Institutional Investors and Stock Return Anomalies

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Abstract

We examine long-short portfolios for twelve well-known pricing anomalies conditioning on whether changes in institutional investors during the year of portfolio formation are on the 'right side' or 'wrong side' of the anomaly's implied mispricing. Stocks in the long-leg of an anomaly portfolio with an increase (decrease) in institutional investors during the year of portfolio formation are labeled right side (wrong side). Stocks in the short-leg of the anomaly portfolio with a decrease (increase) in institutional investors are labeled right side (wrong side). We find that institutions are on the wrong side of anomalies more often than not and that anomaly returns are concentrated almost entirely in stocks with institutions on the wrong side. We consider several competing explanations for these puzzling results.

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The literature provides isolated evidence that institutional investors take the ‘wrong side’ of certain stock return anomalies. That is, they tend to buy overvalued stocks (short leg of anomaly portfolio) and sell undervalued stocks (long leg of anomaly portfolio).[2] For example, institutions tend to buy stocks prior to the long-run underperformance associated with net financing [Lehavy and Sloan (2008)] and seasoned equity offerings [Khan, Kogan, and Serafeim (2012), Edelen, Ince, and Kadlec (2013)]. Likewise, institutions tend to buy growth stocks and sell value stocks [Frazzini and Lamont (2008), Jiang (2010)]. The objective of this study is to document the pervasiveness of this institutional behavior across a wide range of stock return anomalies (e.g. accruals, profitability, investment, asset growth, distress, momentum, equity issuance) and to investigate candidate explanations for this behavior.

Our analysis characterizes each stock in an anomaly portfolio on the basis of whether the change in number of institutional investors during the year of portfolio formation was on the ‘right side’ or ‘wrong side’ of the anomalies’ implied mispricing.[3] Stocks in the long-leg of an anomaly portfolio with an increase (decrease) in institutional investors during the year of portfolio formation are labeled right side (wrong side). Stocks in the short-leg of the anomaly portfolio with a decrease (increase) in institutional investors are labeled right side (wrong side). Following standard practice in the asset pricing / anomalies literatures, we impose a six-month gap between our sorting variable (i.e., changes in institutional investors) and anomaly portfolio returns. This six-month gap also mitigates the effects of price pressure from serially correlated institutional trades [Sias, Starks, and Titman (2006)].

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[2] While the terms ‘overvalued’, ‘undervalued’, ‘right side’ and ‘wrong side’ have mispricing connotations, we consider potential benchmarking implications as well. We use these terms irrespective of context for consistency and clarity of trade direction.

[3] We also characterize stocks by changes in the percent of shares held by institutions. The two approaches yield very similar univariate results, but the change in number of institutions subsumes the change in percent shares held when both measures are employed simultaneously.

We frame our analysis around what we term the 'sophisticated institutions hypothesis,' which asserts that institutional investors are generally aware that widely publicized anomalies provide statistically reliable excess returns over standard performance benchmarks. These excess returns may reflect benchmark errors or mispricing, but such a distinction is not likely relevant to investment managers who are almost uniformly evaluated against these benchmarks (faulty or not). As agents to investment principals, it is reasonable to expect investment managers to maximize their performance evaluation irrespective of whether it benefits the principal (because it exploits mispriced securities) or not (because it involves trading fairly valued securities that only appear mispriced under a faulty benchmark).

Under the sophisticated institutions hypothesis, institutions should tend to position themselves on the right side of anomaly prescriptions, buying long-leg stocks and selling short-leg stocks prior to the anomalous returns. To the extent that institutions do trade on the wrong side of an anomaly's prescription, it should be confined to a subset of stocks whose future returns defy anomaly predictions [i.e., long-leg stocks that earn negative abnormal returns and short-leg stocks that earn positive abnormal returns].

Our evidence strongly rejects these predictions of the sophisticated institutions hypothesis. First, we find that institutions trade contrary to anomaly prescriptions to a remarkable degree. For example, the net change in number of institutions across long-short anomaly portfolios (i.e., the average change in the long-leg minus the average change in the short-leg) is significantly *negative* for 9 out of 12 anomalies. Notably, in 12 out of 12 cases institutions buy more short leg stocks than they sell – despite the fact that anomaly returns are largely driven by the negative returns of the short-leg portfolio [e.g. Stambaugh, Yu, and Yuan (2012)]. All evidence, including that based on changes in the percent of shares held by institutions, suggests that pre-anomaly changes in institutional investors are on the wrong side of the anomaly's implied mispricing more often than not.

Our second line of inquiry examines the relative performance of right-side and wrong-side anomaly stocks. Perhaps the contrary trading by institutions reflects selective participation whereby the long-leg stocks they sell and short-leg stocks they buy defy anomaly predictions.[4] However, our evidence rejects this prediction of the sophisticated institutions hypothesis as well. Across the 12 anomalies we examine, the monthly three-factor alpha for long-short portfolios formed using stocks where the change in institutional investors during the prior year is on the wrong side of the anomaly is 87 bps (t-stat=7.0) versus 26 bps (t-stat=2.4) for portfolios formed using stocks where the change in institutional investors is on the right side of the anomaly. Importantly, we confirm that institutions maintain their positions throughout the anomaly return interval. Thus, the long-leg stocks that institutions sell and short-leg stocks that institutions buy are in fact the primary contributors to anomaly returns.

The presence of large abnormal returns for stocks with institutions on the wrong side of anomalies and absence of abnormal returns when institutions are on the right side of anomalies is potentially consistent with limits-of-arbitrage. Suppose that institutions follow the anomaly prescription for some stocks but not others due to frictions or agency conflict [Shleifer and Vishny (1997)]. In such a setting, the long-leg stocks that institutions buy (right-side) have a relatively large increase in institutions and low future returns (i.e., underpricing has been eliminated) whereas the long-leg stocks they don't buy (wrong-side) have a relatively small increase in institutions and high future returns (i.e., underpricing persists). Likewise, the short-leg stocks that institutions sell (right-side) have a relatively low increase in institutions and

[4] For example, Gibson, Safieddine, and Sonti (2004) find that SEOs with the greatest increase in institutional investors outperform over the 3 months following the offering.

relatively high future returns (i.e., overpricing eliminated) whereas the short-leg stocks they don't sell (wrong-side) have relatively low future returns (i.e., overpricing persists).

Our evidence rejects this limits-of-arbitrage explanation on several counts. First, we find no material difference in characteristics of right-side and wrong-side stocks on dimensions commonly associated with limits-of-arbitrage (such as market capitalization, idiosyncratic risk, liquidity, shares held by institutions). For example, idiosyncratic risk is a key firm characteristic associated with limits-of-arbitrage [e.g. Pontiff (2006)]. The Sharpe ratio normalizes returns for differences in idiosyncratic risk. Yet, the Sharpe ratio of the three-factor alpha for a portfolio of stocks with institutions on the wrong side of anomalies (0.44) is almost three times as large as the Sharpe ratio for a portfolio of stocks with institutions on the right side (0.16). This difference in performance, controlling for a key limits-of-arbitrage variable, is similar to the difference in three-factor alphas between wrong and right sided stocks (i.e., 3 to 1).

Second, the pattern of changes in institutions that we document is inconsistent with limits-of-arbitrage. For example, the average wrong-side long-leg stock has a *decrease* in number of institutions. While frictions might deter institutions from buying stocks in the long-leg portfolio, they would not induce selling. Likewise, the average wrong-side short-leg stock has an *increase* in institutions. Again, while frictions might deter selling they would not induce buying. Some studies argue that institutions' inability to engage in short sales contributes to persistence in overpricing [Hong and Sraer (2012), Stambaugh, Yu, and Yuan (2013)]. Our evidence suggests that these short-sale constraints are not binding. Not only do institutions forego selling their existing holdings in short-leg anomaly stocks; they increase their collective holdings in short-leg stocks that appear to be most overvalued. Indeed, our results are consistent with Lewellen's (2011) argument that book-to-market and momentum anomalies cannot be attributed to limits-of-arbitrage that prohibit institutional investors from exploiting the anomalies.

The negative relation between changes in institutions and future anomaly returns is also potentially consistent with price reversals from investor flow. While the six-month gap we impose between changes in institutions and anomaly returns largely precludes daily or even monthly price-pressures, recent evidence suggests that the effects from correlated flow can be protracted [i.e., as in Coval and Stafford (2007), Frazzini and Lamont (2008), and Khan, Kogan, and Serafeim (2012)]. Thus, we provide several robustness checks and alternative methodologies to control for flow. These analyses yield no indication that flow is a factor behind our results. For example, we find nearly identical results when we exclude mutual funds from our sample – where flow effects are likely to be most severe. Alternatively, when we restrict our sample to only mutual funds and directly control for flow using the methodology developed in Coval and Stafford (2007), we again find nearly identical results.

The two most salient remaining interpretations of our rejection of the sophisticated institutions hypothesis mirror the two possible interpretations of anomalies themselves. It could be that anomalies reflect mispricing, in which case our evidence strongly suggests that institutions themselves contribute to that mispricing. Alternatively, it could be that anomalies reflect errors in standard return benchmarks, in which case our evidence provides insights into the source of those benchmarking errors. That is, it narrows the source of benchmarking errors to something that is highly correlated with changes in the stocks' institutional investor base. As is often the case in such matters, we find evidence consistent with both interpretations.

To distinguish the two, we look for evidence of larger biases in cash flow expectations for anomaly stocks with institutions on the wrong side, using the earnings announcement methodology pioneered in Bernard and Thomas (1990).[5] We find a statistically significant average price increase (decrease) around future earnings announcements for long-leg (short-leg) stocks with institutions on the wrong side, but no such evidence for stocks with institutions on the right side. Because it is unlikely that price revisions during a narrow window surrounding earnings announcements reflect benchmarking errors, the fact that those revisions are significant only for stocks with institutions on the wrong side suggests that wrong-sided institutional trading contributes to mispricing.

However, other evidence appears more consistent with the benchmarking interpretation. For example, we find that anomaly returns are unrelated to changes in the quantity of stock held by institutions after controlling for changes in the number of institutions holding the stock. This suggests a curious role for institutions under the mispricing interpretation: institutional trades contribute to mispricing if and only if they reflect new entry or complete exit from a stock. This result appears more consistent with the potential role of breadth of ownership in asset pricing, as in models of market segmentation [Merton (1987), Allen and Gale (1994), Basak and Cuoco (1998), Shapiro (2002)], and models of liquidity [Amihud and Mendelson (1986) Vayanos (1998), Acharya and Pedersen (2005)].

While puzzling, our rejection of the sophisticated institutions hypothesis is consistent with recent evidence that institutional herding can be destabilizing [see i.e., Coval and Stafford (2007), Frazzini and Lamont (2008), Gutierrez and Kelly (2009) and Dasgupta, Prat, and Verardo (2011)]. This is particularly so given our metric (changes in number of institutions) is highly correlated with standard herding measures [Jiang (2010)]. However, the fact that institutions trade contrary to widely known ex-ante valuation signals casts doubt on herding

[5] See Lewellen (2010) for a discussion of tests of short-horizon return predictability around future earnings announcements.

motives related to information acquisition. Moreover, the fact that our results our not related to persistence in institutional demand [Dasgupta et al (2011)], casts doubt on reputational herding. To the extent that the institutional behavior we document is herding, our evidence points to common tracking of firm characteristics as the explanation [Lakonishok, Shlefer, and Vishny (1994), Del Guercio (1996), Falkenstein (1996), Gompers and Metrick (2001), Barberis and Shleifer (2003), Bennett, Sias, and Starks (2003)].

