

Consistent with the Fama-MacBeth results presented in Table 3, Table 5 shows that the returns to portfolios formed on the three institutional ownership components are strongest within hard-to-value stocks. In fact, the returns to the low-high portfolios are more than twice as large for hard-to-value stocks as they are for easy-to-value stocks. The positive relation between *Slope* and returns and the negative relation between *Residual* and returns suggest that institutions push prices in the direction of their trades. and that after multiple periods of heavy trading, there is a reversal in returns. Overall, these results are consistent with institutional-trades-driven mispricing, especially within hard-to-arbitrage stocks.

Portfolio characteristics in event time

I investigate how institutional ownership, returns, and return on equity of the *Level*, *Slope*, and *Residual* portfolios change over time. Figure 2 shows the mean institutional ownership, cumulative mean return, and quarterly return on equity for the high and low *Level*, *Slope*, and *Residual* portfolios for the twenty quarters preceding and the twenty quarters following the portfolio formation date. I plot the mean institutional ownership, cumulative mean return, and quarterly return on equity for the high-low *Level* and *Slope* and low-high *Residual* portfolios in Figure 3. These two figures indicate that institutions push prices in the direction of changes in firm fundamentals; stocks with a reversal in firm fundamentals experience a reversal in returns and ownership.

Level portfolio characteristics in event time

Panel A of Figure 2 shows that high and low *Level* stocks have fairly stable levels of institutional ownership. High and low *Level* stocks have similar cumulative mean returns leading up to the portfolio date, but high *Level* stocks slightly outperform low *Level* stocks afterwards. As shown in panel A.3, high *Level* stocks have high and relatively stable return on equity. The underperformance of low *Level* stocks after the portfolio formation date appears to be driven by declining firm performance.

Panel A of Figure 3 shows how institutional ownership, cumulative mean return, and return on equity change over time in the high-low *Level* portfolio. in the high-low *Level* portfolio, institutional ownership increases leading up to the portfolio formation date from 55 to around 70 percent of shares outstanding, but declines afterwards to around 57 percent of shares outstanding. Panel A.2 shows that the returns to the high-low *Level* portfolio increase and then decrease prior to the formation date. Following the formation date, the high-low *Level* portfolio's returns reverse and continue to be positive afterwards. Panel A.3 of Figure 3 shows that the difference in return on equity between high and low *Level* stocks widens following the formation date. Since high *Level* stocks are much larger and more liquid than low *Level* stocks, the differences in the patterns of institutional ownership, returns, and return on equity are likely due to changes in firm fundamentals, as well as institutional trades having differing effects on stocks with varying size and liquidity.

Slope portfolio characteristics in event time

Panel B of Figure 2 shows that high *Slope* stocks are heavily purchased by financial institutions, earn high returns, and have positive and fairly stable return on equity. Low *Slope* stocks are heavily sold by financial institutions, have low returns, and have declining or negative return on equity. Meanwhile, the evidence in Figure 3 indicates that the high-low *Slope* portfolio experiences a different pattern than the high-low *Level* portfolio. The high-low *Slope* portfolio generally has increasing cumulative returns and institutional ownership both before and after the formation date. Before the formation date, the high *Slope* portfolio's institutional ownership is 30 percentage points lower than the ownership of the low *Slope* portfolio. However, after the formation date the high *Slope* portfolio's ownership is 30 percentage points higher than the low *Slope* portfolio—an increase of close to 60 percentage points. The cumulative returns of the high-low portfolio follow a similar pattern, as shown in panel B.2 of Figure 3. Starting with zero cumulative return twenty quarters prior to the formation date, the high-low portfolio has a cumulative return of 285 percent twenty quarters after the formation date, consistent with institutions pushing prices in the direction of their trades. Additionally, the high-low *Slope* portfolio has much larger returns than the high-low *Level* portfolio.

Panel B.3 of Figure 3 presents evidence that the patterns in institutional trades and returns are driven by changes in firm fundamentals. Starting twenty quarters prior to the formation date, the return on equity for high *Slope* stocks is approximately five percentage points below the return on equity of low *Slope* stocks. However, high *Slope* stocks experience improving performance relative to low *Slope* stocks. The difference in return on equity between high and low *Slope* stocks is 20 percentage points nine quarters after the formation date, and this difference gradually declines afterwards. By twenty quarters after the formation date, high *Slope* stocks see their return on equity improve by 25 percentage points relative to low *Slope* stocks. Overall, this evidence supports the theory that financial institutions trade based on recent changes in firm fundamentals and that momentum in firm fundamentals results in momentum in institutional trades and returns.

Residual portfolio characteristics in event time

Panel C in both Figures 2 and 3 present evidence that a reversal in firm fundamentals results in a reversal in institutional ownership and returns. Panel C of Figure 2 shows that leading up to the formation date, financial institutions heavily purchase high *Residual* stocks while at the same time heavily selling low *Residual* stocks. Following the formation date, the trend reverses and financial institutions heavily sell high *Residual* stocks and heavily purchase low *Residual* stocks. As shown in panel C.2 of Figure 2, high *Residual* stocks outperform low *Residual* stocks prior to the formation date, but afterward, high *Residual* stocks underperform low *Residual* stocks. The declining return on equity of high *Residual* stocks temporarily improves immediately after the formation date, but then continues to decline afterwards. Low *Residual* stocks have return on equity that improves prior to the formation date and then declines substantially following the formation date.