In the broadest sense, our paper is most similar to Lewellen (2011) in that our basic question is whether institutions act as informed market participants vis à vis anomalies. Our general conclusions are similar – no they do not. We differ in that we consider dynamic measures of institutional participation in anomaly stocks (changes in institutional holdings over the prior year) versus static holdings, and we delve into more detail regarding the relation between anomaly prescribed holdings, institutional holdings, and conditional anomaly returns.

In what follows, Section I describes the data and variables used in our analysis. Section II documents changes in institutional investors prior to anomaly portfolio formation. Section III examines the returns to anomalies conditioning on changes in institutional investors. Section IV discusses possible explanations and Section V concludes the study.

I. Sample, Data, and Variable Definitions

A. Stock Return Anomalies

Table I presents a detailed description of the twelve stock return anomalies we examine along with a primary literature reference. The list includes ten of the eleven anomalies in Stambaugh, Yu, and Yuan (2012) plus book-to-market and the undervalued minus overvalued factor of Hirshleifer and Jiang (2010).[6] From Table I, the anomalies reflect sorts on various measures of financing, investment, profitability, past stock returns, and financial distress. Data on the defining anomaly characteristics and stock returns is obtained from Compustat, the SDC Global New Issues, and CRSP databases. Our initial sample includes all common stock traded on NYSE, AMEX, and Nasdaq from July 1981 through June 2012 (data for institutional holdings starts in 1981). We require firms to have non-missing institutional ownership data from Thomson-Reuters and non-zero institutional holdings either at the beginning or the end of the portfolio formation period. In addition, we exclude utilities, financials, and stocks priced under $5 – results are nearly identical if we include them.

[Table I around here]

For each anomaly except momentum we rank stocks on June 30th of each year t, using data observed either at the calendar year-end or fiscal year-end of year *t*-1.[7] We then form long-short portfolios by taking opposing equal-weighted positions in the top and bottom tercile stocks (positive position in undervalued stocks and negative position in overvalued stocks). In the case of momentum, we use a one-month rather than six-month gap between the rank period data and portfolio formation, and monthly rather than annual rebalancing – as is standard convention in the momentum literature.

Table II documents the magnitude and statistical significance of returns for each of the twelve anomalies over the period 1982-2012. Our analysis examines the returns to the long leg and short leg separately as well as the overall long-short portfolio. Table II confirms the presence of each of the twelve anomalies during our sample period. In particular, the Fama-French (1993)

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[6] We exclude failure probability from the eleven anomalies in Stambaugh, Yu, and Yuan (2012) due to its high degree of overlap with Ohlson's (1980) O-score measure of financial distress.

[7] Two of the anomalies (composite equity issuance and undervalued minus overvalued) use more than one year of historical data (five and two years, respectively).

three-factor abnormal returns for the long-short portfolio are economically and statistically significant for each anomaly. From Table II the monthly abnormal returns range from 0.31% (t-stat=4.6) for the accruals anomaly to 1.09% (t-stat=4.5) for momentum. Also note that, consistent with several studies, the anomalies derive most of their abnormal returns from the short leg of the portfolio ('overvalued' stocks). Several studies attribute this long-short asymmetry to Miller's (1977) argument that differences of opinion under short-sale constraints can cause overpricing [see i.e., Diether, Malloy, and Scherbina (2002), and Stambaugh, Yu, and Yuan (2012)].

[Table II around here]

B. Changes in institutional investors

The literature on institutional trading typically constructs measures of trading activity from either the number of institutions holding the stock or the fraction of shares held by institutions.[8] While we consider both measures (and several additional trading metrics), our analysis focuses on the number of institutions holding the stock for several reasons. First, we are primarily interested in discretionary trades of institutions, and changes in the number of institutions holding a stock are less likely to be driven by nondiscretionary considerations such as investor flow [Khan et al. (2012)] and portfolio rebalancing in comparison to changes in the fraction of shares held. Second, the number of institutional investors captures the breadth of institutional trading whereas the fraction of shares held can be driven by the actions of a few large institutions. Breadth of ownership/trading is directly linked to future returns in several theoretical models via investor recognition and herding. Finally, studies suggest that the quantity of shares

[8] A number of studies use actual time-stamped trade records obtained from transaction analytic services such as Able-Noser or Plexus. While this data is more detailed, it has considerably less coverage.

traded contains little incremental information relative to the number of trades [see, i.e., Jones, Kaul, and Lipson (1994)].

II. Do institutions trade on the right side of anomalies?

Our primary measure of institutional trading is the percentage change in the number of institutional investors (Δ #Inst) over calendar year *t*-1. Note that this period ends six months prior to the measurement of anomaly portfolio returns, beginning June 30 of year *t*. A six-month gap between changes in institutional holdings and returns follows standard convention in the asset pricing and anomalies literature (for all but momentum). Moreover, this gap mitigates potential price pressure from serially correlated institutional trades [Sias, Starks, and Titman (2006)]. However, in the case of momentum we follow the convention in that literature and employ a one-month gap, due to the dependence of momentum returns on the horizon. Where relevant, the potential effects of this one-month gap will be noted.

As previously noted, to differentiate between various competing hypotheses we employ several alternative measures of trading activity, including the change in the fraction of shares held by institutional investors (Δ %Inst); the change in the fraction of shares held by mutual funds (Δ %MF); and the percentage change in number of shareholders of record ('individual' shareholders). Data on institutional holdings is obtained from Thomson-Reuters Institutional Holdings (13F); data on mutual fund holdings are from Thomson-Reuters Mutual Fund Holdings database; and data on number of shareholders of record is from Compustat. All holdings data are winsorized at the 1st and 99^{th} percentiles to address outlier concerns.

Table III documents changes in the number of institutional investors prior to each anomaly's return interval, along with the alternative trade measures. For purposes of comparison, neutral stocks (middle tercile of anomaly ranking) show an average Δ #Inst of 22.6%, reflecting a general increase in both the size and number of 13F institutions during the sample period. Long leg stocks show a slightly higher average increase of 24.9% and short leg stocks show a much higher average increase of 37.7%. Under the sophisticated institutions hypothesis one would expect to observe the opposite – a relatively large Δ #Inst for stocks in the long leg of the anomaly and a relatively small Δ #Inst for stocks in the short leg of the anomaly. This contrary trading pattern of institutions holds in nine of the twelve anomalies.[9]

[Table III around here]

Anomalies based on past operating and stock return performance are the exception. In these cases the change in institutional investors is in line with the anomaly's prescription. For gross profitability (GP), return on assets (ROA), and stock return momentum (MOM), Δ#Inst for stocks in the short leg is significantly smaller than Δ#Inst for stocks in the long leg. This might be due to institutions' tendency to chase past performance [see i.e., Falkenstein (1996)]. Additionally, in the case of stock return momentum the trading pattern might be an artifact of a mechanical (positive) relation between the momentum ranking variable (past returns) and contemporaneous changes in institutional investors via price pressures [see for example Sias, Starks, and Titman (2006)].

Table III Panel B replicates the analysis of Panel A using changes in the fraction of stock held by institutional investors. The results are similar to those for changes in number of

[9] To address concerns of potential outliers we also examine changes in institutional investors at an aggregate level. We first sum the number of intuitional investors at the end of calendar year t-1 in stocks in each leg then subtract the number at the beginning of calendar year t-1, and divide by the latter. The same pattern emerges: pre-anomaly changes in institutional investors are much greater in stocks that are 'overvalued' than stocks that are 'undervalued'.

institutions. In nine out of the twelve anomalies the increase in the fraction of stock held is greater for stocks in the short leg of the anomaly than for stocks in the long leg of the anomaly. Thus, the tendency for institutions to trade contrary to the implied mispricing of the anomalies is evident from both the fractional change in the number of institutional investors holding the stocks and the change in the fraction of shares held by institutional investors.

Table III Panel C replicates the analysis of Panel B, using changes in the fraction of stock held by mutual funds. With mutual funds the magnitudes are smaller and in only six out of the twelve anomalies is the increase in the fraction of stock held greater for stocks in the short leg of anomaly. Finally, Panel D uses changes in the number of shareholders of record (i.e., total number of shareholders) during the fiscal year ending in calendar year t-1. Ten out of the twelve anomalies exhibit a larger increase in the number of shareholders in the short leg. We investigate the marginal explanatory power of these alternative measures of changes in firms' investor base for future stock performance in tables VII and VIII of Section IV.A.

III. Anomaly returns and changes in institutional investors

A. Selective Participation

The fact that institutions take positions contrary to anomaly prescriptions does not necessarily imply that these positions underperform. It could be that the specific long-leg stocks they sell and short-leg stocks they buy do not participate in anomaly returns.[10] We refer to this as the selective participation hypothesis. To more precisely link the institutions' trades to returns, this section focuses on the relation between ex-ante changes in number of institutional investors and ex-post, conditional anomaly returns.

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[10] For example, Gibson, Safieddine, and Sonti (2004) find that SEOs experiencing the greatest increase in institutional investors outperform over the 3 months following the offering.

Table IV reports the monthly Fama-French (1993) three-factor alphas to the long and short legs of each of the twelve anomalies using sub-portfolios that condition on whether changes in institutional investors during the year prior to portfolio formation are on the right side or wrong side of the anomaly's implied mispricing. The right side conditional portfolio contains long-leg anomaly stocks with the largest increases in institutional investors and short-leg stocks with the largest decreases in institutional investors. The wrong side conditional portfolio contains long-leg anomaly stocks with the largest decreases in institutional investors and short-leg stocks with the largest increases. More precisely, for each anomaly we conduct an independent double sort of all stocks on the basis of Δ #Inst in calendar year *t*-1 and the anomaly ranking variable in the fiscal year ending in calendar year *t*-1.[11] We then assign the intersection of the long and short leg of each anomaly with the top and bottom quintiles of changes in institutional investors as right side or wrong side conditional portfolios as defined above.

[Table IV around here]

These conditional portfolios address the selective participation hypothesis outlined above, wherein institutions trade only those long and short leg anomaly stocks in which returns are favorable (to their contrary position). The selective participation hypothesis follows the mutual fund literature, where dozens of papers use the Grinblatt and Titman (1989) holdings-based approach to evaluate fund managers' portfolio selection by relating changes in holdings in period *t*-1 to abnormal returns in period *t*. In many cases these studies show that changes in mutual fund holdings are positively related to future abnormal returns. Applied to our anomalies setting, this literature suggests that right side conditional arbitrage portfolios should yield large abnormal

[11] We assign stocks with zero institutional holdings at the beginning of year *t*-1 and non-zero institutional holdings at the end of year *t*-1 into the highest Δ#Inst quintile. Excluding these stocks from the sample does not alter any of our inferences.

returns that are favorable to their position (positive on the long side, negative on the short side) and wrong side portfolios should yield negligible abnormal returns.