Per panel C of Figure 3, prior to the formation date, the low-high *Residual* portfolio loses 30 percent of its value and has its institutional ownership decline by 25 percentage points. Following the formation date, the low-high portfolio gains back all of the value and institutional ownership it lost. The results in panel C.3 are generally consistent with a shift in firm fundamentals driving the reversal in ownership and returns. Prior to the formation date, the low *Residual* portfolio experiences declining return on equity relative to the high *Residual* portfolio. Around the portfolio formation date, the firm performance reverses and the return on equity of the low *Residual* portfolio improves relative to the high *Residual* portfolio. These results support the theory that a reversal in firm fundamentals causes mispricing, which leads to a reversal in both institutional trades and returns.

Overall, these findings are consistent with i) institutions pushing prices in the direction of recent changes in firm fundamentals and ii) momentum in firm fundamentals resulting in momentum in institutional trades and returns. In addition, a shift in firm fundamentals leads to a reversal in institutional trades and returns in subsequent periods.

Institutional ownership components and changes in firm fundamentals

I further investigate the relation between institutional trades and firm fundamentals using portfolio sorts. Specifically, for each stock, I calculate the absolute standardized return on equity (*ASROE*), defined as the absolute value of standardized return on equity using return on equity data for ten quarters before and after the formation date. When calculating *ASROE*, the most recent return on equity available on the portfolio formation date is excluded from the average and standard deviation calculations. *ASROE* measures how unusual a firm's fundamentals currently are, relative to the surrounding periods.

After calculating *ASROE*, I independently allocate stocks to three portfolios on *HTV* and *ASROE* using 30th and 70th percentile NYSE breakpoints. Independent of the *HTV* and *ASROE* portfolio allocations, stocks are allocated to two portfolios on *Level*, *Slope,* and *Residual* using median NYSE values. The intersection of these sorts produces 18 (3x3x2) *HTV-ASROE-Level*, *HTV-ASROE-Slope*, and *HTV-ASROE-Residual* portfolios. Table VI presents the average monthly Carhart (1997) alphas for these portfolios.[13]

The returns to the high-low *Level* portfolios are generally weaker after controlling for the volatility of return on equity and absolute standardized return on equity. However, the *Slope* and *Residual* effects are strongest within stocks with volatile return on equity (i.e., hard-to-value stocks) and whose return on equity is substantially different from the surrounding periods. This evidence is again consistent with institutional-trades-driven mispricing due to changes in firm fundamentals.

Overall, the results presented in this section are consistent with institutional trades pushing prices in the direction of recent changes in firm fundamentals, shifts in firm fundamentals resulting in mispricing and leading to a reversal in institutional trades and returns, and arbitrage constraints magnifying the impact of institutional trades on returns.

4. Conclusion

In this paper, I investigate the relationship between institutional ownership and returns, controlling for trends in institutional ownership by decomposing institutional ownership into level, slope, and residual components. I find that each component has a unique relation with returns. I document positive relations between the level and slope components and future returns and a strong negative relation between the residual component and future returns. The evidence indicates that financial institutions take large ownership stakes in highly liquid stocks with stable

[13] I find similar results when I also control for the average level of return on equity over the twenty quarters before and after the formation date and when I calculate the standard deviation of return on equity and absolute standardized return on equity using only lagged information.

fundamentals and small ownership stakes in illiquid stocks with declining fundamentals. I provide evidence that financial institutions purchase firms with improving fundamentals and sell firms with declining fundamentals. Momentum in fundamentals causes trends in institutional ownership and momentum in returns, while shifts in firm fundamentals cause a reversal in institutional trades and returns. These results are strongest within arbitrage-constrained stocks; i.e., small, illiquid, and hard-to-value stocks. Collectively, this evidence suggests that the positive short-term and negative long-term relation between institutional trades and returns presented in the literature is driven by financial institutions modifying their equity positions based on changes in firm fundamentals. Overall, these results show the importance of controlling for trends when analyzing the relation between institutional ownership and returns.

References

Abreu, D., and M. K. Brunnermeier. 2003. Bubbles and crashes. *Econometrica* 71 (1): 173-204.

Amihud, Y. 2002. Illiquidity and stock returns: Cross-section and time-series effects. *Journal of Financial Markets* 5 (1): 31-56.

Asness, C. S., T. J. Moskowitz, and L. H. Pedersen. 2013. Value and momentum everywhere. *Journal of Finance* 68 (3): 929-85.

Badrinath, S.G., and S. Wahal. 2002. Momentum trading by institutions. *Journal of Finance* 57 (6): 2449-78.

Baker, M., and J. Wurgler. 2006. Investor sentiment and the cross-section of stock returns. *Journal of Finance* 61 (4): 1645-80.

Banerjee, A. V. 1992. A simple model of herd behavior. *Quarterly Journal of Economics* 107 (3): 797-817.

Beaver, W., M. McNichols, and R. Price. 2007. Delisting returns and their effect on accounting-based market anomalies. *Journal of Accounting and Economics* 43 (2-3): 341-68.

Bikhchandani, S., D. Hirshleifer, and I. Welch. 1992. A theory of fads, fashion, custom, and cultural change as informational cascades. *Journal of Political Economy* 100 (5): 992-1026.

Braun, M., and B. Larrain. 2005. Finance and the business cycle: international, inter-industry evidence. *Journal of Finance* 60 (3): 1097-128.

Bulsiewicz, J. G. 2013. Sample selection and the relation between investor sentiment and profitable trading strategies. Working paper, University of Utah.