We find exactly the opposite: anomaly returns are particularly large for stocks with institutions on the wrong side and are essentially nonexistent for stocks with institutions on the right side. This pattern holds not only for the conditional long-short portfolios but also the individual long and short legs as well. From Table IV Panel A, wrong-side long-leg portfolios have an average monthly abnormal return of 0.22 (t-stat=2.6) versus 0.09 (t-stat=1.0) for right-side long-leg portfolios. Similarly, wrong-side short-leg portfolios have an average monthly abnormal of -0.65 (t-stat=-4.8) versus -0.18 (t-stat=-1.4) when institutions are on the right side. The pattern is even more striking for long-short portfolios. From Table IV, Panel B, abnormal returns of the wrong-side long-short portfolios are statistically significantly positive for 12 out of the 12 cases versus 3 out of the 12 of the cases when institutional investors are on the right side. Across all 12 anomalies, the average monthly abnormal return of the wrong-side long-short portfolio is 0.87 (t-stat=7.0) versus 0.24 (t-stat=2.4) when institutions are on the right' side.

Our results indicate that abnormal returns are concentrated among stocks with institutional investors trading on the wrong side of the implied mispricing for all twelve anomalies, including the three cases where institutions on average trade on the right side of the implied mispricing—gross profitability, return on assets, and momentum. Thus, even in those cases where institutions enter/exit the right stocks on average, anomaly returns reside primarily in stocks where institutions take the wrong side.

B. Holding Periods and Return Horizons

An important consideration for evaluating the selective participation hypothesis is the alignment of institutional holding periods and anomaly returns. While the six-month gap we impose between changes in institutional investors and anomaly returns mitigates potential price pressure from serially correlated institutional trades [see e.g., Sias, Starks, and Titman (2006)], it also raises the possibility that wrong-sided institutions reverse their positions prior to the realization of the long-horizon anomalous returns that we document. This possibility is particularly relevant given the positive relation between changes in institutional holdings and short-horizon (quarterly) returns documented in Wermers (1999), Sias (2004), and other studies.[12] If institutions reverse their positions during the six-month gap they might capture shorter-horizon positive abnormal returns while avoiding the longer horizon negative abnormal returns – leaving little to puzzle over regarding their behavior.

Figure 1 examines potential reversals in changes in number of institutional investors. Specifically, we track Δ#Inst cumulatively from December of year t-2 (start of anomaly portfolio formation period) through June of year t+1 (end of performance evaluation period) separately for both the wrong and right side long and short portfolios of each anomaly. In particular, Panel A tracks the highest Δ#Inst portfolios (right-side long-leg and wrong-side short-leg). Panel B tracks the lowest Δ#Inst portfolios (wrong-side long-leg and right-side short-leg). We aggregate the number of institutions for each portfolio each quarter and report the cumulative change over time. Quarters -3 through 0 reflect the portfolio formation period; quarters 1 and 2 reflect the six-month gap between portfolio formation and performance evaluation periods; and quarters 3 through 6 reflect the four calendar quarters during the performance evaluation period.

[Figure 1 around here]

[12] See i.e., Grinblatt, Titman, and Wermers (1995), Nofsinger and Sias (1999), Chen, Hong, and Stein (2002), Gibson and Safiedine, and Sonti (2004), Chemmanur, He, and Hu (2009), Alti and Sulaeman (2012), and Gutierrez and Kelly (2009).

From Panel A in Figure 1 stocks in the highest Δ#Inst quintile do not experience a reversal in the number of institutional investors regardless of alignment with the anomaly prescription. Indeed, for both portfolios the number of institutional investors continues to increase during the performance evaluation window. Most importantly, for the wrong-side short-leg portfolios the average cumulative change in number of institutional investors is 78% at of the end of the portfolio formation period rising to 91% at the end of the performance evaluation period. Note that, the cumulative Δ#Inst remains higher for wrong-side short-leg stocks than right-side long-leg stocks for all ten quarters. This evidence rejects the hypothesis that institutional demand on the wrong side of anomalies reverses prior to the realization of long horizon anomaly returns, at least on the short-leg side.

Panel B conducts a similar analysis of wrong-side long-leg portfolios. In particular, it tracks the changes in number of institutional investors over event time when Δ#Inst is in the lowest quintile (i.e., wrong-side long-leg and right-side short-leg). Here we see a small reversal tendency in both portfolios, likely reflecting the upward drift in institutional holdings over the sample period. Note that the number of institutions remains substantially below the initial level in both cases. Collectively, the evidence of Figure 1 shows that, on average, institutional investors on aggregate do not reverse their positions taken during the portfolio formation period prior to the long-horizon anomalous returns. Thus, it appears that not only are institutional investors on the wrong side of the implied mispricing of the anomalies, they are also on the wrong side of the realized abnormal returns documented in Table IV.

C. Limits of Arbitrage

Our evidence of large abnormal returns for wrong-side anomaly portfolios, and essentially zero abnormal returns for right-side anomaly portfolios is potentially consistent with a limits-of-arbitrage hypothesis where informed trading eliminates mispricing in some stocks but not others due to frictions or constraints. More specifically, under this hypothesis, wrong-side stocks have higher frictions than right-side stocks. Thus, they yield higher anomaly returns in a costly-arbitrage equilibrium. For example, Stambaugh, Yu, and Yuan (2013) provide evidence that the asymmetry in returns of long and short leg anomaly portfolios arises from limits of arbitrage from short-sale constraints. Perhaps, changes in number of institutional investors reflect the outcome of portfolio decisions under such frictions. And thus, sorting on changes in institutional investors reveals equilibrium mispricing under limits of arbitrage.

Table V provides evidence for evaluating the limits of arbitrage argument in the context of our conditional arbitrage portfolios. A direct way of evaluation the limits of arbitrage argument is to investigate the relative amount of institutional trading involved on the right side versus wrong side of the anomalies. If the larger abnormal returns for wrong-side anomaly stocks are the result of limits to arbitrage, those limits should reveal themselves with relatively little trading. In contrast, Panel A of Table V reveals substantial institutional trading activity on both legs of the wrong-side portfolios. The average increase in the number of institutions in the wrong-side short leg portfolio is 116%, compared to 103% for right-side long-leg portfolios. Moreover, on average, 96% of stocks in the wrong-side short leg portfolio experience an increase in the number of institutional investors. Likewise, the average decrease in wrong-side long-leg portfolios is -17%, with 91% of the stocks in these portfolios experiencing an actual decline in the number of institutional investors. These figures are very similar to that seen with right-side short-leg portfolios (-21% and 94%, respectively). Thus, institutions appear to be just as active when trading on the wrong side as the right side, which is inconsistent with the limits of arbitrage hypothesis.

[Table V around here]

Panel B of Table V reports descriptive statistics of various firm characteristics associated with limits to arbitrage for stocks in the right side and wrong side portfolios. Stocks in both portfolios are very similar on all these dimensions. In particular, they have similar fraction of shares held by institutional investors by the end of the portfolio formation period (40% on the wrong side versus 39% on the right side), Amihud illiquidity ratios (0.16 on both sides), market capitalization ($1.09 billion versus $1 billion), and idiosyncratic risk (46% on both legs). In short, there is no support for limits of arbitrage based on differences in stock characteristics.

Given the importance of idiosyncratic risk as a limit to arbitrage [Pontiff (2006)] we conduct a formal analysis of the risk and return of our conditional arbitrage portfolios using Sharpe ratios. The Sharpe ratio adjusts abnormal returns for differences in idiosyncratic risk. Because more institutions tend to be on the wrong side of the anomaly than the right side, the two conditional portfolios have different number of stocks. Sharpe ratios can be misleading when comparing portfolios of different size. To address this issue we restrict the conditional anomaly portfolios to the same size. Specifically, each month we reconstruct each conditional anomaly portfolio so that it has the same number of stocks as the smaller of the two conditional portfolios belonging to the same leg of the anomaly. We resample stocks in the conditional portfolios from among the full set of stocks that belong to the conditional portfolio with replacement and repeat 5,000 times to generate the tangency portfolio characteristics and test statistics. Panel B of Table IV reports these Sharpe ratios. From Panel B we find the differences in the Sharpe ratios for wrong-side and right-side portfolios are of similar magnitude to the difference in four-factor alphas and highly significant.[13] [14] Thus, we conclude that the difference in returns of wrong side and right side portfolios is not due to differences in idiosyncratic risk.

Finally, the pattern of changes in institutions that we document is inconsistent with limits-of-arbitrage. For example, the average wrong-side long-leg stock has a *decrease* in number of institutions. While frictions might deter institutions from buying stocks in the long-leg portfolio, they would not induce selling. Likewise, the average wrong-side short-leg stock has an *increase* in institutions. Again, while frictions might deter selling they would not induce buying. Some studies argue that institutions' inability to engage in short sales contributes to persistence in overpricing [Hong and Sraer (2012), Stambaugh, Yu, and Yuan (2013)]. Our evidence suggests that these short-sale constraints are not binding. Not only do institutions forego selling their existing holdings in short-leg anomaly stocks; they increase their collective holdings in short-leg stocks that appear to be most overvalued. Indeed, our results are consistent with Lewellen's (2011) argument that book-to-market and momentum anomalies cannot be attributed to limits-of-arbitrage that prohibit institutional investors from exploiting the anomalies.

IV. Robustness and Potential Explanations

A. Institutional Trading and Investor Flow

An important consideration when interpreting institutional trading activity is the potential effects of investor flow. Edelen (1999) finds that roughly 30% of all mutual fund trades are in response to investor flow. Moreover, trading in response to flow can cause price-pressure in the underlying stocks of institutional portfolios. For example, Khan, Kogan, and Serafeim (2012)

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[13] We evaluate the statistical significance of the difference in Sharpe ratios across portfolios using a non-parametric bootstrapping method. Specifically, we calculate the difference for each of the 5,000 randomly constructed samples, record the frequency of samples where the difference is above zero, and multiply this frequency by two to produce the two-tailed p-value for the difference.

[14] We get similar inferences regarding Sharpe ratios when we follow MacKinlay (1995) and Hirshleifer and Jiang (2010) and construct ex-post tangency portfolios that generate the maximum possible Sharpe ratio by optimally combining a set of factor portfolios.

argue that mispricing prior to SEOs is related to price pressures by mutual funds experiencing large investor inflows. Likewise, Frazzini and Lamont (2008) argue that the value effect is due, in part, to mispricing from investor flows into mutual funds holding growth stocks. More generally, Coval and Stafford (2007) show that correlated investor flows into institutional portfolios with common investment objects (particularly highly specialized) can cause relatively protracted price-pressures and subsequent reversals. Thus, the puzzling institutional trading that we find conceivably originates with the decisions of beneficial investors rather than the portfolio managers themselves.

In what follows our methodology includes several elements to distinguish between flow-driven and discretionary trades. First, following Sias, Starks, and Titman (2006), we compare the relation between long-horizon returns and two different measures of institutional trading: the change in the number of institutions and the change in the fraction of shares held by institutions. Flow-induced price pressure should be more closely related to the quantity of shares traded (i.e., change in fraction of shares held) than the change in number of institutions holding the stock. Khan et al. (2012) show that mutual fund inflows typically go towards expansion of existing positions rather than new positions. We find that the relation is driven by changes in the number of institutions. Second, our primary measure of institutional trading (changes in the number of institutional investors) captures new positions as opposed to expansions or contractions to existing positions.

Table VII provides Fama-MacBeth regressions of monthly excess returns, from July of year *t* through June of year *t*+1, on the change in both number of institutional investors and the fraction of shares held by institutions during calendar year *t*-1, as well as the change in the number of shareholders of record during the fiscal year ending during calendar year *t*-1. The regressions also include the following control variables (not tabulated to conserve space): the log of market capitalization as of June of year *t*, the log of the book to market ratio as of December of year *t-1*, cumulative stock returns during the year *t-1*, the fraction of the firm held by institutional investors at the end of December of year *t-1*, and the average monthly Amihud illiquidity ratio between January and June of year *t*. The regressions separately consider short (Panel A) and long (Panel B) leg stocks from each anomaly.