Campello, M., and J. R. Graham. 2013. Do stock prices influence corporate decisions? Evidence from the technology bubble. *Journal of Financial Economics* 107 (1): 89-110.

Carhart, M. M. 1997. On persistence in mutual fund performance. *Journal of Finance* 52 (1): 57-82.

Chen, L., R. Novy-Marx, and L. Zhang. 2011. An alternative three-factor model. Working paper, University of Rochester.

Dasgupta, A., A. Prat, and M. Verardo. 2011. Institutional trade persistence and long-term equity returns. *Journal of Finance* 66 (2): 635-53.

De Long, J. B., A. Shleifer, L. H. Summers, and R. J. Waldmann. 1990b. Positive feedback investment strategies and destabilizing rational speculation. *Journal of Finance* 45 (2): 379-95.

Del Guercio, D. 1996. The distorting effect of the prudent-man laws on institutional equity investments. *Journal of Financial Economics* 40 (1): 31-62.

Edelen, R. M., O. S. Ince, and G. B. Kadlec. 2016. Institutional investors and stock return anomalies. *Journal of Financial Economics* 119 (3): 472-88.

Falkenstein, E. G. 1996. Preferences for stock characteristics as revealed by mutual fund portfolio holdings. *Journal of Finance* 51 (1): 111-35.

Fama, E. F. 1991. Efficient capital markets: II. *Journal of Finance* 46 (5): 1575-617.

Fama, E. F., and K. R. French. 1992. The cross-section of expected stock returns. *Journal of Finance* 47 (2): 427-65.

Fama, E. F., and K. R. French. 1993. Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33 (1): 3-56.

Fama, E. F., and K. R. French. 1996. Multifactor explanations of asset pricing anomalies, *Journal of Finance* 51 (1): 55-84.

Fama, E. F., and K. R. French. 2015. A five-factor asset pricing model. *Journal of Financial Economics* 116 (1): 1-22.

Fama, E. F., and J. D. MacBeth. 1973. Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy* 81 (3): 607-36.

Gebhardt, W. R., C. M.C. Lee, and B. Swaminathan. 2001. Toward an implied cost of capital. *Journal of Accounting Research* 39 (1): 135-76.

Gompers, P. A., and A. Metrick. 2001. Institutional investors and equity prices. *Quarterly Journal of Economics* 116 (1): 229-59.

Grinblatt, M., S. Titman, and R. Wermers. 1995. Momentum investment strategies, portfolio performance, and herding: A study of mutual fund behavior. *American Economic Review* 85 (5): 1088-105.

Hirshleifer, D., A. Subrahmanyam, and S. Titman. 1994. Security analysis and trading patterns when some investors receive information before others. *Journal of Finance* 49 (5): 1665-98.

Hodrick, R. J., and E. C. Prescott. 1997. Postwar U.S. business cycles: An empirical investigation. *Journal of Money Credit, and Banking* 29 (1): 1-16.

Jegadeesh, N., and S. Titman. 1993. Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance* 48 (1): 65-91.

Lakonishok, J., A. Shleifer, and R. W. Vishny. 1992. The impact of institutional trading on stock prices. *Journal of Financial Economics* 32 (1): 23-43.

Naes, R., J. A. Skjeltorp, and B. A. Odegaard. 2011. Stock market liquidity and the business cycle. *Journal of Finance* 66 (1): 139-76.

Nagel, S. 2005. Short sales, institutional investors and the cross-section of stock returns. *Journal of Financial Economics* 78 (2): 277-309.

Newey, W. K., and K. D. West. 1987. A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica* 55 (3): 703-8.

Nofsinger, J. R., and R. W. Sias. 1999. Herding and feedback trading by institutional and individual investors. *Journal of Finance* 54 (6): 2263-95.

Ohlson, J. A. 1995. Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research* 11 (2): 661-87.

Shive, S., and H. Yun. 2013. Are mutual funds sitting ducks? *Journal of Financial Economics* 107 (1): 220-37.

Shleifer, A., and R. W. Vishny. 1997. The limits of arbitrage. *Journal of Finance* 52 (1): 35-55.

Shumway, T. 1997. The delisting bias in CRSP data. *Journal of Finance* 52 (1): 327-40.

Shumway, T., and V. A. Warther. 1999. The delisting bias in CRSP's Nasdaq data and its implications for the size effect. *Journal of Finance* 54 (6): 2361-79.

Sias, R. W. 2004. Institutional herding. *Review of Financial Studies* 17 (1): 165-206.

Wermers, R. 1999. Mutual fund herding and the impact on stock prices. *Journal of Finance* 54 (2): 581-622.

Appendix

Delisting returns methodology

Previously, Beaver et al. (2007), Shumway (1997), and Shumway and Warther (1999) presented evidence that delisting returns can affect the magnitude of trading strategy returns. Following Bulsiewicz (2013), I handle delisting returns in the following manner: If a firm delists in the month following a valid non-delisting return month, then I use both the non-delisting return and the delisting return as given. If a firm has a non-delisting return and a delisting return in the same month, then I combine these two returns into one return observation using simple compounding. If a firm delists in a month and has a non-delisting return, but is missing the delisting return, I assume that the overall return for this month was −100%. In some instances, a firm delists but does not make a delisting payment until a few months following the last valid non-delisting return. In these cases, I assume that the firm makes the delisting payment in the month immediately following the last valid non-delisting return month. I adopt this policy in order to have a continuous series of monthly firm returns. In the rare instances that this delisting payment is missing, I assume that the firm experienced a delisting return of −100%.