[Table VII around here]

Focusing first on Δ #Inst, Table VII confirms the earlier evidence that anomaly returns intensify when institutions trade against the anomaly prescription. In Panel A (short leg), the coefficients on Δ #Inst are negative for all twelve anomalies and significant for ten of the twelve anomalies (p-value of less than 5%) with an average t-statistic of -2.5. Thus, short-leg returns decrease the more wrong-sided (higher) the Δ #Inst. Likewise, from Panel B, long leg returns increase the more wrong sided (lower) the Δ #Inst. Here again the coefficients on Δ #Inst are negative across the board, with a p-value of 5% or less for seven of the anomalies, and an average t-statistic of -2.1. By contrast, controlling for the change in number of institutions, the coefficient on the change in percentage of shares held by institutions, Δ%Inst, is insignificant for all twelve anomalies on the short legs and ten of the twelve anomalies on the long legs. Thus, our effect does not seem related to institutional price pressure, but rather to a broadening of the institutional investor base. Following Khan et al, this suggests that the link between changes in institutions and anomaly returns is not due to flow-induced price-pressure.

We further investigate the possibility that the negative relation between Δ#Inst and stock returns is caused by investor flow by focusing on mutual funds – where flow-induced trading is likely to be most severe. In Table VIII we repeat the Fama-MacBeth regressions of Table VII using changes in mutual fund holdings in place of changes in institutional holdings. In model 1, the change in number of institutions and fraction of shares held by institutions are replaced by the change in the number of mutual funds holding the stock during calendar year t-1 (Δ#MF) and the change in the fraction of a stock held by mutual funds (Δ%MF). The coefficients on the two mutual fund measures are insignificant in both panels A (short leg) and B (long leg). In model 2, we split the total change in the fraction of shares held by institutional investors into its mutual fund (Δ%MF) and non-mutual-fund (Δ%nonMF = Δ%Inst - Δ%MF) components.[15] The coefficient on Δ%MF is insignificant while Δ#Inst remains significantly negative in both panels.

[Table VIII around here]

In models 3 and 4 of Table VIII, we directly control for mutual fund flow using the methodology developed in Coval and Stafford (2007) to identify stocks with flow-induced buying and selling pressure. Due to the incompleteness of the mutual fund flow data prior to 1990, we limit the sample in the last two models to 1991-2012 (see Coval and Stafford (2007)). Model 3 splits Δ%MF into its Δ%MF(Flow-induced) and Δ%MF(Non-flow) components. Δ%MF (Flow-induced) is the change in fraction of stock held by mutual funds under in-flow or out-flow pressure during calendar year *t*-1. Following Coval and Stafford (2007), a mutual fund is classified as under in-flow driven buying pressure (out-flow driven selling pressure) during the year if the fund was subject to capital flows in the top (bottom) 10% of all mutual funds in at least one quarter during that year. Δ%MF(Non-flow) is the change in the fraction of the stock held by mutual funds that are not under flow pressure. Model 3 confirms that flow-induced changes in the fraction of shares held by mutual funds are insignificantly related to future stock

[15] It is not possible to conduct a similar decomposition to the change in the number of institutional investors since 13F filings report mutual funds at the family level. As a result, Δ #non-MF cannot be calculated as the difference between Δ #Inst and Δ #MF.

returns irrespective of the anomaly leg, while Δ #Inst remains significantly negative in both legs.

Finally, in Table VIII model 4, we re-estimate our main specification of Table VII, excluding stocks under flow-induced buying or selling pressure from the sample. Following Khan et al. (2012), we classify a stock as under flow-driven buying (selling) pressure if it is in the top (bottom) decile of Δ%MF(Flow-induced) and in the middle three deciles of Δ%MF(Non-flow).[16] The coefficients on Δ #Inst remain significantly negative on both legs after excluding stocks bought and sold by mutual funds under flow-induced pressure. Thus, by all counts, the relation between changes in institutional investors and long-horizon returns does not appear to be driven by investor flow.

B. Value-weighted Abnormal Returns

A natural question concerns the extent to which our results are driven by micro-cap stocks. Our empirical methodology minimizes the effect of micro-cap stocks in several ways. First, we restrict our sample to firms with a stock price of at least $5 at the time of portfolio formation. Second, our data requirements exclude stocks with zero institutional ownership during the portfolio formation period -- which excludes many micro-cap stocks. Third, following standard convention in the anomalies literature, we construct portfolios by sorting both on the anomaly variable and on market capitalization using the median NYSE size (see Fama and French (1993)). Sorting on market capitalization ensures that the long and short legs of the anomaly factors have similar average market capitalization. Fourth, our Fama-MacBeth regressions in tables VII and VIII include the natural logarithm of market capitalization as of June of year *t* as a control variable.

[16] In untabulated results, we find that stocks under flow-induced pressure constitute between 2% and 4% of the portfolio depending on the anomaly.

Table IX provides an additional check on the sensitivity of our main results (anomaly returns conditional on changes in institutional investors) to firm size by repeating the analysis of Table IV using value-weighted (as opposed to equal-weighted) portfolio returns. Across the 12 anomalies, the average monthly three-factor alpha of the wrong-side long-short portfolio is 85 basis points per month (t-stat=6.5) using value-weighted returns compared to 87 basis points (t-stat=7.0) using equal weighted returns. All 12 wrong-side long-short portfolios have statistically significant alphas using value-weighted returns. Likewise, the average monthly three-factor alpha of right-side long-short portfolios is 20 basis points (t-stat=1.6) compared to 26 basis points (t-stat=2.4) using equal weighted returns. The difference between right and wrong side portfolio returns remains significant using value weighting with an alpha of -65 basis points per month (t-stat=3.0) compared to -60 basis points (t-stat=-3.0) in Table IV.

[Table IX around here]

Finally, in untabulated results, we also repeat the analysis in Table IV excluding stocks with less than five institutional investors at the time of portfolio formation -- which should exclude the least liquid stocks from the sample. The results are nearly identical to those of Table IV. Thus, we conclude that micro-cap stocks do not overly influence our main results.

C. Poor Investment Decisions or Benchmarking Errors?

Collectively our evidence suggests that either institutional investors make poor portfolio decisions with respect to well-known anomaly pricing errors, or their portfolio decisions are correlated with time-varying discount rates that standard performance benchmarks fail to capture. Our remaining analysis considers these explanations.

Several studies attempt to distinguish between mispricing and risk-based explanations of financial anomalies by examining returns around earnings announcements (see, e.g., Bernard and Thomas, 1990; Chopra et al., 1992; La Porta et al. 1997). The basic idea is that valuation errors caused by biased expectations about future cash flows should be corrected, in part, during subsequent earnings announcements (Lewellen, 2010). The empirical implication of the mispricing hypothesis for our findings is that we should observe significant negative (positive) abnormal returns surrounding earnings announcements for wrong-side short (long) leg stocks and little to no announcement period returns for right-side stocks (given their weak anomaly returns),

Table X reports the average abnormal return of stocks surrounding earnings announcements during the 12 months following portfolio formation. Following standard convention for this literature, we compute abnormal returns as the average daily return during the three-day earnings announcement window (event days -1 and +1) minus the average daily return of the same stock outside the earnings announcement window. For robustness we also report market-adjusted abnormal returns and abnormal returns over a longer window (days -3 to 3).

[Table X around here]

The results of Table X are consistent with the mispricing explanation for anomaly returns for wrong-side stocks. In particular, wrong-side short-leg stocks (bought by institutions) experience negative cash-flow surprises during earnings announcements for 11 out of the 12 anomalies (average t-stat of -3.1). Likewise, wrong-side long-leg stocks (sold by institutions) also experience positive cash-flow surprises during earnings announcements for 11 out of 12 anomalies (average t-stat of 4.3). By comparison, earnings announcement returns for right-side stocks are, for the most part, statistically insignificant with an overall long-short three-day abnormal return of -6 basis points (t-stat=-1.7). The results are robust to using a seven-day event window as well as using market-adjusted announcement returns. Altogether, this evidence suggests that at least some of the anomalous returns associated with institutions taking the wrong side of anomaly portfolios are due to systematic errors in cash-flow expectations.

Curiously, this bias in cash flow expectations seems to apply to long-horizon earnings (i.e., the next 6-18 months) but not short-horizon (i.e., the next quarter) earnings. In particular, Baker, Litov, Wachter, and Wurgler (2010) find that stocks that mutual funds' buy outperform stocks they sell during the immediate subsequent earnings announcement period. In unreported results, we confirm this positive relation using changes in institutional holdings and the immediate subsequent earnings announcement period abnormal returns in the context of our sample of anomaly stocks. This difference in the relation between changes in institutional holdings and earnings announcement period returns may be just another manifestation of the more general difference in the relation between changes in institutional holdings and short versus long-horizon returns discussed in section III.B.

C.1 Behavioral Biases and Agency Conflicts

The mispricing explanation – and preceding evidence – contradicts the conventional wisdom that institutional investors are relatively informed.[17] However, it is consistent with a growing body of research that suggests institutional herding can be destabilizing, resulting in long-horizon return reversals [Coval and Stafford (2007), Gutierrez and Kelly (2009) and Dasgupta, Prat, and Verardo (2011)]. The literature on herding examines a number alternative motives, including manager reputation [Scharfstein and Stein (1990)], information acquisition

[17] See i.e., Coval and Moskowitz (2001), Badrinath and Wahal (2002), Cohen, Gompers, and Vuolteenaho (2002), Parrino, Sias, and Starks (2003), Gibson, Safieddine, and Sonti (2004), Alti and Sulaeman (2012).

[Banerjee (1992), Bikhchandani, Hirshleifer and Welch (1992)], and tracking of common firm characteristics [Lakonishok, Shleifer, and Vishny (1994), Falkenstein (1996), Barberis and Shleifer (2003)]. Our evidence casts doubt on herding explanations based on information acquisition, at least in the context of stock return anomalies. Such an explanation is hard to reconcile with our evidence that institutions trade contrary to widely known ex-ante valuation signals, confirmed by ex-post poor returns. That evidence is more consistent with trade motives entwined with agency conflicts and/or behavioral biases, perhaps relating to reputation or the tracking of common firm characteristics.

C.2 Time-varying Discount Rates

While our evidence of biased cash flow expectations for wrong-side stocks is consistent with mispricing, the fact that anomaly returns are strongly related to changes in the number of institutional investors but unrelated to changes in quantity of stock held by institutions suggests a more complex relation than simply price-pressure from institutional demand. Indeed, the dependence on the breadth of the firm's investor base points to a possible role for time-varying discount rates as several theories link discount rates to the investor base by way of via changes risk, changes in the pricing of risk (i.e., market segmentation) and changes in liquidity. To the extent these links are not captured by standard return benchmarks our primary metric conceivably relates to return benchmark errors, in a way that partially accounts for the evidence on wrong-side anomaly portfolios [Cochrane (2011)].