Financial variables used

Absolute standardized return on equity (ASROE): Absolute value of standardized quarterly return on equity. Standardized return on equity is calculated as the difference between the quarterly return on equity available on the formation date, minus the average quarterly return on equity, all scaled by the standard deviation of quarterly return on equity. The average and standard deviation of return on equity are calculated using the ten quarters before and after the formation date, excluding the most recent quarterly return on equity available on the formation date.

Book-to-market ratio: Book-to-market ratio is defined as book value of equity scaled by market value of equity, following the methodology used in Fama and French (1992). Firms with negative book equity are excluded.

Change in institutional ownership (*Change IO*): The quarterly change in the total number of shares held by all financial institutions, scaled by shares outstanding. Previously used by Nofsinger and Sias (1999) to study the relation between institutional trades and returns.

Expected mutual fund trades (*EMFT*): The quarterly change in the number of shares of a particular stock held by all mutual funds, scaled by that stock's number of shares outstanding at the start of the quarter (Shive and Yun (2013)).

Firm size (ME): Share price multiplied by shares outstanding, in billions of dollars.

Hard-to-value (*HTV*): Standard deviation of quarterly return on equity calculated using the ten quarters before and after the formation date, inclusive of return on equity on the formation date.

Illiquidity (*ILIQ*): The Amihud (2002) illiquidity measure, calculated using one quarter of daily data.

Institutional ownership (*IO*): The total shares held by all financial institutions (as reported in 13F filings), scaled by shares outstanding.

Institutional trade persistence (*Persistence*): The number of consecutive quarters that a certain stock has been bought or sold by financial institutions (Dasgupta et al. (2011)). I construct this measure using a window size of three quarters.

Level component of institutional ownership (Level): Fitted value of institutional ownership after de-trending institutional ownership using the Hodrick-Prescott (1997) filter with $\lambda = 1600$.

Market: The value-weighted return of all CRSP stocks minus the one-month Treasury bill rate (Fama and French (1993, 2015)).

Mutual fund herding (*Herding*): The Lakonishok et al. (1992) mutual fund herding measure, as used in Wermers (1999), is defined as the buy herding measure if the stock is bought in net, or as the sell herding measure if the stock is sold in net.

Residual component of institutional ownership (*Residual*): Difference between the actual institutional ownership and the level component (*Level*) of institutional ownership.

Residual institutional ownership (*RIO*): The residual ownership remaining after regressing logit institutional ownership on log firm size and squared log firm size (Nagel (2005)). The goal of this variable is to capture the amount of institutional ownership that is unrelated to firm size.

Return momentum (*Momentum*): The compound return between months $t - 12$ and $t - 2$ (Asness et al. (2013) and Fama and French (1996)). Continuation in returns was originally documented in Jegadeesh and Titman (1993).

Return on equity (*ROE*): Quarterly income before extraordinary items divided by one-fourth of lagged book equity, constructed following the methodology used in Chen et al. (2011).

Slope component of institutional ownership (Slope): Quarterly difference in the level component (*Level*) of institutional ownership.

TABLE 1

Correlations between institutional variables

	(1)	(2)	(3)	(4)	(5)
(1) Change in institutional ownership	1				
(2) Institutional ownership	0.11	1			
(3) Level	0.02	0.97	1		
(4) Residual	0.40	0.27	0.06	1	
(5) Slope	0.23	0.05	0.07	-0.07	1

Notes: This table presents correlations between institutional variables. Correlations are calculated using quarterly data from 1980 to 2010. The level (*Level*), slope (*Slope*), and residual (*Residual*) components of institutional ownership are determined using the Hodrick-Prescott (1997) filter with λ = 1600. Descriptions of the other institutional variables are given in the Appendix. All variables are winsorized at the 1st and 99th percentile each quarter.

TABLE 2

Summary statistics for portfolios formed on institutional ownership components

Panel A: Portfolios formed on Level					
Decile	B/M	Firm Size	ILIQ	IO	Mom.
1(Low)	0.8417	0.2791	1.4895	0.1251	0.2540
10(High)	0.6861	1.8048	0.0538	0.8278	0.1844
Spread(10-1)	-0.1556	1.5257	-1.4356	0.7027	-0.0696
t (spread)	(-7.61)	(15.42)	(-6.59)	(42.11)	(-4.22)
Panel B: Portfolios formed on Slope					
Decile	B/M	Firm Size	ILIQ	IO	Mom.
1(Low)	0.9204	1.0956	0.4826	0.4410	0.1332
10(High)	0.6548	0.6239	0.3323	0.4281	0.3807
Spread(10-1)	-0.2656	-0.4718	-0.1504	-0.0130	0.2475
t (spread)	(-8.22)	(-5.09)	(-4.65)	(-1.17)	(8.64)
Panel C: Portfolios formed on Residual					
Decile	B/M	Firm Size	ILIQ	IO	Mom.
1(Low)	0.8521	0.9062	0.4167	0.3516	0.1891
10(High)	0.6851	0.9341	0.2821	0.5918	0.3635
Spread(1-10)	0.1670	-0.0279	0.1346	-0.2403	-0.1745
t (spread)	(4.71)	(-0.38)	(4.68)	(-18.23)	(-5.19)

Notes: This table reports summary statistics for equally-weighted portfolios formed on *Level*, *Slope*, and *Residual*. The reported statistics are time series means of cross-sectional medians calculated at the end of each calendar quarter from 1980 to 2010. Stocks are allocated to decile portfolios each calendar quarter using NYSE breakpoints. The portfolios only include common shares (share code equal to 10 or 11) of companies with a share price greater than \$5 and less than \$1,000. Descriptions of all variables are given in the Appendix. All variables are winsorized at the 1st and 99th percentile each quarter.