This correlation might arise through several asset-pricing channels. First, institutions might be attracted to firms that have recently undergone changes in characteristics that correlate with lower risk. For example, productivity shocks as in Q theory [Li, Livdan, and Zhang (2009)] or the exercise of real options [Carlson, Fisher, Giammarino (2006) and Carlson, Fisher, and

Giammarino (2010)]. Second, asset-pricing theories relate required returns to a firm's investor base directly through market segmentation and the pricing of idiosyncratic risk [Merton (1987), Allen and Gale (1994), Basak and Cuoco (1998), Shapiro (2002)]. According to these theories, an increase in the investor base improves diversification and lowers required returns. This idiosyncratic risk/investor base factor is not accounted for by standard performance benchmarks. Finally, asset-pricing theories relate required returns to the investor base (indirectly) through liquidity [Amihud and Mendelson (1989), Vayanos (1998), Acharya and Pedersen (2005)].

A number of recent studies provide empirical support for a link between anomaly returns and time-varying discount rates in the context of seasoned equity offerings [see i.e., Carlson, Fisher, Giammarino (2006), Li, Livdan, Zhang (2009)], Some of these studies provide direct support for the investor base - discount rate channel [Lehavy and Sloan (2008), Bilinski, Liu, and Strong (2012), and Edelen, Ince, and Kadlec (2013)]. Our evidence suggests that this investor base –discount rate link might also be relevant to other anomalies.

D. Herding and institutional trade persistence

Our evidence that institutions take the wrong side of anomalies is potentially relevant to the ongoing debate on the price implications of institutional herding. Several explanations for herding are offered in the literature. These include information acquisition [Banerjee (1992) and Bikhchandani, Hirshleifer and Welch (1992), Froot, Scharfstein, and Stein (1992) and Hirshleifer, Subrahmanyam, and Titman (1994)]; managerial reputation [Scharfstein and Stein (1990)]; and tracking common firm characteristics [Lakonishok, Shleifer, and Vishny (1994), Del Guercio (1996), Falkenstein (1996), Gompers and Metrick (2001), Barberis and Shleifer (2003), Bennett, Sias, and Starks (2003)]. See Sias (2004) for further discussion of institutional herding.

A particularly relevant paper in this literature is Dasgupta et al. (2011), who document that stocks that are persistently bought or sold by institutions over three to five consecutive quarters experience subsequent long-term stock return reversals. In this section, we investigate whether the negative relation between changes in institutions and anomaly returns that we document is driven by such persistence in institutional demand. We then discuss our evidence in the context of other herding studies.

Following Dasgupta et al. (2011), we place stocks with an increase or decrease in institutional ownership over three or more adjacent quarters during calendar year t-1 in the "persistent" sample and the rest in the "non-persistent" sample. We then repeat the time-series abnormal returns analysis from Table IV separately for the two samples and report the average three-factor alphas across the twelve anomalies. We find that the differential return to wrong-side versus right-side anomaly portfolios is very similar using stocks from either the persistent sample or non-persistent sample. Thus, our results are not due to persistence in institutional demand.

From Panel A of Table XI, using stocks in the persistent sample, long-short portfolio returns with institutions trading on the right side earn an average three factor alpha of 19 basis points per month (t-statistic of 1.3) versus 82 basis points per month (t-statistic of 6.0) with institutional trading on the wrong side. The difference is 63 basis points with a t-statistic of 2.6. Using stocks in the non-persistent sample, institutions trading on the right-side earn an average three factor alpha of 26 basis points per month (t-statistic of 2.1) versus 95 basis points (t-statistic of 7.1) for wrong-sided portfolios.

In Panel B of Table XI, we repeat the Fama-MacBeth analysis of Table VII including a variable that measures the maximum number of consecutive quarters during year t-1 with an increase (decrease) in the percent of shares held by institutions for short-leg (long-leg) stocks.

We refer to this variable as *Buy* (*Sell*) *Persistence* and present the results in column one. Neither the coefficient on *Buy Persistence* in the short-leg regression, nor *Sell Persistence* in the long-leg regression, is significantly negative. In column two we repeat the baseline regressions from Table VII using only stocks from the non-persistent sample. Again, we find that the coefficients on Δ-#Inst are significantly negative, confirming that our results are not driven by persistence in institutional trades over adjacent quarters.

The insignificant role of persistence in Table XI casts doubt on reputational herding by institutions as a potential explanation for our findings.[18] Moreover, the fact that institutions trade contrary to widely known ex-ante valuation signals, confirmed by ex-post poor returns, casts doubt on herding explanations based on information acquisition. Thus, to the extent that institutional managers are making poor portfolio decisions, our evidence points to common tracking of firm characteristics as a likely cause. We leave the identification of firm characteristics that trigger correlated trading among institutions to future research.

Interpretations and Conclusions

Our findings have implications for the growing debate on the causes of stock return predictability. From a behavioral perspective, our results cast institutional investors as the key culprits in an exhaustive list of asset-pricing anomalies. From an efficient markets perspective, our results raise the possibility that institutional demand is negatively correlated with stochastic discount rates in a way that eludes conventional asset pricing models.

A behavioral interpretation of our results is both odd but at the same time plausible. It is odd because institutions are generally thought of as 'smart' and that should subsume knowledge

[18] The implicit assumption here is that reputational herding is likely to take place over multiple adjacent quarters as institutions observe and replicate other institutions' past trades. This assumption might be too strong if institutions can observe each other's trades contemporaneously and replicate them within the same calendar quarter.

of the widely cited decades old anomalies literature. On the other hand, it is also plausible because institutional money management entails agency conflicts that result in suboptimal portfolio decisions such as excessive turnover [Chalmers, Edelen, and Kadlec (1999)], risk taking [Brown, Harlow, and Starks (1996) and Chevalier and Ellison (1997),] and herding for reputational reasons [see studies cited above]. Moreover, if anomalous returns are a consequence of mispricing, then the most obvious place to look for an impact big enough to distort asset prices is the beast with the largest footprint – institutions.

An asset pricing interpretation of our results points to the need for refinements to benchmarks to capture time-varying discount rates that arise from time-varying risk and/or the effects of market segmentation and liquidity. While it is difficult to settle this debate conclusively lacking a correctly specified asset-pricing model, our findings establish institutional demand as a unifying link between seemingly independent anomalies that needs to be accounted for by competing explanations.

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Table 1, *continued on next page*

Anomalies considered

Anomaly	Label	Description
		Panel A. Accounting & Operating Anomalies
Operating Accruals	ACC	The change in current assets (ACT) minus the changes in cash (CH) and current liabilities (LCT), plus the sum of changes in short-term debt (DLC) and taxes payable (TXP), minus depreciation and amortization expense (DP), deflated by the lagged total assets (AT).
Net Operating Assets	NOA	The sum of short-term debt (DLC), long-term debt (DLTT), minority interest (MIB), preferred stock (PSTK), and common equity (CEQ) minus cash and short-term investment (CHE), deflated by the lagged total assets (AT).
Gross Profitability	GP	Total revenues (REVT) minus cost of goods sold (COGS), divided by total assets (AT).
Return on Assets	ROA	Income before extraordinary items (IB) deflated by the lagged total assets (AT).
Investment to Assets	IVA	The change in gross property, plant, and equipment (PPEGT) plus the change in inventories (INVT), deflated by the lagged total assets (AT).
Asset Growth	AG	The change in total assets deflated by the lagged total assets.
O-Score	O-SC	The probability of bankruptcy calculated using accounting variables such as total liabilities divided by assets, working capital divided by assets, current liabilities divided by current assets, net income, and inflation-adjusted total assets applied to coefficients estimated using a logit regression of bankruptcies.
		Panel B. Return & Valuation Anomalies
Book to market	B/M	Book value of common equity (SEQ or AT-LT) plus net deferred tax assets (TXDB), investment tax credit (ITCB), and postretirement benefit liabilities (PRBA), divided by equity market capitalization end of calendar year t.
Momentum	MOM	Cumulative stock return between months j-2 and j-12, where j is the month of return forecast.
		Panel C. Financing Anomalies
Undervalued minus overvalued	UMO	The portfolio "U" (undervalued) contains firms with equity or debt repurchases and without any equity or debt issuances during the two most recent fiscal years. The portfolio "O" (overvalued) contains firms with equity or debt issuances and without any equity or debt repurchases during the two most recent fiscal years.
Net Composite Equity Issuance	CEI	The natural log of the ratio of the market value of equity at the end of December of year t to the market value of equity at the end of December of year t-5, minus the past 5-year natural log stock return.
Net Stock Issuance	NSI	The natural log of the ratio of the split-adjusted shares outstanding at fiscal year end in t and in t-1. Following Fama and French (2008), the split-adjusted shares outstanding is shares outstanding (CSHO) times the cumulative adjustment factor (ADJEX_C) from Compustat.

Table 1, *continued*
Anomalies considered

Label	Citation	Ranking Variable
	Panel A. Accounting & Operating Anomalies	
ACC	Hirshleifer, Hou, Teoh, and Zhang (2004)	$ACC_t = \frac{\Delta ACT_t - \Delta CH_t - \Delta LCT_t + \Delta DLC_t + \Delta TXP_t - DP_t}{AT_{t-1}}$
NOA	Hirshleifer, Hou, Teoh, and Zhang (2004)	$NOA_t = \frac{DLC_t + DLTT_t + MIB_t + PSTK_t + CEQ_t - CHE_t}{AT_{t-1}}$
GP	Novy-Marx (2012)	$GP_t = \frac{REVT_t - COGS_t}{AT_t}$
ROA	Fama and French (2008)	
IVA	Titman, Wei, and Xie (2004); Lyandres, Sun, and Zhang (2008)	$IVA_t = \frac{\Delta PPEGT_t + \Delta INVT_t}{AT_{t-1}}$
AG	Cooper, Gulen, and Schill (2008)	$AG_t = \frac{AT_t - AT_{t-1}}{AT_{t-1}}$
O-SC	Ohlson (1980)	Model 1 in Ohlson (1980)
	Panel B. Return & Valuation Anomalies	
B/M	Fama and French (1993)	$B/M_t = \frac{(SEQ_t \text{ or } AT_t - LT_t) + TXDB_t + ITCB_t + PRBA_t}{ME_t}$
MOM	Jegadeesh and Titman (1993)	
	Panel C. Financing Anomalies	
UMO	Hirshleifer and Jiang (2010)	
CEI	Daniel and Titman (2006)	$CEI_t = \log\left(\frac{ME_t}{ME_{t-5}}\right) - r(t\text{-}5,t)$
NSI	Pontiff and Woodgate (2008)	$NSI_t = \log\left(\frac{CSHO_t * ADJEX\_C_t}{CSHO_{t-1} * ADJEX\_C_{t-1}}\right)$

Table 2
Anomaly returns

The table presents monthly returns in units of percent between July of 1982 and June of 2012. Anomaly portfolios (see Table 1 for acronyms) are held from July of year *t* through June of year *t*+1, consisting of a long position in Long leg stocks (highest-performing 1/3 for the ranking variable as reported by previous studies, as of June year *t*) plus a short position in Short leg stocks (lowest-performing 1/3). The anomaly portfolio return is listed as Long - short. The Sharpe ratio refers to the mean monthly return of the Long-short portfolio divided by its standard deviation. Excess returns refer to the stock return less the one month US Treasury bill rate. Three-factor alphas refer to the intercept from a time-series regression of monthly excess returns on the MKT, SMB, and HML factors, excluding HML for the B/M anomaly. Heteroskedasticity-adjusted t-statistics are in parentheses.