TABLE 3

Fama-MacBeth regressions

Panel A: Fama MacBeth regressions by subperiod			
Lagged variable:	1980 to 2010	1980 to 1995	1996 to 2010
Intercept	-0.0076	-0.0083	-0.0068
	(-0.70)	(-0.62)	(-0.40)
Level	0.0431	0.0591	0.0268
	(4.24)	(4.97)	(1.74)
Slope	1.7414	1.3682	2.1209
	(9.03)	(5.25)	(8.96)
Residual	-0.4839	-0.3858	-0.5836
	(-11.05)	(-8.06)	(-9.55)
Average adjusted-R^2	0.0842	0.0860	0.0824

Panel B: Fama MacBeth regressions with interaction terms					
Lagged variable:	(1)	(2)	(3)	(4)	(5)
Intercept	-0.0155	-0.0071	0.0194	-0.0108	0.0080
	(-1.41)	(-0.65)	(2.12)	(-1.02)	(0.89)
Firm size	0.0075	-0.0003	-0.0005	-0.0002	0.0046
	(5.12)	(-0.67)	(-1.01)	(-0.51)	(4.10)
Firm size*Level	-0.0133	.	.	.	-0.0076
	(-4.61)	.	.	.	(-3.38)
Firm size*Slope	-0.6936	.	.	.	-0.5615
	(-6.56)	.	.	.	(-6.61)
Firm size*Residual	0.0912	.	.	.	0.0459
	(7.50)	.	.	.	(3.13)
Illiquidity	0.0196	-0.0030	0.0175	0.0197	0.0202
	(1.95)	(-0.29)	(1.92)	(1.87)	(1.03)
Illiquidity*Level	.	0.0498	.	.	0.0046
	.	(1.34)	.	.	(0.13)
Illiquidity*Slope	.	1.7066	.	.	-0.3184
	.	(3.81)	.	.	(-0.35)
Illiquidity*Residual	.	-0.3387	.	.	-0.0834
	.	(-3.16)	.	.	(-0.50)

TABLE 3 (continued)

Panel B: Fama MacBeth regressions with interaction terms					
Lagged variable:	(1)	(2)	(3)	(4)	(5)
Hard to value	.	.	-0.1297	.	-0.1227
	.	.	(-3.79)	.	(-3.45)
Hard to value*Level	.	.	0.2453	.	0.2338
	.	.	(3.11)	.	(2.95)
Hard to value*Slope	.	.	6.0144	.	5.6511
	.	.	(3.99)	.	(3.40)
Hard to value*Residual	.	.	-0.6759	.	-0.4628
	.	.	(-4.45)	.	(-2.32)
Level	0.0577	0.0426	0.0046	0.0479	0.0224
	(5.25)	(4.29)	(0.50)	(4.48)	(2.05)
Level*Slope	.	.	.	-1.6443	-0.1848
	.	.	.	(-2.65)	(-0.24)
Level*Residual	.	.	.	0.7769	0.4242
	.	.	.	(9.87)	(4.56)
Slope	2.2503	1.6160	0.9509	2.5761	1.7547
	(12.00)	(8.30)	(3.58)	(7.98)	(3.92)
Slope*Residual	.	.	.	-6.7922	-7.5376
	.	.	.	(-3.49)	(-3.71)
Residual	-0.5564	-0.4618	-0.3475	-0.8611	-0.6163
	(-12.91)	(-10.44)	(-7.32)	(-11.45)	(-7.97)
Average adjusted-R^2	0.0882	0.0862	0.0896	0.0901	0.1004

Notes: This table reports estimated Fama-MacBeth (1973) coefficients from predictive regressions of quarterly returns on lagged institutional and financial variables. The Fama-MacBeth regressions are estimated at the end of each calendar quarter from 1980 to 2010. All models include the following control variables: book-to-market ratio, change in institutional ownership, expected mutual fund trades, firm size, herding, illiquidity, *Persistence*, residual institutional ownership, and return momentum. Reported *t*-statistics are in parentheses and are adjusted for autocorrelation using Newey-West (1987) standard errors.

TABLE 4

Institutional ownership components portfolio returns

Panel A: Average monthly raw returns

	Equally-weighted			Value-weighted		
	Low	High	Low-High	Low	High	Low-High
Level	0.0074	0.0159	-0.0086	0.0045	0.0120	-0.0075
	(2.52)	(5.21)	(-5.06)	(1.47)	(4.06)	(-3.44)
Slope	-0.0001	0.0258	-0.0259	0.0059	0.0166	-0.0107
	(-0.03)	(6.95)	(-13.81)	(1.48)	(4.50)	(-5.42)
Residual	0.0317	-0.0022	0.0338	0.0176	0.0041	0.0135
	(8.56)	(-0.55)	(17.35)	(5.23)	(0.97)	(6.55)