	Accounting & Operating							Return & Valuation		Financing			AVG
	ACC	NOA	GP	ROA	IVA	AG	O-SC	B/M	MOM	UMO	CEI	NSI	
Excess Returns:													
Long leg	0.81	0.89	1.00	0.74	0.96	0.98	0.82	1.02	1.20	1.03	1.06	0.96	0.95
Short leg	0.46	0.35	0.40	0.51	0.37	0.26	0.54	0.27	0.34	0.35	0.60	0.39	0.40
Long - short	0.35	0.55	0.61	0.23	0.59	0.71	0.28	0.75	0.85	0.68	0.46	0.56	0.55
	(4.6)	(4.5)	(5.8)	(1.5)	(6.1)	(5.2)	(2.8)	(3.8)	(3.3)	(5.1)	(2.7)	(3.4)	(5.9)
Sharpe ratio	0.24	0.24	0.31	0.08	0.32	0.27	0.14	0.20	0.17	0.27	0.14	0.18	0.31
Three-factor Alphas:													
Long leg	-0.01	0.15	0.25	-0.01	0.13	0.11	0.10	0.33	0.47	0.25	0.26	0.16	0.16
	(-0.1)	(1.6)	(2.9)	(-0.1)	(1.8)	(1.4)	(1.4)	(2.8)	(5.7)	(3.2)	(3.2)	(2.1)	(2.6)
Short leg	-0.32	-0.51	-0.47	-0.37	-0.48	-0.54	-0.34	-0.61	-0.62	-0.51	-0.25	-0.44	-0.44
	(-3.1)	(-4.5)	(-4.5)	(-2.8)	(-4.4)	(-4.3)	(-3.1)	(-4.6)	(-3.2)	(-4.5)	(-2.7)	(-4.1)	(-4.0)
Long - short	0.31	0.66	0.73	0.37	0.61	0.64	0.45	0.93	1.09	0.76	0.52	0.61	0.60
	(4.6)	(6.2)	(7.1)	(2.8)	(7.4)	(6.5)	(5.0)	(4.8)	(4.5)	(8.3)	(5.4)	(6.1)	(8.7)

Table 3
Pre-anomaly shareholder changes

The table presents shareholder changes during the calendar year prior to anomaly portfolio formation, 1982 - 2012 (see Table 1 for acronyms). Panel A reports the average change in the number of institutional shareholders (number at the end of period divided by the number at the beginning minus one) for stocks in each subsample. Panels B and C report the change in percentage of shares outstanding held by institutions and by mutual funds, respectively (end of period percentage minus beginning). Panel D reports the change in number of shareholders (number at the end divided by the number at the beginning of period minus one). All calculations are then winsorized at the 1% level in both tails. All statistics are calculated each month and the time-series mean and t-statistics are reported.

	ACC	NOA	GP	ROA	IVA	AG	O-SC	B/M	MOM	UMO	CEI	NSI	AVG
Panel A: Average change in number of institutional shareholders (end / beginning of period minus one)													
Long leg	24%	28%	31%	41%	20%	15%	29%	12%	50%	22%	12%	15%	25%
Neutral	21%	23%	26%	23%	25%	22%	26%	25%	17%	26%	18%	20%	23%
Short leg	44%	42%	29%	23%	42%	55%	31%	51%	7%	45%	30%	53%	38%
Long-short	-19%	-14%	2%	18%	-22%	-40%	-2%	-39%	43%	-24%	-18%	-38%	-13%
	(-18.6)	(-14.3)	(2.5)	(17.1)	(-22.1)	(-36.5)	(-2.3)	(-33.8)	(37.8)	(-20.9)	(-18.8)	(-34.4)	
Panel B: Average change in % shares held by institutional shareholders (end minus beginning of period)													
Long leg	3.9%	4.6%	4.8%	6.0%	3.2%	2.5%	5.0%	2.2%	4.5%	2.4%	1.7%	2.0%	3.6%
Neutral	3.4%	3.5%	4.3%	3.6%	4.0%	3.2%	4.1%	4.2%	3.8%	3.9%	2.1%	2.7%	3.6%
Short leg	6.7%	6.3%	5.0%	4.1%	6.3%	8.2%	4.5%	7.6%	5.3%	8.5%	3.2%	7.6%	6.1%
Long-short	-2.8%	-1.7%	-0.2%	1.9%	-3.1%	-5.7%	0.5%	-5.4%	-0.8%	-6.1%	-1.5%	-5.6%	-2.5%
	(-14.3)	(-8.5)	(-0.6)	(9.1)	(-16.2)	(-26.9)	(2.6)	(-27.3)	(-4.2)	(-29.0)	(-8.5)	(-27.3)	
Panel C: Average change in % shares held by mutual funds (end minus beginning of period)													
Long leg	0.3%	0.4%	0.4%	0.6%	0.3%	0.2%	0.5%	0.0%	0.4%	0.3%	0.2%	0.2%	0.3%
Neutral	0.3%	0.3%	0.4%	0.3%	0.4%	0.3%	0.4%	0.4%	0.3%	0.3%	0.2%	0.3%	0.3%
Short leg	0.6%	0.5%	0.3%	0.2%	0.5%	0.8%	0.3%	0.8%	0.3%	0.9%	0.4%	0.8%	0.5%
Long-short	-0.3%	-0.1%	0.1%	0.4%	-0.2%	-0.6%	0.2%	-0.8%	0.1%	-0.6%	-0.2%	-0.6%	-0.2%
	(-2.9)	(-0.9)	(1.0)	(3.4)	(-2.2)	(-5.3)	(1.9)	(-7.4)	(0.3)	(-4.8)	(-1.1)	(-34.4)	
Panel D: Change in number of shareholders of record (end / beginning of period minus one)													
Long leg	31%	32%	34%	49%	18%	16%	38%	18%	33%	12%	2%	12%	25%
Neutral	22%	24%	29%	22%	27%	22%	27%	32%	26%	28%	8%	18%	24%
Short leg	53%	57%	40%	35%	59%	73%	38%	53%	41%	66%	20%	70%	50%
Long-short	-23%	-26%	-7%	14%	-40%	-56%	0%	-35%	-8%	-54%	-18%	-57%	-26%
	(-11.9)	(-13.8)	(-4.8)	(7.4)	(-25.4)	(-27.5)	(-0.1)	(-21.1)	(-4.7)	(-28.0)	(-22.7)	(-27.9)	

Table 4

Abnormal returns of anomly portfolios conditional on institutional demand

Panel A presents the intercept from a time-series regression of portfolio returns on the MKT, SMB, and HML factors (B/M anomaly portfolio excludes HML). Portfolios are formed using independent sorts on terciles of the indicated anomaly variables (see Table 1 for acronyms) and quintiles of change in number of institutional investors, rebalanced June of year t using rankings from calendar t-1 (fiscal year ending in t -1 for anomalies) . The dependent variable is the equally-weighted monthly excess portfolio return. 'Wrong side' refers to short-leg stocks with Δ#Inst in the highest quintile and long-leg stocks with Δ#Inst in the lowest quintile. 'Right side' refers to short-leg stocks with Δ#Inst in the lowest quintile and long-leg stocks with Δ#Inst in the highest quintile. Panel C reports the average Sharpe ratio (mean monthly return divided by standard deviation) over 1,000 iterations of random resampling right and wrong side portfolios of equal size. Panel D reports three-factor alphas conditioning on Δ%Inst. Heteroskedasticity-adjusted t-statistics are in parentheses except in Panel C where non-parametric bootstrapped p-values are in brackets (*** and ** indicates p-value < 0.001 and 0.05, respectively).

	Accounting & Operating							Return & Valuation		Financing			AVG
	ACC	NOA	GP	ROA	IVA	AG	O-SC	BM	MOM	UMO	CEI	NSI	
Panel A. Three-factor alphas conditional on anomaly ranking and change in # of institutions													
Wrong-side short leg	-0.48	-0.69	-0.61	-0.61	-0.65	-0.64	-0.49	-0.72	-1.40	-0.63	-0.52	-0.59	-0.65
[Portfolio WS]	(-3.6)	(-4.6)	(-4.0)	(-3.4)	(-4.7)	(-4.6)	(-3.3)	(-4.8)	(-5.9)	(-4.7)	(-3.4)	(-4.4)	(-4.8)
Right-side short leg	-0.08	-0.18	-0.26	0.00	-0.18	-0.25	-0.09	-0.30	-0.59	-0.12	-0.01	-0.13	-0.18
[Portfolio RS]	(-0.7)	(-1.2)	(-2.1)	(0.0)	(-1.3)	(-1.5)	(-0.7)	(-1.7)	(-2.9)	(-0.7)	(-0.1)	(-0.9)	(-1.4)
Right-side long leg	-0.13	0.13	0.16	-0.18	-0.02	0.05	-0.02	0.24	0.35	0.23	0.30	0.19	0.09
[Portfolio RL]	(-0.9)	(0.9)	(1.3)	(-1.6)	(-0.2)	(0.4)	(-0.1)	(1.6)	(3.3)	(1.8)	(2.4)	(1.6)	(1.0)
Wrong-side long leg	0.14	0.28	0.41	0.12	0.21	0.16	0.25	0.33	0.51	0.19	0.15	0.12	0.22
[Portfolio WL]	(1.3)	(2.3)	(3.6)	(1.0)	(2.0)	(1.6)	(2.3)	(2.4)	(3.4)	(1.7)	(1.5)	(1.2)	(2.6)
Panel B. Three-factor alphas of long minus short anomaly portfolios, conditioning on change in # of institutions													
Right side long - short	-0.04	0.30	0.41	-0.19	0.16	0.30	0.07	0.54	0.95	0.35	0.31	0.33	0.26
[Portfolio RL - RS]	(-0.2)	(1.7)	(2.8)	(-1.3)	(0.9)	(1.6)	(0.5)	(2.3)	(3.6)	(1.9)	(1.7)	(1.9)	(2.4)
Wrong side long - short	0.62	0.97	1.02	0.73	0.85	0.80	0.73	1.05	1.91	0.82	0.67	0.71	0.87
[Portfolio WL - WS]	(4.6)	(5.9)	(5.8)	(3.5)	(6.5)	(5.9)	(4.7)	(4.8)	(6.7)	(5.2)	(4.4)	(5.2)	(7.0)
Difference	-0.66	-0.67	-0.61	-0.91	-0.69	-0.50	-0.66	-0.51	-0.96	-0.47	-0.36	-0.38	-0.60
	(-2.8)	(-2.9)	(-2.6)	(-3.9)	(-3.0)	(-2.0)	(-3.0)	(-2.3)	(-3.8)	(-1.9)	(-1.4)	(-1.7)	(-3.0)
Panel C. Sharpe ratios of long minus short anomaly portfolios, conditioning on change in # of institutions													
Right side long - short	-0.03	0.02	0.04	-0.10	-0.01	0.05	-0.05	0.08	0.08	0.03	0.04	0.03	0.04
[p-value]	[0.31]	[0.52]	[0.11]	***	[0.73]	[0.07]	[0.07]	**	[0.06]	[0.36]	[0.19]	[0.26]	**
Wrong side long - short	0.19	0.25	0.25	0.15	0.26	0.23	0.17	0.17	0.15	0.17	0.16	0.17	0.27
[p-value]	***	***	***	***	***	***	***	***	***	***	***	***	***
Difference	-0.22	-0.23	-0.21	-0.25	-0.27	-0.18	-0.22	-0.09	-0.07	-0.14	-0.12	-0.14	-0.23
[p-value]	***	***	***	***	***	***	***	[0.05]	[0.28]	**	**	***	***
Panel D. three-factor alphas of long minus short portfolios, conditioning on change in % held by institutions													
Right side long - short	-0.12	0.49	0.48	0.08	0.44	0.55	0.13	0.58	0.93	0.42	0.30	0.49	0.37
[Portfolio RL - RS]	(-0.9)	(3.2)	(3.4)	(0.6)	(3.1)	(3.9)	(1.0)	(2.7)	(3.6)	(2.2)	(1.8)	(3.8)	(4.4)
Wrong side long - short	0.55	1.04	1.00	0.64	0.86	0.77	0.75	1.09	1.77	0.77	0.66	0.58	0.83
[Portfolio WL - WS]	(4.3)	(6.1)	(6.1)	(3.7)	(6.1)	(5.6)	(4.9)	(4.7)	(7.0)	(5.2)	(4.4)	(4.5)	(7.1)
Difference	-0.67	-0.55	-0.51	-0.55	-0.42	-0.22	-0.63	-0.51	-0.84	-0.35	-0.35	-0.09	-0.47
	(-3.2)	(-2.7)	(-2.5)	(-3.1)	(-2.2)	(-1.2)	(-3.3)	(-2.7)	(-4.7)	(-1.3)	(-1.7)	(-0.6)	(-2.9)

Table 5

Summary statistics of portfolios that condition on both anomaly and institutional demand rankings

Stocks are ranked into quintiles in June of year t using data from year t-1 on the basis of the anomaly variable and, independently, on the basis of change in number of institutional investors. 'Wrong side' refers to short-leg stocks with Δ#Inst in the highest quintile and long-leg stocks with Δ#Inst in the lowest quintile. 'Right side' refers to short-leg stocks with Δ#Inst in the lowest quintile and long-leg stocks with Δ#Inst in the highest quintile. Panel A presents statistics related to the change in the number of institutitional investors during year t-1: the average change winsorized at 1% on both legs; the aggregate change calculated as the total change in institutional investors for all stocks in the subportfolio divided by the total number of institutional investors at the beginning of the period; the percentantage of stocks in the subportfolio with a net increase in institutional investors; and the percentage of stocks with a net decrease in institutional investors. Panel B presents the % of a firm's shares outstanding held by institutional investors at the beginning of the calendar year t; the average monthly Amihud's illiquidity ratio between January and June of year t; market capitalization in 2012 million dollars as of June of t; and the annualized idiosyncratic volatility using monthly residuals from the Fama-French three-factor model between July of t-3 and June of t.

Panel A: Change in number of institutions during year t-1

	Average (winsorized)			Portfolio aggregate			% Stocks with increase			% Stocks with decrease		
Across 12 anomalies →	avg	max	min	avg	max	min	avg	max	min	avg	max	min
Wrong-side short leg (WS)	116%	131%	17%	77%	89%	4%	96%	100%	52%	3%	42%	0%
Right-side short leg (RS)	-21%	-2%	-24%	-20%	-10%	-23%	2%	28%	0%	94%	98%	64%
Right-side long leg (RL)	103%	120%	75%	73%	85%	49%	99%	100%	88%	1%	8%	0%
Wrong-side long leg (WL)	-17%	35%	-23%	-16%	17%	-21%	6%	67%	0%	91%	97%	25%

Panel B: Other characteristics

	% held by institutions, January t			Amihud illiquidity, January - June t			Market capitalization (2012 $million), June t			Idiosyncratic volatility, July t-3 to June t		
Across 12 anomalies →	avg	max	min	avg	max	min	avg	max	min	avg	max	min
Wrong-side short leg (WS)	41%	48%	34%	0.08	0.18	0.04	1,147	1,501	589	51%	57%	47%
Right-side short leg (RS)	39%	48%	35%	0.17	0.30	0.05	962	2,353	532	46%	51%	42%
Right-side long leg (RL)	39%	46%	36%	0.15	0.41	0.06	1,037	1,493	699	46%	53%	36%
Wrong-side long leg (WL)	40%	42%	38%	0.23	0.35	0.11	1,035	1,552	723	42%	47%	32%
Inst. on right side (RL & RS)	39%	44%	36%	0.16	0.26	0.13	1000	1,675	806	46%	48%	42%
Inst. on wrong side (WL & WS)	40%	43%	38%	0.16	0.19	0.13	1,091	1,485	857	46%	49%	41%
t-statistic on difference, right - wrong	(-0.8)			(0.4)			(-1.9)			(0.3)		

Table 6

Fama-MacBeth regressions: Anomaly-stock returns on institutional holdings changes

Each June of year t, stocks are classified as Short Leg (Panel A) or Long Leg (Panel B) on the basis of 12 anomaly variables (see Table I for acronyms) measured during fiscal-year ending in calendar year t-1. The dependent variable is the raw monthly stock return between July of t and June of t+1. Changes in institutional investors are measured during calendar year t-1. Six control regressors are included but not reported: the log of market capitalization as of June t, log of book to market as of December t-1, cumulative monthly stock returns during year t-1, the average monthly Amihud's illiquidity ratio between January and June of year t, % shares held by institutional investors in December of year t-1, and the number of institutional investors holding the stock in December of year t-1. t-statistics in parentheses estimated using Newey-West serial correlation consistent standard errors with a six-month lag.

	Accounting & Operating							Return & Valuation		Financing			AVG
	ACC	NOA	GP	ROA	IVA	AG	O-SC	BM	MOM	UMO	CEI	NSI	
							Panel A: Short leg stocks						
Δ-#Inst	**-0.20**	**-0.22**	-0.16	**-0.32**	**-0.18**	**-0.18**	**-0.19**	**-0.16**	**-0.30**	**-0.19**	-0.16	**-0.18**	**-0.20**
	(-2.3)	**(-3.1)**	(-1.8)	**(-3.5)**	**(-2.2)**	**(-2.6)**	**(-2.3)**	**(-2.4)**	**(-3.7)**	**(-2.3)**	(-1.3)	**(-2.4)**	**(-2.5)**
Δ-%Inst	-0.04	-0.08	0.43	0.58	0.20	-0.22	0.12	-0.31	0.41	-0.39	-0.35	0.18	0.04
	(-0.1)	(-0.3)	(1.0)	(1.4)	(0.6)	(-0.6)	(0.3)	(-0.9)	(1.2)	(-1.0)	(-1.0)	(0.5)	(0.1)
Δ-#Shr	-0.01	-0.05	-0.05	-0.07	-0.04	-0.06	-0.10	-0.02	-0.08	-0.01	-0.06	0.00	-0.05
	(-0.2)	(-1.3)	(-0.9)	(-0.8)	(-1.2)	(-1.9)	(-1.0)	(-0.9)	(-1.5)	(-0.4)	(-1.0)	(0.2)	(-0.9)
							Panel B: Long leg stocks						
Δ-#Inst	**-0.18**	-0.09	-0.08	**-0.19**	**-0.34**	-0.11	**-0.21**	**-0.28**	**-0.15**	-0.19	**-0.28**	-0.11	**-0.18**
	(-2.1)	(-1.0)	(-1.2)	**(-3.1)**	**(-3.4)**	(-1.2)	**(-3.6)**	**(-2.6)**	**(-2.1)**	(-1.9)	**(-2.2)**	(-1.2)	**(-2.1)**
Δ-%Inst	0.40	-0.27	-0.26	**-0.77**	-0.18	0.21	**-0.85**	0.26	0.10	0.04	0.00	-0.03	-0.11
	(1.0)	(-0.6)	(-0.6)	**(-2.1)**	(-0.5)	(0.5)	**(-2.1)**	(0.7)	(0.3)	(0.1)	(0.1)	(-0.1)	(-0.3)
Δ-#Shr	-0.09	-0.03	-0.02	0.00	0.05	0.03	-0.02	-0.07	-0.02	-0.31	-0.15	-0.09	-0.06
	(-1.3)	(-0.6)	(-0.5)	(0.0)	(0.7)	(0.4)	(-0.4)	(-1.0)	(-0.6)	(1.8)	(-1.2)	(-1.3)	(-0.6)

Table 7

Fama-MacBeth regressions: Anomaly-stock returns on mutual fund flow

Stocks are classified each June as short leg (Panel A) or long leg (Panel B) on the basis of 12 anomaly variables measured during fiscal-year ending in year t-1. The dependent variable is the raw monthly stock return. Change in institutions is measured over calendar year t-1. Δ-%MF (Flow-induced) is the net change in the fraction of a firm's shares outstanding held by mutual funds under in- or out-flow pressure during calendar year t-1 as in Coval and Stafford (2007) whereas Δ-%MF(Non-flow) corresponds to complement funds. The last model in each panel excludes stocks that are both in the top or bottom decile of Δ-%MF(Flow-induced) and the middle three deciles of Δ-%MF(Non-flow). Seven control regressors are included but not reported: the fractional change in shareholders of record during the fiscal year ending in calendar year t-1, log of market capitalization June t, log of book to market December t-1, stock return during year t-1, average Amihud's illiquidity ratio January - June year t, % shares held by institutions December year t-1, and number of institutional investors December year t-1. t-statistics in parentheses using Newey-West correction for serial correlation (six-month lag).

	Panel A: Short leg stocks				*Panel B: Long leg stocks*			
Δ-#Inst		-0.20	-0.28	-0.30		-0.18	-0.23	-0.23
		(-2.5)	(-2.9)	(-2.9)		(-2.1)	(-2.1)	(-2.1)
Δ-#MF	-0.06				-0.05			
	(-1.4)				(-1.2)			
Δ-%Inst				-0.13				-0.35
				(-0.4)				(-0.8)
Δ-%nonMF		0.05	0.06			-0.06	-0.20	
		(0.1)	(0.0)			(-0.2)	(-0.5)	
Δ-%MF	0.20	0.16			-0.49	-0.69		
	(0.2)	(0.2)			(-0.5)	(-0.7)		
Δ-%MF (Flow-induced)			0.01				-0.04	
			(0.1)				(-0.1)	
Δ-%MF (Non-flow)			-0.01				-0.01	
			(-0.7)				(-0.6)	

Table 8
Value-weighted abnormal returns

This table replicates Panels A and B of Table 4, using value-weighted (weighting as of June t) monthly excess returns in place of the equal weighted returns used in Table 4.