Panel B: Average monthly Carhart alphas

	Equally-weighted			Value-weighted		
	Low	High	Low-High	Low	High	Low-High
Level	-0.0032	0.0041	-0.0073	-0.0053	0.0001	-0.0054
	(-3.41)	(4.08)	(-4.37)	(-3.85)	(0.12)	(-2.63)
Slope	-0.0120	0.0136	-0.0256	-0.0048	0.0050	-0.0098
	(-9.86)	(15.41)	(-14.73)	(-2.53)	(5.00)	(-5.34)
Residual	0.0198	-0.0142	0.0340	0.0074	-0.0080	0.0154
	(17.00)	(-11.84)	(17.02)	(6.57)	(-4.03)	(6.88)

Notes: This table reports average monthly raw returns and Carhart (1997) four-factor alphas to low, high, and low-high portfolios formed on *Level*, *Slope*, and *Residual*. Stocks are allocated to decile portfolios on each of the three components at the end of each calendar quarter from 1980 to 2010, and held for one quarter. Reported returns are in decimal form and *t*-statistics are in parentheses and are calculated using Newey-West (1987) standard errors.

TABLE 5

Average Carhart alphas to low-high *Level*, *Slope*, and *Residual* portfolios by subgroup

Panel A: Portfolios formed within subperiods

	Equally-weighted			Value-weighted		
	1980-2010	1980 to 1995	1996 to 2010	1980-2010	1980 to 1995	1996 to 2010
Level	-0.0073	-0.0065	-0.0094	-0.0054	-0.0058	-0.0071
	(-4.37)	(-3.29)	(-3.45)	(-2.63)	(-3.09)	(-2.07)
Slope	-0.0256	-0.0210	-0.0301	-0.0098	-0.0087	-0.0114
	(-14.73)	(-11.02)	(-10.88)	(-5.34)	(-4.18)	(-4.25)
Residual	0.0340	0.0257	0.0419	0.0154	0.0103	0.0202
	(17.02)	(14.85)	(14.41)	(6.88)	(4.44)	(6.05)

Panel B: Portfolios formed within size subgroups

	Equally-weighted			Value-weighted		
	Small	Medium	Large	Small	Medium	Large
Level	-0.0123	-0.0099	-0.0045	-0.0147	-0.0085	-0.0015
	(-6.71)	(-4.30)	(-1.47)	(-7.75)	(-3.70)	(-0.47)
Slope	-0.0320	-0.0162	-0.0023	-0.0317	-0.0140	-0.0034
	(-15.38)	(-8.37)	(-1.13)	(-13.37)	(-7.37)	(-1.30)
Residual	0.0425	0.0205	0.0103	0.0392	0.0180	0.0096
	(17.98)	(9.06)	(4.15)	(15.65)	(8.21)	(2.90)

Panel C: Portfolios formed within illiquidity subgroups

	Equally-weighted			Value-weighted		
	Liquid	Moderate	Illiquid	Liquid	Moderate	Illiquid
Level	-0.0062	-0.0160	-0.0126	-0.0019	-0.0099	-0.0108
	(-1.43)	(-6.26)	(-7.14)	(-0.48)	(-4.05)	(-6.05)
Slope	-0.0075	-0.0228	-0.0311	-0.0041	-0.0146	-0.0247
	(-3.33)	(-10.83)	(-14.20)	(-1.57)	(-8.30)	(-11.13)
Residual	0.0140	0.0251	0.0425	0.0109	0.0185	0.0342
	(6.15)	(10.56)	(17.28)	(3.47)	(8.71)	(14.12)

TABLE 5 (continued)

Panel D: Portfolios formed within hard to value subgroups						
	Equally-weighted			Value-weighted		
	Easy	Moderate	Hard	Easy	Moderate	Hard
Level	0.0005	-0.0020	-0.0106	0.0007	0.0005	-0.0116
	(0.25)	(-1.33)	(-4.84)	(0.37)	(0.23)	(-3.88)
Slope	-0.0123	-0.0188	-0.0306	-0.0043	-0.0031	-0.0131
	(-5.60)	(-8.97)	(-13.71)	(-1.57)	(-1.30)	(-4.17)
Residual	0.0178	0.0258	0.0371	0.0055	0.0099	0.0187
	(10.06)	(11.85)	(15.09)	(2.17)	(3.18)	(6.11)

Notes: This table reports average monthly Carhart (1997) four-factor alphas to low-high *Level*, *Slope*, and *Residual* portfolios formed within size (*ME*), illiquidity (*ILIQ*), and hard to value (*HTV*) subgroups. Each quarter from 1980 to 2010, stocks are sorted into decile portfolios on *Level*, *Slope*, and *Residual*. Independent of the institutional ownership component sorts, stocks are sorted into three portfolios on *ME*, *ILIQ*, and *HTV* using 30th and 70th percentile NYSE breakpoints. Each portfolio is held for one quarter. Reported returns are in decimal form and *t*-statistics are in parentheses and calculated using Newey-West (1987) standard errors.