	Accounting & Operating							Return & Valuation		Financing			AVG
	ACC	NOA	GP	ROA	IVA	AG	O-	BM	MOM	UMO	CEI	NSI	
Panel A. Three-factor Alphas Conditional on Anomaly Ranking and the Change in the # of Institutions													
Wrong-side short leg	-0.47	-0.73	-0.74	-0.72	-0.75	-0.65	-0.50	-0.73	-1.44	-0.66	-0.48	-0.62	-0.69
[Portfolio WS]	(-3.2)	(-4.5)	(-4.6)	(-4.0)	(-4.9)	(-4.5)	(-3.3)	(-4.5)	(-5.4)	(-4.6)	(-3.0)	(-4.4)	(-5.0)
Right-side short leg	-0.06	-0.15	-0.27	-0.03	-0.16	-0.33	-0.11	-0.40	-0.47	-0.08	0.00	-0.17	-0.18
[Portfolio RS]	(-0.4)	(-1.0)	(-2.0)	(-0.2)	(-1.1)	(-1.8)	(-0.7)	(-2.2)	(-1.8)	(-0.5)	(-0.0)	(-1.0)	(-1.4)
Right-side long leg	-0.30	0.19	0.09	-0.20	-0.12	0.02	-0.09	0.14	0.34	0.17	0.17	0.01	0.02
[Portfolio RL]	(-2.0)	(1.2)	(0.7)	(-1.4)	(-0.9)	(0.1)	(-0.7)	(1.0)	(2.7)	(1.3)	(1.2)	(0.1)	(0.2)
Wrong-side long leg	0.07	0.29	0.35	0.06	0.11	0.02	0.19	0.28	0.56	0.02	0.16	0.13	0.17
[Portfolio WL]	(0.6)	(1.8)	(2.6)	(0.4)	(0.9)	(0.2)	(1.4)	(1.8)	(3.2)	(0.2)	(1.4)	(1.1)	(1.7)
Panel B. Conditional Long Minus Short Alphas Using the Change in the # of Institutions													
Right side long - short	-0.23	0.34	0.36	-0.16	0.04	0.35	0.02	0.54	0.81	0.26	0.17	0.18	0.20
[Portfolio RL - RS]	(-1.4)	(1.7)	(2.1)	(-1.0)	(0.3)	(1.7)	(0.1)	(2.4)	(2.7)	(1.2)	(0.8)	(0.9)	(1.6)
Wrong side long - short	0.55	1.02	1.09	0.78	0.86	0.67	0.70	1.01	2.00	0.68	0.64	0.75	0.85
[Portfolio WL - WS]	(3.3)	(5.9)	(5.4)	(3.5)	(5.2)	(4.3)	(4.0)	(4.2)	(6.5)	(3.9)	(3.6)	(4.8)	(6.5)
Difference	-0.78	-0.68	-0.73	-0.94	-0.82	-0.32	-0.68	-0.47	-1.19	-0.42	-0.47	-0.57	-0.65
	(-3.1)	(-2.7)	(-2.7)	(-3.4)	(-3.1)	(-1.2)	(-2.7)	(-1.8)	(-4.0)	(-1.5)	(-1.5)	(-2.2)	(-3.0)

Table 9, continued on next page

Abnormal returns around quarterly earnings announcements

Stocks are sorted independently on anomalies (see Table 1 for acronyms) and the change in the number of institutional investors during the previous year. Earnings announcement (EA) returns are measured around quarterly earnings announcements during the year following portfolio formation. 'Wrong Side' refers to a large increase in the number of institutional investors (largest delta-#Inst quintile) for stocks in the short leg, and a large decrease (smallest delta-#Inst quintile) for stocks in the long leg of anomalies. 'Right Side' refers to a large increase in the number of institutional investors (largest delta-#Inst quintile) for stocks in the long leg, and a large decrease (smallest delta-#Inst quintile) for stocks in the short leg of anomalies. Panel A reports average raw returns during the earnings announcement window of -1 to +1 minus the average raw returns of the same stock during non-earnings-announcement days. Panel B reports the average abnormal returns across the twelve anomalies using two alternatives: i) market-adjusted abnormal returns using daily value-weighted market returns, and ii) event window of -3 to +3 days. T-statistics are in parentheses.

Anomaly:	ACC	NOA	GP	ROA	IVA	AG	O-SC	BM	MOM	UMO	CEI	NSI	Avg
	Panel A: Average Daily EA (-1:+1) Minus Non-EA Returns												
Wrong-side short leg	-0.08%	-0.08%	-0.10%	-0.10%	-0.10%	-0.10%	-0.08%	-0.08%	-0.07%	-0.09%	-0.08%	-0.08%	-0.09%
[Portfolio WS]	(-2.2)	(-2.8)	(-3.1)	(-2.0)	(-3.1)	(-3.1)	(-2.3)	(-2.7)	(-2.2)	(-2.5)	(-2.2)	(-2.7)	(-3.2)
Right-side short leg	0.02%	0.05%	-0.02%	0.05%	0.05%	0.02%	0.06%	-0.02%	0.00%	0.01%	-0.01%	-0.03%	0.02%
[Portfolio RS]	(0.5)	(1.6)	(-0.5)	(1.4)	(1.3)	(0.4)	(1.6)	(-0.5)	(0.3)	(0.2)	(-0.1)	(-0.7)	(0.5)
Right-side long leg	-0.02%	-0.04%	0.03%	-0.05%	-0.03%	-0.02%	-0.06%	0.08%	-0.04%	0.03%	-0.01%	0.02%	-0.01%
[Portfolio RL]	(-0.8)	(-1.1)	(0.7)	(-1.4)	(-0.9)	(-0.6)	(-1.6)	(2.3)	(-1.6)	(0.9)	(-0.4)	(0.5)	(-0.4)
Wrong-side long leg	0.07%	0.05%	0.15%	0.07%	0.08%	0.10%	0.07%	0.09%	0.14%	0.13%	0.12%	0.14%	0.10%
[Portfolio WL]	(1.7)	(1.2)	(4.0)	(1.5)	(2.6)	(3.3)	(1.8)	(2.7)	(4.0)	(3.5)	(3.2)	(4.9)	(3.6)
Right side long - short	-0.04%	-0.09%	0.05%	-0.10%	-0.08%	-0.04%	-0.12%	0.10%	-0.04%	0.02%	0.00%	0.05%	-0.03%
[Portfolio RL - RS]	(-1.0)	(-2.3)	(0.9)	(-3.0)	(2.1)	(-0.7)	(-3.1)	(1.7)	(-1.6)	(0.3)	(0.2)	(0.8)	(-1.0)
Wrong side long - short	0.15%	0.13%	0.25%	0.17%	0.18%	0.20%	0.15%	0.17%	0.21%	0.22%	0.20%	0.22%	0.19%
[Portfolio WL - WS]	(3.4)	(3.1)	(6.2)	(2.9)	(5.3)	(6.0)	(2.8)	(5.6)	(5.0)	(4.5)	(4.5)	(6.4)	(6.7)
Difference	-0.19%	-0.22%	-0.20%	-0.27%	-0.26%	-0.24%	-0.27%	-0.07%	-0.25%	-0.20%	-0.20%	-0.17%	-0.22%
	(-3.2)	(-3.7)	(-3.5)	(-4.0)	(-4.5)	(-3.3)	(-4.2)	(-1.0)	(-4.3)	(-2.4)	(-3.0)	(-2.6)	(-4.2)

Table 9, continued

Abnormal returns around quarterly earnings announcements

Panel B: Alternative measures for average abnormal returns

Return benchmark:	Non-EA returns		Market-adjusted	
Event window:	-1:+1	-3:+3	-1:+1	-3:+3
Wrong-side short leg	-0.09%	-0.05%	-0.09%	-0.04%
[Portfolio WS]	(-3.2)	(-1.9)	(-3.4)	(-2.3)
Right-side short leg	0.02%	0.01%	0.03%	0.04%
[Portfolio RS]	(0.5)	(0.5)	(1.4)	(2.0)
Right-side long leg	-0.01%	-0.01%	0.02%	0.02%
[Portfolio RL]	(-0.4)	(-0.6)	(0.9)	(1.2)
Wrong-side long leg	0.10%	0.05%	0.14%	0.09%
[Portfolio WL]	(3.6)	(2.0)	(5.7)	(5.4)
Right side long - short	-0.03%	-0.02%	-0.01%	-0.02%
[Portfolio RL - RS]	(-1.0)	(-1.5)	(-0.5)	(-1.2)
Wrong side long - short	0.19%	0.09%	0.23%	0.13%
[Portfolio WL - WS]	(6.7)	(6.1)	(6.5)	(6.4)
Difference	-0.22%	-0.12%	-0.24%	-0.15%
	(-4.2)	(-4.4)	(-4.2)	(-5.1)

Table 10

Return regressions conditioning on persistence in institutional trading

Stocks are classified as 'Persistent' in year t if there are three or more consecutive quarters in year t-1 where the fraction of shares held by institutional investors changed in the same direction; and 'Non-persistent' otherwise. Panel A repeats the time series regressions of Table 4 except for a further partitioning based on Persistence, along with heteroskedasticity-adjusted t-statistics (see Table 4 for portfolio construction). Panel B repeats the Fama-MacBeth regressions of table 6 except for the inclusion of persistence variables. Buy (Sell) persistence is the number of consecutive calendar quarters during t-1 with a positive (negative) Δ%Inst. Three control regressors are included but not reported: the log of market capitalization as of June t, log of book to market as of December t-1, and cumulative monthly stock returns during year t-1. (t-statistics in parentheses estimated using Newey-West serial correlation consistent standard errors with a six-month lag.)

Panel A. Three-factor alphas from time series regressions

	Persistent stocks	Non-persistent stocks
Right side long - short	0.19	0.26
	(1.3)	(2.1)
Wrong side long - short	0.82	0.95
	(6.0)	(7.1)
Difference	-0.63	-0.69
	(-2.6)	(-3.2)

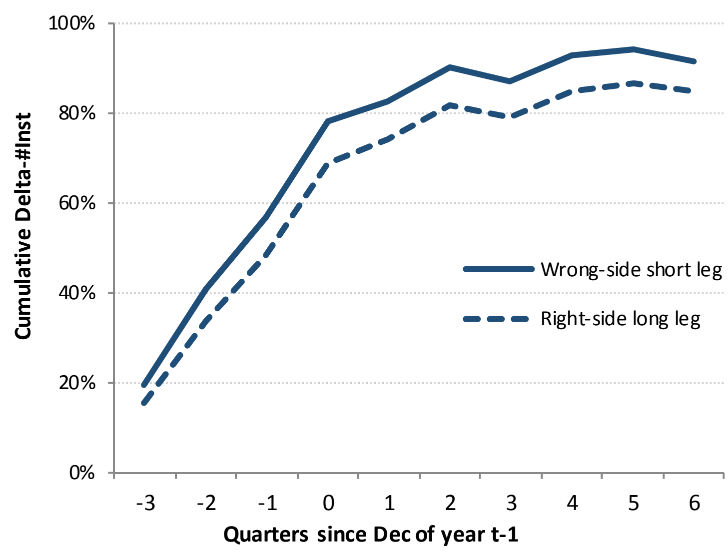
Panel B. Fama-MacBeth regressions

	All stocks in the indicated leg	Non-persistent stocks
Short leg stocks:		
Δ-#Inst	-0.27	-0.27
	(-3.6)	(-2.9)
Buy persistence	0.08	
	(2.4)	
Long leg stocks:		
Δ-#Inst	-0.19	-0.25
	(-2.3)	(-2.2)
Sell persistence	-0.04	
	(-1.0)	

Figure 1. Cumulative changes in number of institutional investors across 12 anomalies

This chart depicts cumulative changes in number of institutional investors from December of year t-2 through June of year t+1, averaged across 12 anomalies. Panel A depicts stocks in the highest tercile of Δ#Inst during the ranking period (quarters -3 to 0), separately for stocks in the short and long anomaly legs. Panel B likewise depicts stocks in the lowest Δ#Inst quintile. Holdings are aggregated by first summing the number of institutions holding any stock in the subportfolio during the quarter, then changes are cumulated and averaged across anomalies. Stocks are independently ranked into quintiles on the basis of the change in the number of institutional investors holding the stock during year t-1. 'Wrong side' refers to short-leg stocks with Δ#Inst in the highest quintile and long-leg stocks with Δ#Inst in the lowest quintile. 'Right side' refers to short-leg stocks with Δ#Inst in the lowest quintile and long-leg stocks with Δ#Inst in the highest quintile.

Panel A: Stocks in the highest Δ#Inst quintile between quarters -4 and 0



Panel B: Stocks in the lowest Δ#Inst quintile between quarters -4 and 0