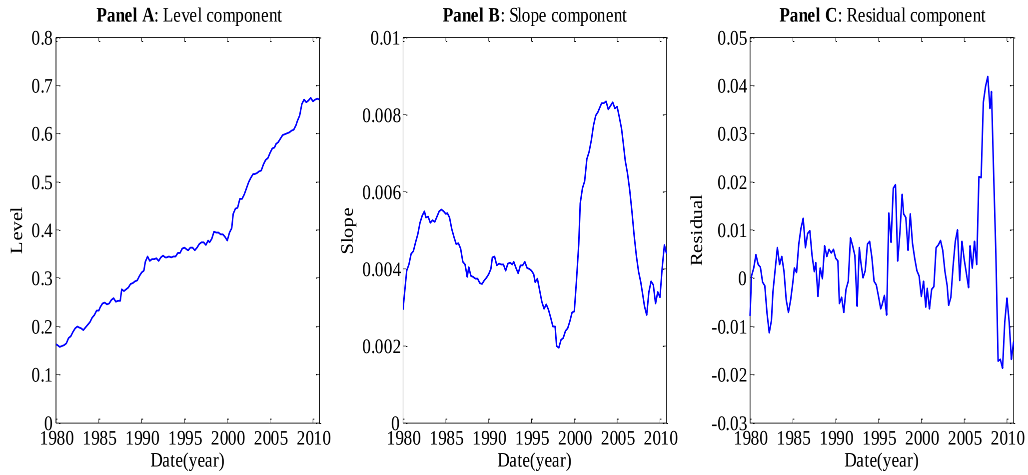
TABLE 6

Average monthly equally-weighted Carhart alphas to triple-sorted portfolios

Panel A: High-Low Level portfolio Carhart alphas			
	Easy to value	Moderate to value	Hard to value
Low ASROE	0.0012	0.0006	0.0037
	(1.08)	(0.42)	(2.02)
Moderate ASROE	0.0006	0.0010	0.0031
	(0.48)	(0.95)	(1.98)
High AZROE	0.0008	0.0018	0.0024
	(0.86)	(1.75)	(1.77)
Panel B: High-Low Slope portfolio Carhart alphas			
	Easy to value	Moderate to value	Hard to value
Low ASROE	0.0024	0.0050	0.0139
	(2.92)	(4.46)	(11.53)
Moderate ASROE	0.0029	0.0068	0.0144
	(3.43)	(7.65)	(11.10)
High ASROE	0.0024	0.0052	0.0160
	(2.80)	(5.35)	(10.28)
Panel C: Low-High Residual portfolio Carhart alphas			
	Easy to value	Moderate to value	Hard to value
Low ASROE	0.0043	0.0079	0.0150
	(4.78)	(8.08)	(10.30)
Moderate ASROE	0.0056	0.0109	0.0182
	(6.63)	(11.58)	(11.11)
High ASROE	0.0056	0.0132	0.0216
	(5.65)	(10.61)	(12.50)

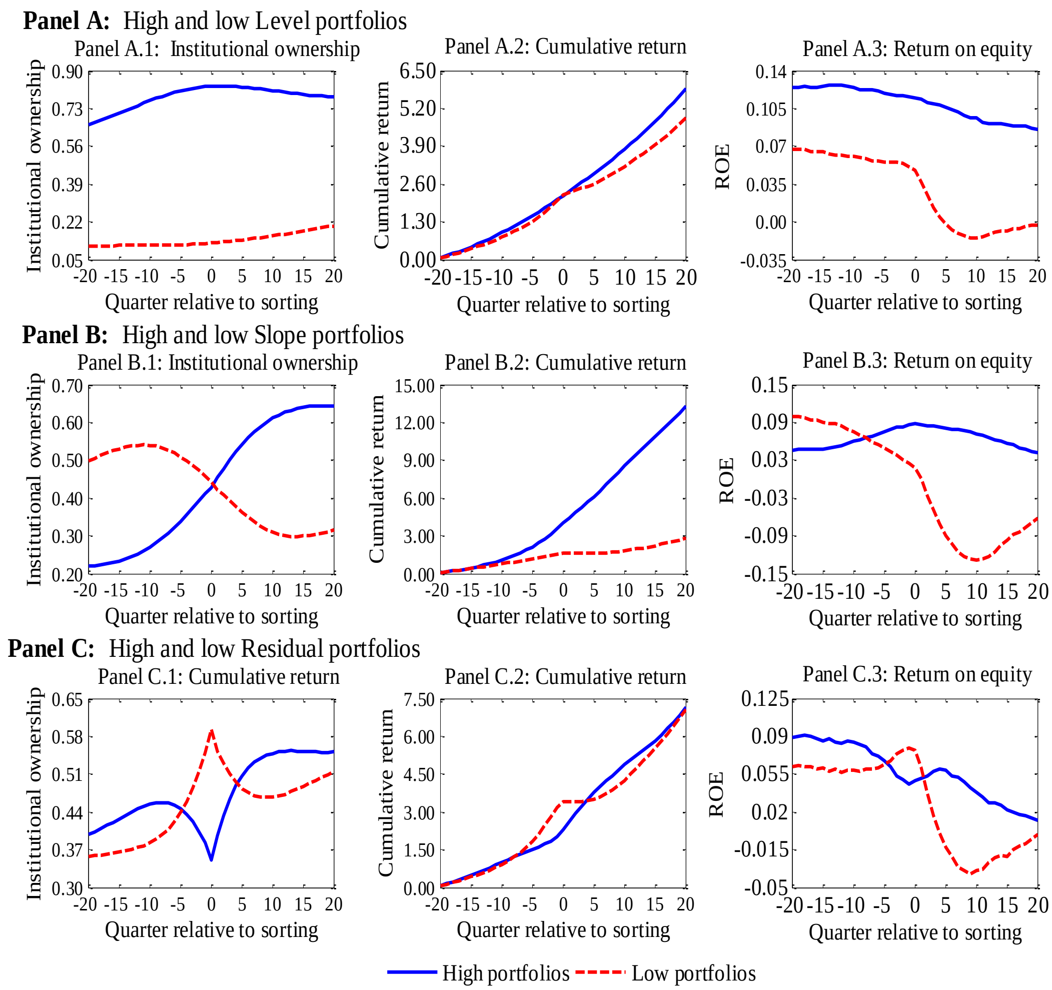
Notes: This table reports average monthly Carhart (1997) alphas to 18 equally-weighted portfolios, formed by independently sorting stocks each quarter into three portfolios on standard deviation (*Hard-to-Value* (*HTV*)) and absolute standardized (*ASROE*) return on equity using 30th and 70th percentile breakpoints and to two portfolios on *Level*, *Slope*, and *Residual* using median values. The intersection of these sorts produces 18 *HTV-ASROE-Level*, *HTV-ASROE-Slope*, and *HTV-ASROE-Residual* portfolios. Portfolios are held for three months. Reported *t*-statistics are in parentheses and are adjusted for autocorrelation using Newey-West (1987) standard errors.

Figure 1 Time series of equally-weighted institutional ownership components



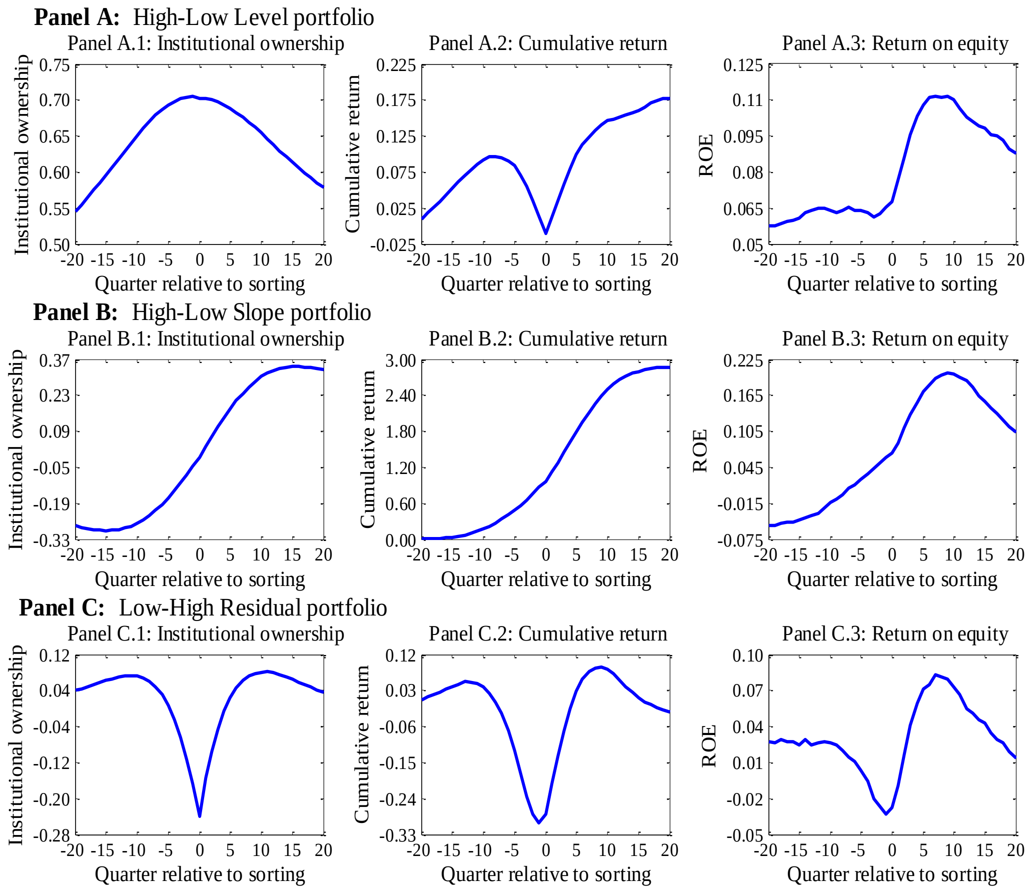
Notes: This figure plots the time series means of the level (*Level*), slope (*Slope*), and residual (*Residual*) components of institutional ownership for all common equity securities traded in the U.S. (share codes equal to 10 and 11) with a share price between \$5 and \$1,000. *Level*, *Slope*, and *Residual* are determined using the Hodrick-Prescott (1997) filter with λ = 1600.

Figure 2 Portfolio characteristics in event time for high and low portfolios



Notes: This figure plots the cumulative mean return, institutional ownership, and quarterly return on equity for the twenty quarters before and after the formation date of the high and low *Level*, *Slope*, and *Residual* portfolios. Cumulative returns are calculated using equally-weighted quarterly portfolio returns. Mean portfolio returns are calculated using quarterly stock returns that are calculated by compounding the three monthly returns earned over the quarter. Institutional ownership and quarterly return on equity are winsorized each quarter at the 1st and 99th percentiles. The figure shows time series means of cross-sectional portfolio means.

Figure 3 Portfolio characteristics in event time for high-low and low-high portfolios



Notes: This figure plots the cumulative mean return, institutional ownership, and quarterly return on equity for the twenty quarters around the formation date of the high-low *Level*, *Slope*, and *Residual* portfolios. Cumulative returns are calculated using equally-weighted quarterly portfolio returns. Mean portfolio returns are calculated using quarterly stock returns that are calculated by compounding the three monthly returns earned over the quarter. Institutional ownership and quarterly return on equity are winsorized each quarter at the 1st and 99th percentiles. The figure shows time series means of cross-sectional portfolio means.